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Authors: Dr. Aaron B. Rosa, Dr. Niklas Gudowsky, Dr. Philine Warnke, with support from Nora Häuser

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European Union

CIMULACT Partners

TEKNOLOGIRÅDET – DANISH BOARD OF TECHNOLOGY (DBT)
Arnold Nielsens Boulevard 68E, 2650 Hvidovre – Denmark,
Contact: Lars Klüver
lk@tekno.dk
www.tekno.dk

FRAUNHOFER GESELLSCHAFT ZUR FORDERUNG DER ANGEWANDTEN FORSCHUNG EV (ISI)
Breslauer Strasse 48, 76139 Karlsruhe – Germany
Contact: Philine Warnke
Philine.Warnke@isi.frauenhofer.de
https://www.isi.fraunhofer.de/

OESTERREICHISCHE AKADEMIE DER WISSENSCHAFTEN (ITA)
Apostelgasse 23, 1030 Vienna - Austria
Contact: Niklas Gudowsky
niklas.gudowsky@oeaw.ac.at
http://www.oeaw.ac.at/

MISSIONS PUBLIQUES (MP)
35 Rue du Sentier, 75002 Paris – France
Contact: Yves Mathieu
Yves.Mathieu@missionspubliques.com
http://missionspubliques.fr/

STRATEGIC DESIGN SCENARIOS SPRL (SDS)
Rue Dautzenberg, 36-38, BE-1050 Brussels - Belgium
Contact: François Jégou
f.jegou@gmail.com
http://www.strategicdesignscenarios.net/

TECHNOLOGICKE CENTRUM AKADEMIE VED CESKE REPUBLIKY (TC ASCR)
Ve Struhách 1076/27, 160 00 Praha 6-Bubeneč – Czech Republic
Contact: Lenka Hebakova
hebakova@tc.cz
http://www.tc.cz/cs

ASOCIATIA INSTITUTUL DE PROSPECTIVA (Prospectiva)
Bucharest, Sector 5, Aleea Sălaj no. 6,
România, postal code 051907
Contact: Radu Gheorghiu
Gheorghiu.Radu.Christian@gmail.com
http://www.prospectiva.ro/

APPLIED RESEARCH AND COMMUNICATIONS FUND (ARC Fund)
1113, Sofia 5, Alexander Zhendov St. Bulgaria
Contact: Zoya Damianova
Zoya.Damianova@online.bg
http://www.arcfund.net/

GREENDEPENDENT INTEZET NONPROFIT KOZHASZNU KORLATOLT FELELOSSEGU TARSASAG (GDI)
2100 Gödöllő, Éva u. 4. , Hungary
Contact: Edina Vadovics
Edina@greendependent.org
http://www.intezet.greendependent.org/

POLITECNICO DI MILANO (POLIMI)
Via Durando, 38a, 20158 Milano, Italy
Contact: Anna Meroni
Anna.Meroni@polimi.it
http://www.polimi.it/

THE ASSOCIATION FOR SCIENCE AND DISCOVERY CENTRES (SCIENCE)
Suite 101, QC30, 30 Queen Charlotte Street; Bristol BS1 4HJ, United Kingdom
Contact: Penny Fidler
Penny.Fidler@sciencecentres.org.uk
http://sciencecentres.org.uk/

FUNDACIO CATALANA PER A LA RECERCA I LA INNOVACIO (FCRi)
Paseo Lluís Companys, 23m Barcelona 08010 Spain
Contact: Belén Lopez
Belen.Lopez@fundaciorecerca.cat
http://www.fundaciorecerca.cat

AKADEMIEN DER WISSENSCHAFTEN SCHWEIZ VEREIN (TA Swiss)
Brunngasse 36, CH-3001 Bern – Switzerland
Contact: Elise Gortchacow
elise.gortchacow@ta-swiss.ch
www.akademien-schweiz.ch

Zentrum für Technologiefolgen-Abschätzung
Centre d'évaluation des choix technologiques
Centro per la valutazione delle scelte tecnologiche
Centre for Technology Assessment
www.ta-swiss.ch, Brunngasse 36, 3011 Bern

HELSINGIN YLIOPISTO (UH)
Fabianinkatu 33, 00014 Helsinki – Finland
Contact: Petteri Repo
Petteri.Repo@helsinki.fi
https://www.helsinki.fi/fi

TEKNOLOGIRADET – THE NORWEGIAN BOARD OF TECHNOLOGY (NBT)
Kongens Gate 14, N-0153 Oslo, Norway
Contact: Åke Refsdal Moe
Ake.refsdal.moe@teknologiraadet.no
http://teknologiradet.no/

INSTYTUT TECHNOLOGII EKSPLOATACJI-PANSTWOWY INSTYTUT BADAWCZY (ITeE-PIB)
ul. K. Pułaskiego 6/10, Radom 26-600, Poland
Contact: Beata Poteralska
Beata.Poteralska@itea.radom.pl
http://www.itee.radom.pl/

ASOCIACIJA ZINIU EKONOMIXOS FORUMAS (KEF)
J. Galvydžio g. 5, LT-08236, Vilnius – Lithuania
Contact: Edgaras Leichteris
Edgaras@zef.lt
http://www.zef.lt/

SIA BALTIJAS KONSULTACIJAS (BC)
Vīlandes 6-1, Riga, LV-1010, Latvia
Contact: Sandra Smalina
Sandra@granti.eu
http://www.balticconsulting.com/

UNIVERSITY COLLEGE CORK, NATIONAL UNIVERSITY OF IRELAND, CORK (UCC)
Western Road, Cork – Ireland
Contact: Stephen McCarthy
Stephen.mccarthy@ucc.ie
http://www.ucc.ie/

WAGENINGEN ECONOMIC RESEARCH
Alexanderveld 5, 2585 DB Den Haag – Netherlands
Contact: Volkert Beekman
Volkert.Beekman@wur.nl
www.lei.wur.nl

MEDIATEDOMAIN LDA (Mediatedomain)
Rua Nery Delgado 9-1, P-2775-253 Parede – Portugal
Contact: Ursula Caser
ursicaser@gmail.com
http://uc-mediation.eu/

UNIVERSITA TA MALTA (UoM)
Msida MSD 2080 – Malta
Contact: Sandra M. Dingli
Sandra.m.dingli@um.edu.mt
http://www.um.edu.mt/

SLOVENSKA AKADEMIA VIED (SAS)
Štefánikova 49, 814 38 Bratislava 1 - Slovakia
Contact: Tomas Michalek
Michalek@up.upsav.sk
https://www.sav.sk/

SLOVENIAN BUSINESS & RESEARCH ASSOCIATION (SBRA)
Av. Lloyd George 6, 1000 Brussels,Belgium
Contact: Draško Veselinovič
drasko.veselinovic@sbra.be
http://www.sbra.be/

RTD TALOS LIMITED (RTD Talos)
P.O. BOX 21722, 1512 Lefkosia, Cyprus
Contact: Melinda Kuthy
mk@talos-rtd.com
http://www.talos-rtd.com/

4MOTION ASBL (4motion)
10, rue du Commerce, L-4067 Esch/Alzett – Luxembourg
Contact: Gary Diderich
Gary@4motion.lu
http://www.4motion.lu/

ODRAZ - ODRZIVI RAZVOJ ZAJEDNICE (ODRAZ)
Ul. kneza Ljudevita Posavskog 2, 10000, Zagreb – Croatia
Contact: Lidija Pavic-Rogosic
lidija@odraz.hr
http://www.odraz.hr/

STATENS GEOTEKNISKA INSTITUT (SGI)
Månstorpsvägen 14, 263 32 Höganäs – Sweden
Contact: Lisa Van Well
Lisa.VanWell@swedgeo.se
http://www.swedgeo.se/

ATLANTIS SYMVOULEFTIKI ANONYMI ETAIREIA ATLANTIS CONSULTING (SA ATL)
9th klm of Thessaloniki - Thermi, GR-570 01 – Greece
Contact: Magda Chatzi
chatzi@atlantisresearch.gr
http://www.atlantisresearch.gr/

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Summary

From its onset, the CIMULACT project aimed to provide a unique contribution to the inputs shaping the final work programme for H2020 (FP8) and the development of the ninth framework programme (FP9) to follow H2020. In order to achieve this, CIMULACT was structured as a multi-phase, inclusive future visioning and foresight process - using thousands of citizen-generated visions of the future to contribute to the development of a workable Research and Innovation agenda for the EU. This deliverable aims to test the 'uniqueness' of CIMULACT proposals in light of contemporary, expert-based foresight reports whose aim was also to influence the FP8/FP9 creation process.

This research has uncovered a series of quantitative and qualitative differences between CIMULACT's proposed research topics and the trends and advisements present in the selected foresight reports. Given the results of this study, we believe a strong case can be made for the expansion of citizen-based, participatory foresight projects with regard to policy and agenda setting across numerous sectors.

Our experimental design hinged on a novel method of comparative reading between the 46 CIMULACT research topic proposals derived from hundreds of EU citizen visions, and sixteen expert conducted foresight reports. This method included two rounds of comparative reading for each expert foresight study, the collection of interrelated citations from foresight reports and CIMULACT topics, and two rounds of qualitative assessment regarding the connections between each report and the CIMULACT project.

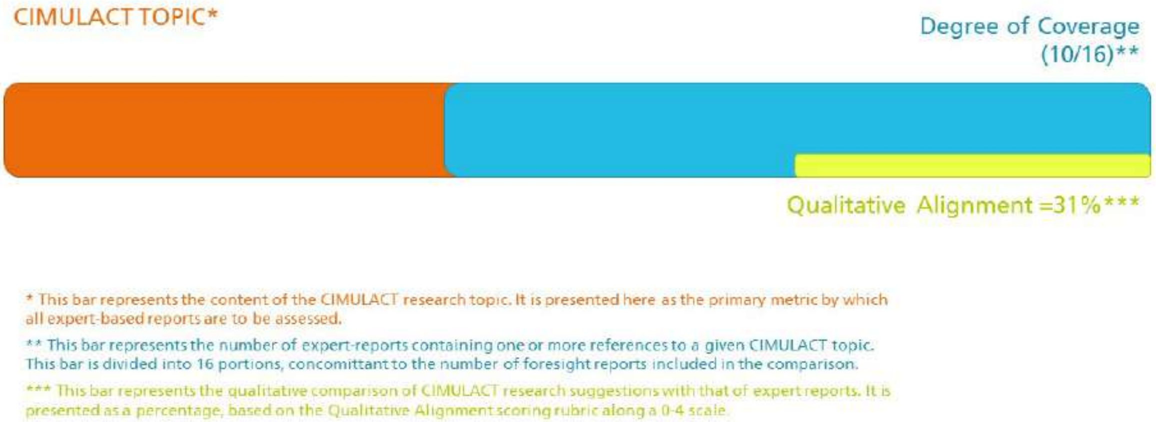
The results of this deliverable demonstrate explicit differences between the content and intention of CIMULACT when compared to expert-based foresight reports. Our method's "Degree of Coverage" (DoC) metric showed that CIMULACT proposals were generally well represented within expert foresight studies, with some rather notable exceptions regarding quality of life expectations, redesigned education models, alternative economic systems and work schema, development of community and social values, and inclusive governace among other research topics. However, the DoC metric alone cannot speak to the qualitative differences between expert-based foresight reports and the CIMULACT research proposals.

In our comparative readers' assessments, the average level of qualitative alignment between CIMULACT topics and expert reports was quite low across all topic areas. This indicates that despite a topic being mentioned within multiple expert studies, there remains a substantial difference between citizens and experts in: 1) the framing of research problems, 2) the methods promoted to address these challenges, and 3) the prioritization of research areas for the upcoming framework program. We believe that this data underscores the importance of CIMULACT, and other inclusive and participatory

projects, in providing EU policy makers with a citizen developed view of desirable futures and the suggested means by which they can be achieved.

According to our comparative reading, the R&I agenda proposed by the CIMULACT project contrasts significantly with expert-based foresight reports, particularly in the promotion of inclusive social experimentation to find scalable solutions to the perceived challenges. Furthermore, It would appear that well-being, work-life balance, and related aspects of the citizen desires expressed in their visions are systematically ignored by some component of the expert-based foresight process. Whereas expert-based reports tend to focus on the possibilities that new technologies could afford, and general statements concerning trends and their potential impacts, CIMULACT proposals focus on presenting deliberate R&I research agendas across a variety of social, economic, and political challenge areas. It is our conclusion that the methodology employed by CIMULACT facilitated new approaches to social innovation, and resulted in a novel R & I agenda that clearly speaks to the fundamental, future-oriented desires of diverse citizenry.

Figure 1: Overall degree of coverage and qualitative alignment of expert-based forsight studies with CIMULACT topics



* This bar represents the content of the CIMULACT research topic. It is presented here as the primary metric by which all expert-based reports are to be assessed.

** This bar represents the number of expert-reports containing one or more references to a given CIMULACT topic. This bar is divided into 16 portions, concomittant to the number of foresight reports included in the comparison.

*** This bar represents the qualitative comparison of CIMULACT research suggestions with that of expert reports. It is presented as a percentage, based on the Qualitative Alignment scoring rubric along a 0-4 scale.

Figure Description 1: This image shows that overall coverage of CIMULACT topics was approximately 62.5%, while Qualitative alignment was 31%. This legend also acts as a legend for all similar bar graphs found in the report.

In general, elements of the CIMULACT research topics were represented within the expert-reports, but overall alignment between CIMULACT and expert-studies remained low. Some key thematic differences include, but are not limited to:

- Governance issues were seldom mentioned and typically framed as a continuation of existing power structures within expert-based reports. In contrast, CIMULACT results present distributed forms of governance as critical spaces for experimentation across all major societal sectors. This omission accounts for a significant part of the misalignments.

- Citizen visions for a desirable and sustainable future forms the baseline for proposed research topics, resulting in a society-centric frame for future research and innovation.

- The focus of expert-based reports often fails to recognize the importance of individual choice that is at the heart of CIMULACT's research topics, and as such renders reconciliation between the content of the expert-based reports and that of CIMULACT difficult. By excluding the concept of personal agency that underpins much of the CIMULACT research topics, the recommendations of expert-based reports seem to hide their impact of humans behind a mask of ambiguity.

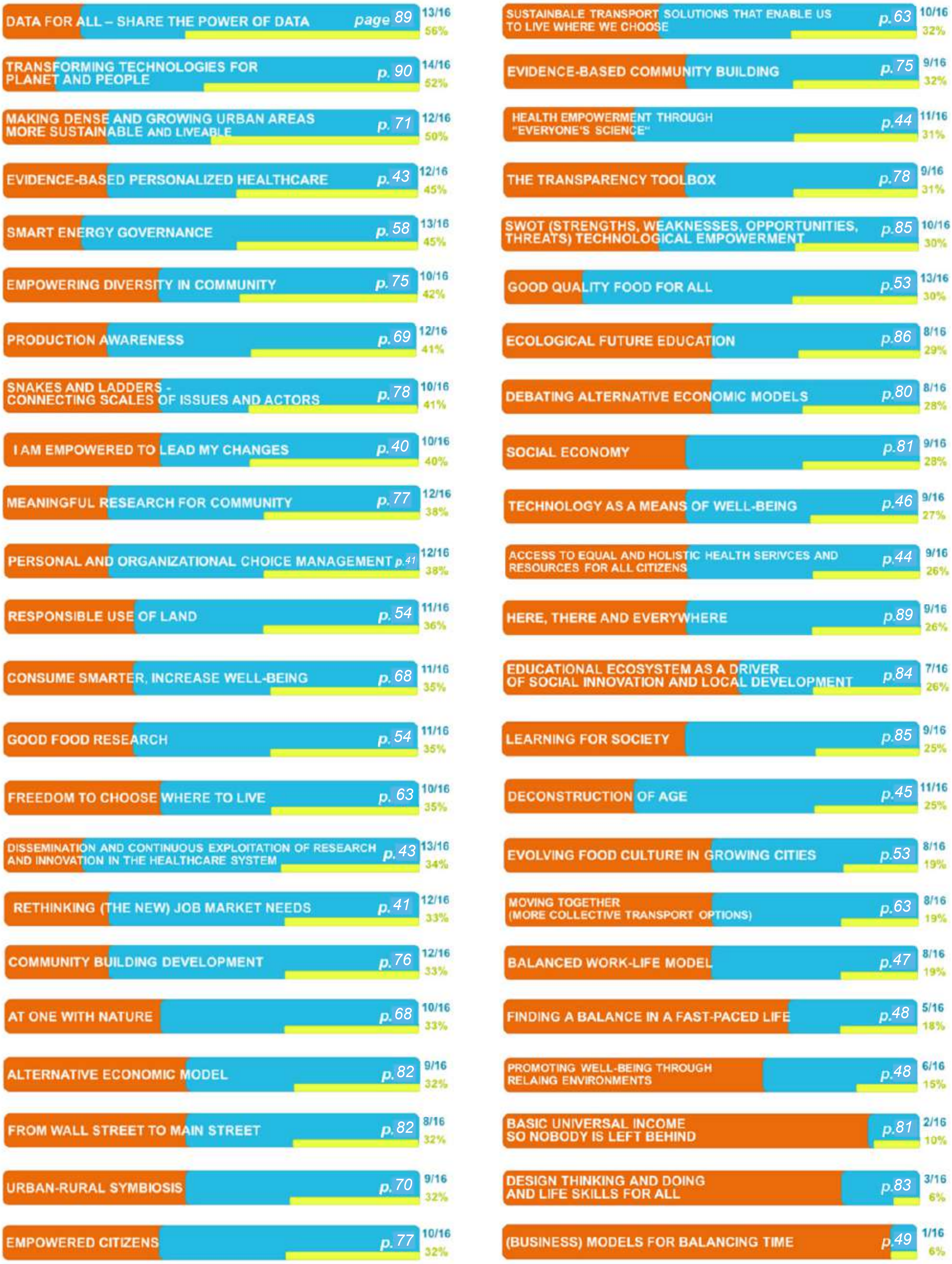
- Overall, each of the CIMULACT topics set out to provide a broad scope for research to explore several directions for research and innovation activities. This perspective reduces technocratic solutionism, and presents research areas and goals couched within scenarios that reflect the plurality and diversity that compose the EU's citizenry.

- Education was a major crosscutting issue mentioned across numerous CIMULACT research topics, as educational measures were frequently part of solutions to challenges. However, education (both formal and informal) was distinctly under-represented in many expert-based reports, particularly with regard to addressing social challenges.

- The Basic Universal Income topic is one of the least represented and least aligned topics of all 46 CIMULACT topics, making it a very unique contribution to research policy-oriented discussions.

In regards to the utility that the CIMULACT project may provide in future policy design, we believe that the divergent thinking outlined here makes this report invaluable to social agenda setting, and is good evidence for broad, participatory foresight as a necessary methodological component of organizational and social governance more generally. Figure 2 presents an overview of all CIMULACT topics ordered by descending degree of the qualitative alignment score - a visual demonstration of the discrepancy between citizen-derived and expert-based foresight that CIMULACT has helped unveil.

Figure 2: CIMULACT topics ordered descending by qualitative alignment (green bar)



1

INTRODUCTION TO PARTICIPATORY AGENDA SETTING AND CIMULACT

1. Introduction to participatory agenda setting and CIMULACT

The CIMULACT project collected, explored, and aggregated citizen-based visions of desirable and sustainable futures for the EU as a means to derive a research and innovation agenda for the EU by which governing structures can better align R&I policy and funding to the aspirations of their citizens. This ambitious goal utilized a rigorous multi-method and multi-actor approach including online consultations (D4.2)[1], citizen, expert, and stakeholder workshops in 30 countries (D1.3, D2.1, D3.2), and public conferences with attendant EC officials. During this process, the thoughts and ideas of thousands of European citizens, experts and stakeholders were collected and analyzed; resulting in the final citizen-based Research Topics (D2.2).

The working hypothesis of the CIMULACT project is that citizen-derived visions of the future must be accounted for in EU-Level policy formulation and decision-making particularly in regards to the last tranche of calls and topics of Horizon2020 (2018-2020) as well as the next R&I framework programme. Results are primarily aimed at making the Horizon 2020 more responsive to societal needs, thereby putting responsible research and innovation (RRI) into action. In addition to EU-level, the CIMULACT consortium undertook considerable effort to support national R&I agenda setting with the project's findings. Our project supposed that citizen-based visions for a future EU, would illuminate new pathways for responsible research and innovation across the continent. This hypothesis was based on several experiences with previous projects concerned with citizen-based STI agenda setting processes, such as the CIVISTI project or VOICES (see Box 1). Implicit in this supposition is that opinions and values concerning future prospects emerging from citizen-sourced images of preferable futures would differ from the work of foresight experts and institutional, futures-oriented policy studies. This task tests this assumption by directly comparing a selection of expert-based foresight reports with the final CIMULACT results.

The majority of the foresight reports examined in this study have directly informed the EU governing bodies and policy-making over the past few years, or served a similar function in nations outside the EU. These reports range from technological forecasts to analyses of diverse social change drivers, and they encompass multiple professional foresight methodologies. The selection of international foresight reports was included to account for alternative methods and findings from other parts of the world, with comparable economic and social structure as the European Union. Despite differences across structure and content of these expert foresight studies, our examination reveals crosscutting alignments and disparities between citizen visions and expert opinion.

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[1] All CIMULACT project deliverables are available at the project website: http://www.cimulact.eu/publications/

In the broadest of generalizations, the discrepancy between expert and citizen approaches to foresight seems to rest in the primacy of technology for the former, and the influence of societal dynamics in the latter. The technological and social cannot be thought of as distinct entities, and it is through citizen-derived research recommendations that we find the best representation of their mutual influence over one another contextualized within a proposed agenda. While in many expert reports technology tends to be viewed as valuable from an economic point of view, social values of community-building, respectful human interaction, physical and mental well-being, to name just a few of those emphasized by CIMULACT, are core components of negotiating policy decisions towards sustainable and inclusive growth.

Box 1: Overview on CIMULACT predecessors — EU-projects CIVISTI and VOICES

During the past 10 years a few participatory agenda setting processes were conducted on national as well as international level. Here, we want to give a short overview on two projects that facilitated such a process on EU-level and can be considered direct predecessors of CIMULACT. The following projects applied different methods and engaged different target groups in agenda setting for science, technology and innovation. CIMULACT built upon the experiences made within these two projects as well as several others.

CIVISTI — Citizens Visions on Science, Technology and Innovation (2008-2011)
The CIVISTI project was a European research foresight project funded by the Socio-economic, Sciences and Humanities (SSH) Program. The aim of the project was to identify new, emerging topics for the EU R&D policy. It consulted citizens in 7 European countries (Denmark, Austria, Flanders/Belgium, Finland, Malta, Bulgaria, Hungary) uncovering European citizens' visions of the future and transform these into relevant long-term science, technology and innovation issues (civisti.org). Within the project citizens developed visions of a desirable future and experts and stakeholders used these to derive recommendations for the 8th EU-framework programme for research and innovation (Horizon 2020) which was in the making at that time. The CIVISTI method was afterwards applied and adapted in several national settings (for examples see Gudowsky and Sotoudeh 2017, Gudowsky et al. 2017). This method significantly inspired the method applied in CIMULACT.

VOICES — Views, Opinions & Ideas of Citizens in EU on Science
The VOICES consultation process gathered opinions and ideas about urban waste from citizens across the EU. It used science centres and museums as powerful spaces for public engagement and applied a renowned method - focus groups. The results were fed back to policymakers in order to influence the direction of EU research policy under Horizon 2020. It was funded under the Science in Society 2013.1.2.1-1 call on citizen participation in science and technology policy in Horizon 2020 (www.voicesforinnovation.eu). While CIVISTI sought to find general recommendations for STI policy, VOICES generated advice on the specific topic of urban waste as a resource, and the concept of a "zero waste society" and conducted its participatory process in 27 EU countries engaging 1000 citizens, thereby laying groundwork with valuable lessons learned for CIMULACT's extensive engagement process.

Background: The CIMULACT methodology - From citizens visions to concrete topics for future R&I

This section provides an overview of the several stages of engagement processes the CIMULACT consortium implemented between October 2015 and December 2016. For a more detailed description, consult Deliverables 2.1 and 2.2[2] available on the project's website (**www.cimulact.eu**). By including input from thousands of EU citizens, the CIMULACT project aims to present these qualitative priorities in a language and method that can be most useful to the European Commission and its officers as they draft the next framework program. That is why the participatory approach to research proposal creation within CIMULACT included the following components:

Citizens Visions: As a starting point the consortium organized a visioning workshop in each of the 30 participating European nations. In each workshop approximately 36 citizens, selected to maximize diversity regarding several socio-demographic criteria, produced 179 visions of desirable and sustainable futures following a standardized method. These visions used a time horizon that was 30-40 years from the present (circa 2045-2055). (cf. Deliverable 1.3: Vision Catalogue[3]).

Societal Needs: a group of CIMULACT consortium members supported by external experts (challengers) met in Paris for a clustering workshop and extracted 26 underlying, crosscutting, implicitly and explicitly mentioned needs within the citizens visions (cf. Deliverable 2.1: First Draft of Social Needs Based Research Programme Scenarios).

Research programme scenarios: At a two-day workshop in Milano in April 2016, consortium members, 30 external experts and stakeholders as well as 30 citizens (one from each visioning workshop) co-created 48 suggestions for research programme scenarios on the basis of the 179 visions as well as the 26 identified societal needs (cf. Deliverable 2.1).

Enriching research programme scenarios: In order to refine and enrich the 48 research programme scenarios and push them towards becoming actual research topics, two parallel activities were carried out. An online consultation applying an argumentative Delphi engaged more than 3400 people, whom could prioritize the scenarios and enrich them with additional arguments (cf. Deliverable 4.2 European Report on Online Consultation Results[4]). Additionally, the consortium organized face to face consultations in 30 countries, engaging citizens, experts, policy-makers, and other stakeholders to review and enrich the scenarios (cf.

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[2] http://www.cimulact.eu/wp-content/uploads/2017/03/CIMULACT-D2.1_final.pdf
http://www.cimulact.eu/social-needs-based-research-programme-scenarios/

[3] http://www.cimulact.eu/wp-content/uploads/2016/06/D1.3final.pdf

[4] http://www.cimulact.eu/european-report-on-online-consultation-results/

Deliverable 3.2 Programmes and concepts for all citizen and multi-actor consultations[5]).

Drafting topics: consortium core-partners met for another two-day workshop (Paris, November 2016) to integrate the results of the online and the face-to-face consultations. The results of this aggregation and synthesis were 48 one-paged research topics with precise descriptions of challenge, scope and expected impact of the proposed research activities.

Refining topics with decision makers: to ensure applicability of the drafted topics to EU research programming, the consortium organized a final Pan European Conference in Brussels (December 2016) to engage European Commission Programme Officers and experts. On that day, 75 participants reduced the 48 drafted research topics down to 46 by merging highly similar topics, and then selected and refined 23 final topics for presentation to policy makers (cf. Deliverable 2.2 Final citizen's based research topics[6]).

For the purpose of comparative reading, we used the larger corpus of CIMULACT research topics (46 total) in alignment with the project's mission to be both transparent and inclusive to the maximum extent possible. In our efforts to include as many voices and perspectives from the comprehensive CIMULACT process, it became clear that the original CIMULACT research topics would best represent the comprehensive aspirations of the thousands of EU citizens involved in the project.

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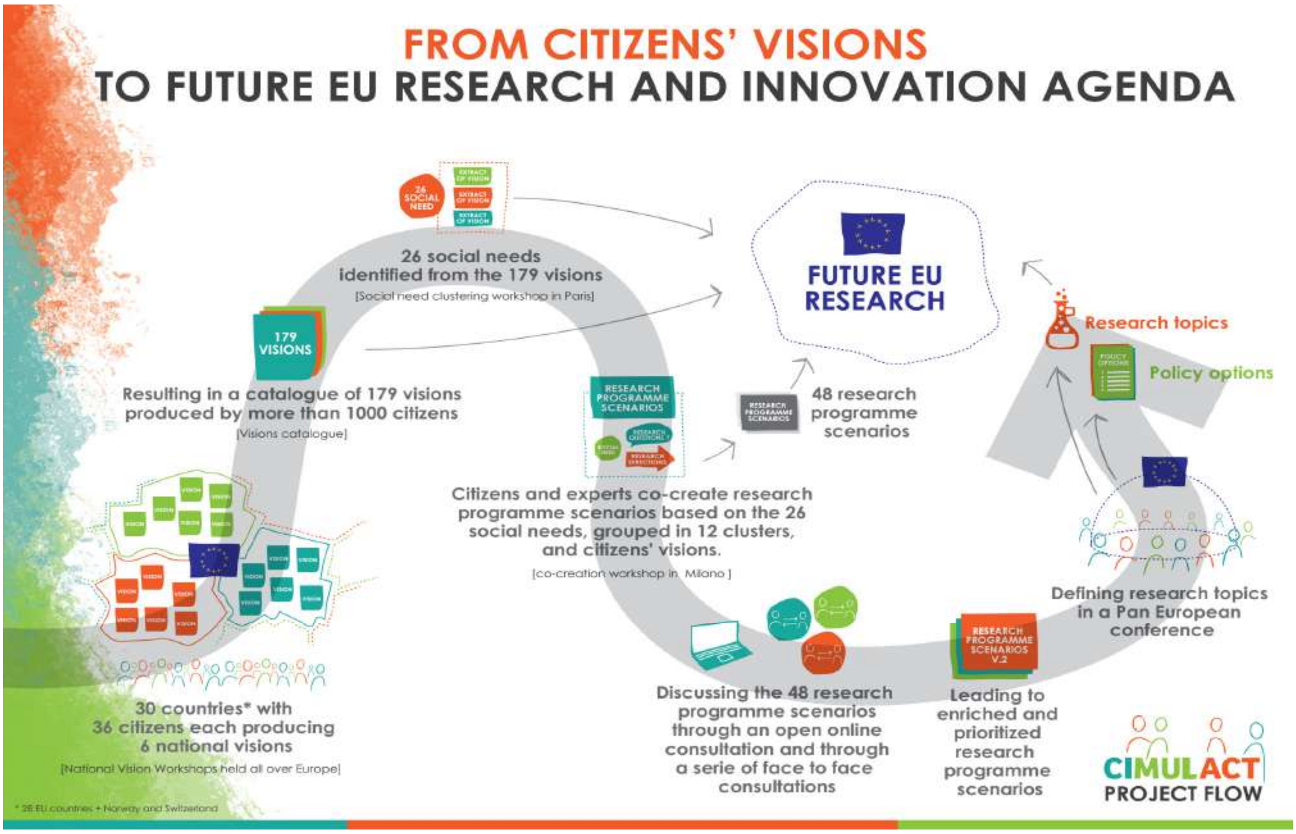
[5] http://www.cimulact.eu/wp-content/uploads/2017/09/D3.2-Programmes-and-concepts_compressed.pdf

[6] http://www.cimulact.eu/wp-content/uploads/2017/03/CIMULACT-Deliverable-2.2-2017_low_res.pdf

Figure 3:Overview of the CIMULACT methodology



2

METHODOLOGY OF THIS STUDY

2. Methodology of this study

Comparative readings of foresight reports are complicated because of the large diversity of methodologies employed across the field and by the non-standard categories and classification schema that form the framework of most reporting of results. Past attempts at comparing national foresight reports have confronted these challenges in different ways including a national objectives analytical model (Gavigan, Scapolo 1999), and the development of comparative matrices (Alsan, Oner 2004). Foresight comparisons can also be organized along methodological approaches (Fernández Güell, López 2016), numbers of participants, organizing bodies of the foresight program and the difficulty to measure 'policy impacts' (Calof, Smith 2012). Components of the methodologies employed in previous studies are applicable to our analysis, but no single methodology discovered during the literature review was comprehensively applicable to the needs of the CIMULACT comparative reading. Thus, we developed a new comparative model that addressed the needs of this project (see Table 1).

Table 1: Overview of workflow and method of comparison

Step	Task
Preparation	Identification and selection of foresight studies for comparison; Identifying keywords and concepts within CIMULACT topic for comparison
Comparative reading 1	Matching direct quotes from foresight report to key concepts of CIMULACT topics
Comparative reading 2	Checking first reading, adding additional direct quotes from foresight report to key concepts of CIMULACT topics
Degree of Coverage	Calculating measure of 'Does foresight report cover CIMULACT topic?' (yes/no)
Qualitative analyses 1	Independent assessment of degree of alignment between direct quotes and key concepts
Qualitative analyses 2	Independent assessment of degree of alignment between direct quotes and key concepts
Aggregation and review	Comparing results of qualitative analysis 1 & 2; Revisiting and discussion of cases with a difference in score >1 point
Final scoring	Calculating average alignment scores for topics and reports

Preparation: Selection of expert based foresight studies

In selecting expert based foresight reports for comparison with the CIMULACT results, we faced a number of challenges. Firstly, it was critical that the purpose of each expert-based report be similar in character to the stated purpose of the CIMULACT project: to shape the prioritization of research topics within a large-scale, long-term R&I agenda. This selection criteria was viewed as the principle guiding measure, and allowed our team to rapidly narrow the field of candidate reports. As the CIMULACT project results are intended to influence the shaping of the next tranche of calls for Horizon 2020 as well as the next EU framework program (FP9), we selected a number of expert-based reports written to shape phases of H2020 (FP8). We therefore concentrated our search for expert based reports within a number of online databases[7] whose contents are most likely to fit our criteria. The constant influx of reports into these online libraries mandated that we revisit our search across these databases halfway through the research.

Secondly, we selected expert-based reports with a similar scope to the CIMULACT project: broad ranging in terms of included research fields. This entailed that expert-based foresight reports that focused on a particular sector or field of inquiry (i.e. biotechnology, raw materials, etc.), or those that were national in scope, were excluded from our comparison. Though these reports often included detailed foresight knowledge, the specificity of their results rendered them incomparable to the highly integrated fields of research that enabled CIMULACT's broader perspective.

We acknowledge that the methods employed to find candidate reports, and the selection criteria outlined below, are areas in which the methodology can be further improved. Resource restrictions limited the amount of time we had to identify reports that might be useful in our comparison, and further limited the total number of reports that we could include.

Additional categories for selection

Several pieces of information inherent in each expert-based report enable a meta-level comparison across the final set of reports selected for comparison. These categories include commissioning organizations, authoring organizations, publication date, time horizon, methodological approach, and the intended audience, all of which are recognized categories in previous foresight mapping analyses (Popper 2009).

COMMISSIONING ORGANIZATION

The nature and orientation of the commissioning organization is informative of the purpose and scope of the report, as well as the intended audience for the results. In looking for broad ranging, policy-oriented reports that could be applied at a national or international level, it was useful to focus on reports commissioned by organizations that operate within such domains. Thus foresight reports that had been commissioned by the European Commission, the European Parliament, The Office of Economic Co-operation

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[7] Databases included: https://publications.europa.eu/en, http://openfutures.net/, http://publications.jrc.ec.europa.eu/repository/, http://www.foresightfordevelopment.org/sobipro/55-resources

and Development, and other institutes working within an international context were of primary interest to our comparison. Also, as CIMULACT is aimed to fulfill the needs of public policy makers, foresight activities of privately owned international organizations were discounted from our selection pool.

AUTHORING ORGANIZATION

The size, structure, location, and culture of a foresight institution can play an important role in the reporting that it publishes. Selecting reports primarily from institutions and consortiums with direct ties to one or more EU member states was a high priority for comparison of the CIMULACT results. While it is beyond the scope of this research to analyze the institutional culture and structure of the reporting institutes, we collected and compared location information. For a more comprehensive comparison, it was important that foresight reports from sources outside the EU, and pertaining to non-EU contexts, were also included in our analysis set. Even as the EU R&I policy is meant to govern internal budgeting and agenda setting, the international nature of research and innovation practice, combined with the EU's position as an international research partner, made the inclusion of non-EU authored and focused foresight reports a necessity.

TIME HORIZON & DATE OF PUBLICATION

Firstly, it was important to compare CIMULACT results with a group of contemporary, peer publications. We selected foresight reports published within the last five year (2012-2017) with the majority of reports not being older than three years. While it is often the case that long-term trends and forecasts remain valid for many years after their initial publication, the content-focus of this research led us to select recently published expert-based reports.

Though the internal time horizon for the CIMULACT project was closer to 35 years, as citizens were initially asked to imagine visions of the future based 30-40 years from now, we used a shorter time horizon for selecting reports based on the CIMULACT project's expected impact to influence the next tranche of calls for Horizon 2020 and the next framework program for the EU (FP9). From those reports that clearly state a target time horizon, a majority of the selected foresight reports target the year 2020 or shortly thereafter, in order to address the H2020 Framework Programme itself. The year 2030, an approximate 15 year time horizon from the beginning of the CIMULACT project, was also a recurrent time horizon amongst the selected reports. while one report targeted the year 2050 for a portion of its work. Additionally, two of the reports were intentionally ambiguous concerning a specific time horizon they intended to investigate. Within both of these reports, we find multiple time horizons, each concerning specific contents (technologies, trends, etc.).

METHODS

The range of methods used in the selected foresight studies represents an uneven distribution across the totality of foresight methods, and yet there are good reasons for such a selection given the underlying methodology of the CIMULACT project. Nearly all of the reports deployed multiple methods, often with one or two particular methods becoming the centerpieces for the foresight results.

The most popular methods deployed in our selected foresight reports include scenario development, the identification of critical technologies, trend analysis, and literature reviews. Workshops and/or conferences were also organized across many of the production cycles for these reports, often to facilitate the execution of a more specific method (writing scenarios, validating findings, exploring social dynamics). Additionally, the selected reports include Weak Signal identification and Horizon Scanning research.

INTENDED AUDIENCE

Taking into account the context in which each foresight report's results were to be read and utilized was determined based on the commissioning institution, and the stated intentions of the report (where available). At a general level, the primary audience for the majority of the reports was one or more components of the European Commission (EC). In one instance the European Parliament itself commissioned a foresight report from its internal research group (EPRS). Other commissioning institutions include Danish Agency for Science, Technology and Innovation, The Copenhagen Research Forum, The Atlantic Council, and Finland's Committee for the Future.

Some of these reports are written for a generalized audience, with an expected readership of " an enlightened citizen, a researcher, an entrepreneur, or an investor..." (Linturi et al. 2014). Many of the reports funded by the European commission are written in an accessible language, but are rather focused on presenting policy-makers, specified stakeholder groups, and governing officials with foresight results that address their information requirements.

Table 2: Foresight reports chosen for comparison

Report Title	Year Pub.	Time Horizon	Methods	Institution	Location	Authoring Inst.
Using foresight to support the next strategic programming period of Horizon 2020 (2016-2018)	2014	H2020	Drivers of Change, 'Disruptors'	European Commission	EU (Brussels)	Vincent Rousselet & Associates Ltd

100 opportunities for Finland and the world: Radical Technology Inquirer (RTI) for anticipation/evaluation of technological breakthroughs.	2014	Not Explicit	Technological Forecast,	Committee for the Future	Finland	VTT, What Futures Ltd., Solveto Ltd.
An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy	2016	2025	Trend Analysis, Wildcards, Technological Forecast,	Danish Agency for Science, Technology and Innovation	Denmark	OECD
Recommendations for an optimized implementation of Horizon 2020	2012	H2020	Trend Analysis	Copenhagen Research Forum	Denmark	Copenhagen Research Forum
Visions for Horizon 2020. Copenhagen Research Forum II	2012	H2020	Scenario Development, Technological Forecast,	Copenhagen Research Forum	Denmark	Copenhagen Research Forum
Foresight Services to Support Strategic Programming within Horizon 2020	2014	H2020	Scenario Development, Technological Forecast, Trend analysis	European Commission	EU (Brussels)	RAND Europe
Envisioning 2030: US Strategy for the Coming Technology Revolution	2013	2030	Trend analysis, Technological Forecasting	The Atlantic Council of the United States	USA	The Atlantic Council of the United States
Ten Technologies which could change our lives: Potential impacts and policy implications	2015	Not Explicit (21st C)	Technological Forecasting	European Parliament	EU (Brussels)	European Parliamentary Research Service

Preparing the Commission for future opportunities- Foresight network fiches	2015	2030	Technological Forecasting, Trend Analysis, Workshops	European Commission	EU (Brussels)	EC Foresight Network, 21 DGs participated.
Global Trends to 2030: Can the EU meet the challenges ahead?	2015	2030	Trend Analysis	European Strategy and Policy Analysis System	EU (Brussels)	European Strategy and Policy Analysis System
The Global Economy in 2030: Trends and Strategies for Europe	2013	2030	Trend Analysis	European Strat-egy and Policy Analysis System	EU (Brussels)	Centre for European Policy Studies (CEPS)
Making Europe Open and Polycentric. Vision and Scenarios for the European Territory towards 2050	2014	2050	Scenario Development, Trend Analysis, Mapping	ESPON monitoring committee	EU (Luxembourg)	MCRIT, IGEAT, Tersyn, HAS RCERS, S&W, IOM, IGSO, RIKS, SGH, ISIS, U of Thessaly, ERSILIA Foundation
Strategic Foresight: Towards the 3rd Strategic Programme of Horizon 2020	2015	H2020	Drivers of Change, Scenario Development (2030),	European Commission	EU (Brussels)	SAMI Consulting
European Value Changes Signals, Drivers, and Impact on EU Research and Innovation Policies	2016	Not Explicit (H2020)	Trend Analysis, Weak Signals	European Commission, DG R&I	EU (Germany)	IISA, Fraunhofer ISI
OBSERVE: Observing Emergence.	2017		Horizon Scanning, Sense-Making, Online Consultation.	European Commission	EU (Germany)	Fraunhofer ISI

State of the Future, 2013-2014	2014		Trend analysis, Horizon Scanning	The Millenium Project	USA	The Millenium Project

Preparation: Comparative analytical framework

As the purpose of the CIMULACT project was to derive topics for future R&I planning at the EU level, we used the 46 topics that resulted from the final CIMULACT workshop in Brussels (D2.2) as the primary basis for comparison[8]. This decision meant that a content driven comparative analytical framework was necessary, and we developed a series of 'lenses' from the CIMULACT topics, the descriptive text that accompanied them, and the thematic groupings under which they were categorized (Harvard STS 2017). (See Example in Table 3). Comparative lenses were composed of the keywords and critical concepts that delineated each of the 46 CIMULACT research topics, and were highlighted in the comparative reading template itself.

Table 2.2 Example of Comparative Lens derived from CIMULACT Research Topics.

Research Scenario Title	Grand Challenge	Thematic Cluster	Descriptive Text of Convergent Research (Keywords and Concepts Highlighted)	Quotations From Report
Finding a balance in a fast-paced life	Health and well-being	Work-life balance and well-being	Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to	" Quoted Text from foresight report" (page number within expert report)

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[8] CIMULACT produced 48 research scenarios during a co-creation workshop in Milano (D2.1). During post-production of this workshop the 48 research scenarios were prepared to serve as input material for the final policy workshop in Brusseles and thus became potential topics. In the final policy workshop participants chose 23 out of the 48 potential topics and elaborated those into the final research topics, 22 potential topics remained in their original state, two were merged. Thus Deliverable 2.2 encompasses 23 final topics and 23 potential ones. These 46 topics served as basic material for our analysis in this deliverable

			travel such as teleportation and space travel for saving time • ensuring more accessible environments digitalisation of many of the "analog" activities overcoming the notion that time is money	

Comparative reading

During the first phase of the comparative reading, two members of the CIMULACT team independently analyzed each foresight report based on these lenses. During each comparative reading, direct quotes from the expert-based foresight report were matched with corresponding CIMULACT topic. The results of each individual reading were recorded in a comparative template based on the comparative lenses that were developed at the onset. Finally, individual comparative results for each report were aggregated into a single file from which a more thorough synthesis of findings could be derived (Annex 2).

Degree of coverage metric

This phase of the work allowed us to conceive a general "Degree of Coverage" (DoC) metric, indicating that at a basic level our comparative readers believed each CIMULACT topic was either covered (=1) or not covered (=0) based on whether or not a quote from the expert based report had been matched to the topic area. This data was aggregated across all comparisons, allowing us to state a comprehensive DoC score for each of the CIMULACT topic (See data analysis). Numeric DoC data was also assigned a qualitative signifier according to the following scheme:

DoC 1-3 = Low
DoC 4-6 = Medium-Low
DoC 7-10 = Medium
DoC 11-13 = Medium-High
DoC 14-16 = High

While this level of analysis provides a perfunctory view of the comparative results, two problems emerge that demanded further development of our method. Firstly, we encountered many concepts, technologies, and perspectives in the expert-based report that found little or no mention inside the CIMULACT topics. These exceptions were collected in each of the comparative reading templates, and were organized according to the Research topic clusters that were identified under each of the Grand Challenges (see Annex 4). For analysis purposes, content from the expert-based reports that was not identified in CIMULACT, was exempted from the "Degree of Coverage" and "Qualitative Alignment" metrics that were employed (described below).

Qualitative Analysis

Alignment metric

The second problem was that the "Degree of Coverage" metric presented an over-simplification of complex qualitative analysis that had been conducted during the comparative readings. Text excerpts from expert-based reports varied widely in their alignment to the details and intentions of the CIMULACT topic. In some cases, expert-based quotations were only nominally related to the CIMULACT topic to which they were assigned, whereas in other cases both CIMULACT and an expert-based report content were very closely related. In order to address this second problem our comparative readers were tasked to provide an assessment of the "Qualitative Alignment" (QA) between each CIMULACT research topic and the expert-based citations that had been highlighted. This assessment consisted of a four-level scale:

0 = No Alignment - This designation was used when no text from expert-based studies had been assigned to the CIMULACT topic.
1 = Low Alignment - This designation was used when expert-based text discussed one or more aspect of a CIMULACT topic, but differed on goals, research recommendations, or perspective of analysis (i.e. technocratic, econo-centric).
2 = Medium Alignment - This designation was used when expert-based text generally matched with CIMULACT topic content, but missed some key components or only partially connected to CIMULACT's stated research goals.
3 = High Alignment - This designation was used when expert-based report content was deemed to nearly mirror that of CIMULACT topic content, according to the specifics mentioned, the more general research paths and goals, and the broader social implications for such research.

To ensure that QA scores were assigned without bias or influence, each of the comparative reading graphs were independently reviewed by two CIMULACT comparative readers. Following the second QA comparison, average alignment scores were calculated for each of the expert reports with regard to CIMULACT topic content. In addition, a brief explanation text was written to justify the QA Scores.

Following these two phases of comparison and data gathering, we were able to calculate comprehensive "Degree of Coverage" and "Qualitative Alignment" scores for each of the CIMULACT topic with respect to all 16 selected expert-based reports.

Workflow of Analysis

Two phases of analysis were necessary for a comprehensive comparison between the CIMULACT results and the selected foresight studies. In the first phase, each selected foreisght report was read by two foresight specialists from the CIMULACT consortium. Each reading compared the content of the selected foresight report to the 46 topics and descriptive text that accompanies them. During this phase, specific passages from each of the expert-based foresight reports were collected in conjunction with the CIMULACT topic that they adressed. These passages represent a relationship between the texts in the qualitative assessment of the reader.

Given that each CIMULACT topics combined multiple fields of research, technological developments, and other types of social change, it was necessary to take an interpretive approach to reading the expert-based reports. Several factors could be taken into account during the comparative reading, including: A) the context in which a critical technology was assessed, B) presented use cases or case studies, C) implications of trends, and others. As this assessment is highly subjective, it was actively monitored through the implementation of a second reader, and frequent dialgoue between readers concerning their selection of passages and the connections that were being drawn.

The second phase of analysis involved the aggregation of data from the first phase of comparative reading, with a quantitative approach to measure the degree of coverage for each on the CIMULACT Research Topics across all of the surveyed expert-based reports. Degree of coverage was defined along five grades of relationality, according to the number of passages linked to each of the CIMULACT topics - low, medium-low, medium, medium-high, and high. This quantitative analysis is paired with a qualitative assessment concerning the nature of the coverage across the different expert-based reports.

3

FINDINGS AND DISCUSSION

3. Findings & Discussion

The following chapter presents the results of our comparative reading of 16 expert based foresight reports against CIMULACT's citizen-derived Research Topics. To best convey these results we have organized the chapter in a hierarchy that reflects the organizational principles that have been developed during the CIMULACT project. As mentioned above, the 46 Research Topics were first organized according to the EU-designated Grand Challenge to which they best correspond (CIMULACT Deliverable 2.2)). Thus within this chapter you will find a section that is dedicated to each of the Grand Challenges - encompassing all of the CIMULACT research topics within that Grand Challenge, and the results of the comparative readings.

Additionally, CIMULACT Research Topics were also organized according to sub-challenge clusters - distinct areas that outline components of the Grand Challenges, or approaches to solving them, from different social, economic, political, and or industrial sectors. For example, in regards to the Grand Challenge titled ***Europe in a Changing World: inclusive, innovative, and reflective societies***, four sub-clusters of CIMULACT topics were organized - Community Building, Participatory Governance, Economy, and Education. On average, three CIMULACT Research Topics have been placed within each of these clusters. Using this organizational scheme allows our research to be more easily translated across other CIMULACT project deliverables, while also allowing those unfamiliar with the CIMULACT project to distill useful information regarding how the citizen derived topics can be read as relating to existing EU priority areas.

Leading off each Grand Challenge section is a short descriptive text concerning the Grand Challenge itself, and the clusters and research topics that are related. A general overview of the findings can also be found in both text and table formats. These overviews include both Degree of Coverage (DOC) and Qualitative Alignment (QA) scores for the CIMULACT research topics listed under the Grand Challenge.

Each of the sub-clusters is given its own section, including a descriptive text outlining how the sub-cluster allows divergent CIMULACT Research Topics to communicate and support one another with regard to the Grand Challenge. This is followed by an overview of the results concerning the aggregate DOC and QA comparison scores for the clustered research topics. Then the individual comparative results for the CIMULACT Research Topics that fall within that cluster are presented. The individual research topic results include a graphic depiction of the comparison scores, and an explanatory text that better composes the qualitative assessments of similarities and differences between CIMULACT and expert-based foresight reports.

Results visualization

The visual aids for quickly referencing the comparison results follows a standard formats across all of the research topics. Within this graphic are three key pieces of information that can be read as follows (See Figure 2). First, the CIMULACT Research Topic title and an orange bar that represents the topic, and its inherent R&I agenda, as a critical component of one or more citizen visions for a better future. Second, a blue bar extending from right to left represents the Degree of Coverage score for each topic. This bar is divided into 16 equal portions, with each portion representing one of the expert-based reports. For each expert-based foresight report that was connected to the research topic by our comparative readers, one portion of the blue bar was added. The third bar, a thin green bar along the bottom of the graphic corresponds to the QA score in percentage form. The full length of the orange bar is considered one hundred percent, though no research topics had a QA score of that magnitude.

Figure 4: Legend for Reading Comparative Results Graphics

* This bar represents the content of the CIMULACT research topic. It is presented here as the primary metric by which all expert-based reports are to be assessed.

** This bar represents the number of expert-reports containing one or more references to a given CIMULACT topic. This bar is divided into 16 portions, concomittant to the number of foresight reports included in the comparison.

*** This bar represents the qualitative comparison of CIMULACT research suggestions with that of expert reports. It is presented as a percentage, based on the Qualitative Alignment scoring rubric along a 0-4 scale.

After each cluster, there is a general discussion about the qualitative differences and similarities between the CIMULACT Research Topics and the expert-based foresight reports. Given the qualitative nature of this research, the discussion areas provides a critical view into our findings, and the rationale of the comparative readers who have conducted this assessment. Within these discussion, the reader can locate important information concerning the individual research topics (and components of them), and the cluster itself, as represented within expert-based foresight studies.

All data shown in the bar graphs correspond to the following two tables, which show the aggregated scores for each metric and expert report. Table 3 shows the aggregated scores for Degree of Coverage metric for 16 expert-based foresight reports with regard to CIMULACT topics. Table 4 shows the aggregated scores for the Qualitative Alignment metric for 16 expert-based foresight reports with regard to CIMULACT topics.

Table 3: Aggregated scores for Degree of Coverage metric for 16 expert-based foresight reports with regard to CIMULACT topics

	Representation score: 0 = no; 1 =yes (regardless of alignment)																	**Overall Representation of Topic within expert studies**	**Percentage**
	(CIMUALCT topic represented in expert study? = column 2 comp reading)																		
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16		
	yellow = cases need revisiting																		
GC	CIMULACT topics																		
GRAND CHALLENGE 1 – Health, demographic change and well-being	I am empowered to lead my changes	1	0	1	0	1	1	0	0	1	1	0	0	1	1	1	1	**0,63**	63%
	Rethinking (the new) job market needs	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	**0,75**	75%
	Personal and organizational choice management	0	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	**0,75**	75%
	Dissemination and continuous exploitation of research and innovation in the healthcare system	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	**0,81**	81%
	Evidence-based personalized healthcare	1	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	**0,75**	75%
	Access to equal and holistic health services and resources for all citizens	0	1	1	0	1	0	0	0	1	1	0	1	1	1	0	1	**0,56**	56%
	Health empowerment through “Everyone’s science”	1	1	1	0	1	1	0	1	1	0	1	0	1	1	0	1	**0,69**	69%
	Deconstruction of age	1	1	1	0	1	0	0	0	1	1	0	1	1	1	1	1	**0,69**	69%
	Technology as a means of wellbeing	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	**0,56**	56%
	Balanced work-life model	0	1	1	0	0	0	1	0	1	0	1	0	1	1	1	0	**0,50**	50%
	Finding a balance in a fast-paced life	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	**0,31**	31%
	Promoting well-being through relating environments	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	0	**0,38**	38%
	(Business)Models for balancing time	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**0,06**	6%
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland	Good quality food for all	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	**0,81**	81%
	Evolving food culture in growing cities	0	1	1	0	1	1	1	0	0	0	0	0	1	1	0	1	**0,50**	50%
	Good food research	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	**0,69**	69%
	Responsible use of land	1	1	1	0	1	1	1	0	1	1	0	1	1	0	0	1	**0,69**	69%
GRAND CHALLENGE 3 – Energy	Smart energy governance	1	1	1	0	1	1	1	0	1	1	1	1	1	0	1	1	**0,81**	81%
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	Sustainable transport solutions that enable us to live where we choose	0	1	1	0	1	1	1	0	1	1	0	1	1	1	0	0	**0,63**	63%
	Freedom to choose where to live	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	0	**0,63**	63%
	Moving together (more collective transport options)	0	1	1	0	1	0	1	1	1	1	0	0	1	0	0	0	**0,50**	50%
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	At one with nature	0	0	1	0	1	0	0	1	1	0	1	1	1	1	1	1	**0,63**	63%
	Consume smarter, in-crease wellbeing	1	0	1	0	1	1	0	1	1	1	1	0	1	0	1	1	**0,69**	69%
	Production awareness	1	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	**0,75**	75%
	Urban-rural Symbiosis	0	0	0	0	1	1	0	1	1	0	1	1	1	0	1	1	**0,56**	56%
	Making dense and growing urban areas more sustainable and liveable	1	1	1	0	1	0	1	1	1	0	1	1	1	0	1	1	**0,75**	75%
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Empowering diversity in community	1	1	1	0	1	0	0	0	1	1	0	1	1	1	0	1	**0,63**	63%
	Evidence- based community building	1	1	0	0	1	0	0	0	1	1	0	1	1	1	0	1	**0,56**	56%
	Community building development	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	**0,75**	75%
	Empowered citizens	1	1	0	0	1	1	0	0	1	1	1	0	1	1	0	1	**0,63**	63%
	Meaningful research for community	1	1	1	1	1	1	0	0	1	1	0	1	0	1	1	1	**0,75**	75%
	Snakes and ladders- Connecting scales of issues and actors	1	1	0	1	1	1	0	0	1	1	0	0	1	0	1	1	**0,63**	63%
	The transparancy toolbox	0	1	0	1	1	1	0	0	1	1	0	0	1	1	0	1	**0,56**	56%
	Debating alternative economic models	1	0	0	0	1	1	0	1	1	0	0	0	0	1	1	1	**0,50**	50%
	Social economy	1	1	1	0	0	1	0	0	1	0	0	0	1	1	1	1	**0,56**	56%
	Basic universal income so nobody is left behind	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**0,13**	13%
	Alternative economic model	1	1	1	0	1	1	1	0	0	0	0	0	1	1	0	1	**0,56**	56%
	From wall street to main street	0	1	1	0	1	1	0	1	1	1	0	0	0	0	0	1	**0,50**	50%
	Educational ecosystem as a driver of social innovation and local development	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0	1	**0,44**	44%
	Design thinking and doing and life skills for all	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	**0,19**	19%
	Learning for society	1	0	1	0	1	1	0	0	1	1	0	0	1	1	0	1	**0,56**	56%
	SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	0	1	1	0	1	1	1	0	1	0	1	0	1	1	0	1	**0,63**	63%
	Ecological future education	0	1	1	0	1	1	0	1	1	0	1	0	0	0	0	1	**0,50**	50%
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of	Data for all- Share the power of Data	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	**0,81**	81%
	Here, there and everywhere	1	1	1	0	1	0	0	0	1	1	0	0	1	0	1	1	**0,56**	56%
	Transforming technologies for planet and people	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	**0,88**	88%
	Overall representation of expert report within CIMULACT	**0,59**	**0,78**	**0,74**	**0,11**	**0,85**	**0,65**	**0,35**	**0,35**	**0,83**	**0,59**	**0,43**	**0,3**	**0,83**	**0,72**	**0,57**	**0,85**		
	Overall representation of expert report within CIMULACT (percentage)	**59%**	**78%**	**74%**	**11%**	**85%**	**65%**	**35%**	**35%**	**83%**	**59%**	**43%**	**30%**	**83%**	**72%**	**57%**	**85%**		

Table 4: Aggregated scores for Qualitative Alignment metric for 16 expert-based foresight reports with regard to CIMULACT topics

Alignment Score : 0 = no alignment, 1 = low, 2= medium, 3= high ;
(If topic is represented, how well do directions, intentions etc. of CIMULACT topic and expert topic study align. For justification see qualitative analysis)

	Expert Study	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	**Overall Alignment of Topic with expert studies (0-3)**	Overall Alignment of Topic with expert studies (approx. percentage)
	CIMULACT topics																		
GRAND CHALLENGE 1 – Health, demographic change and well-being	I am empowered to lead my changes	2	0	1,5	0	1,5	2	0	0	1	3	0	0	2	3	1	2	**1,19**	40%
	Rethinking (the new) job market needs	1	1	1,5	0	1	1,5	1	1	0	2,5	1,5	0	1,5	1	0	1,5	**1,00**	33%
	Personal and organizational choice management	0	0	1	0	1,5	1,5	1	1,5	1	2,5	1	0	1	1,5	2,5	2	**1,13**	38%
	Dissemination and continuous exploitation of research and innovation in the healthcare system	1	1,5	2	0	1	1	1	0	1,5	1,5	1	0	1,5	1	1,5	1	**1,03**	34%
	Evidence-based personalized healthcare	1,5	2	2	0	2,5	1	0	1,5	2,5	1	0,5	0	3	1,5	1,5	1	**1,34**	45%
	Access to equal and holistic health services and resources for all citizens	0	1	1,5	0	1,5	0	0	0	1	1,5	0,5	1,5	1,5	1,5	0	1	**0,78**	26%
	Health empowerment through "Everyone's science"	1	1	1	0	2,5	1	0	2	1	0	0,5	0	2,5	1	0	1,5	**0,94**	31%
	Deconstruction of age	1	1	1	0	1,5	0	0	0	1	1	0,5	1	1	1	1	1	**0,75**	25%
	Technology as a means of wellbeing	0	0,5	1	0	0	0	1	2	0	1,5	1,5	0	0	2	2,5	1	**0,81**	27%
	Balanced work-life model	0	1,5	1	0	0	0	1	0	1	0	0,5	0	1,5	1	1,5	0	**0,56**	19%
	Finding a balance in a fast-paced life	0	2	1	0	0	0	0	0	0	0	0,5	0,5	1	1,5	2	0	**0,53**	18%
	Promoting well-being through relating environments	0	1	0	0	0	0	0	0	2	0	0,5	0	1	1	1,5	0	**0,44**	15%
	(Business)Models for balancing time	0	0,5	0	0	0	0	0	0	0	0	0	0,5	1	1	0	0	**0,19**	6%
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	Good quality food for all	1	1	1	1	2,5	1	0	1	1	0	0	0	1	1	1	2	**0,91**	30%
	Evolving food culture in growing cities	0	1	1	0	1	1	1	0	0	1	0	0	1	1	0	1	**0,56**	19%
	Good food research	1	1	1	1	3	2	1	0	2	0	0	0	1	1	1,5	1,5	**1,06**	35%
	Responsible use of land	1	2	1	0	1,5	1	2	0,5	2	0	0	2,5	2	0	0,5	1,5	**1,09**	36%
GRAND CHALLENGE 3 – Energy	Smart energy governance	1	2	1,5	0	1,5	0,5	1	0,5	2,5	1	1	2,5	2,5	0,5	2,5	1	**1,34**	45%
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	Sustainable transport solutions that enable us to live where we choose	0	2	1	0	2	1	2	0,5	1	0	0	2,5	2,5	1	0	0	**0,97**	32%
	Freedom to choose where to live	1	2	0	0	1,5	0	0	0	1	2,5	1	2,5	2	1,5	2	0	**1,06**	35%
	Moving together (more collective transport options)	0	1	1	0	2,5	0	1	1,5	1	0	0	0	1	0	0	0	**0,56**	19%
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	At one with nature	0	0,5	1	0	3	0	0	1	2	1,5	1	2	1	1	1	1	**1,00**	33%
	Consume smarter, in-crease wellbeing	1,5	0,5	1	0	2	0,5	0	1	2,5	1,5	1	0	2	0	2,5	1	**1,06**	35%
	Production awareness	2	1	1	0	1	1,5	0	1,5	2,5	1	1	0	2	1	3	1	**1,22**	41%
	Urban-rural Symbiosis	0	0,5	0,5	0	1	1,5	0	1,5	1	0	1	3	3	0	1,5	1	**0,97**	32%
	Making dense and growing urban areas more sustainable and liveable	1	2	1,5	0	2	0	2,5	1,5	2	0	1	3	3	0	2,5	2	**1,50**	50%
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Empowering diversity in community	1	1,5	1,5	0	3	0	0	0	2,5	1,5	0	1,5	3	2	0	2,5	**1,25**	42%
	Evidence- based community building	1	1,5	0	0	3	0	0	0	2	0	0	1,5	1	2	0	1	**0,81**	27%
	Community building development	1	1	0	0	2,5	1	0	0	1	0	1	1,5	2,5	2,5	1	1	**1,00**	33%
	Empowered citizens	0,5	2,5	0,5	0	1,5	2	0	0	2	0	1	0	1,5	2	0	2	**0,97**	32%
	Meaningful research for community	1,5	1,5	3	2,5	1,5	1,5	0	0	0,5	0	0	1,5	0	2,5	1	1	**1,13**	38%
	Snakes and ladders- Connecting scales of issues and actors	1,5	2,5	0	1,5	2	1	0	0	2	2,5	0	0	2	0	2,5	2	**1,22**	41%
	The transparancy toolbox	0	3	0	2,5	0,5	1	0	0	1	1	0	0	1,5	3	0	1,5	**0,94**	31%
	Debating alternative economic models	1	0	2	0	1	1,5	0	1	1	2	0	0	0,5	1,5	1	1	**0,84**	28%
	Social economy	1,5	1,5	1	0	0	1	0	0	1	3	0	0	1	1	1,5	1	**0,84**	28%
	Basic universal income so nobody is left behind	0	0,5	1	0	0	0	0	0	0	2,5	0	0	0	0	0	1	**0,31**	10%
	Alternative economic model	1,5	1	1	0	1	2,5	1	0	0	2,5	0	0	2	2	0	1	**0,97**	32%
	From wall street to main street	0	1	1	0	1	1	0	1,5	1	2,5	0	0	0	0	0	1,5	**0,66**	22%
	Educational ecosystem as a driver of social innovation and local development	0	3	0,5	0,5	2,5	2,5	0	0	1,5	0	0	0	1	0	0	1	**0,78**	26%
	Design thinking and doing and life skills for all	0	0	0,5	0	0,5	0	0	0	1	0	0	0	0	0	0	1	**0,19**	6%
	Learning for society	1	0	2	0	1	2,5	0	0,5	1	0	0	0	1	1	0	2	**0,75**	25%
	SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	0	2,5	1,5	0	1	1,5	0,5	0,5	2,5	0	1	0	1,5	1	0	1	**0,91**	30%
	Ecological future education	0	3	1	0	1,5	1	0	1,5	1,5	2,5	1	0	0	0	0	1	**0,88**	29%
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	Data for all- Share the power of Data	1	3	2,5	1	1,5	2	1	1,5	2	3	0	0	2	2,5	2,5	1,5	**1,69**	56%
	Here, there and everywhere	1	3	1	0	1,5	0	0	0	1	0	0	0	2	0	1,5	1,5	**0,78**	26%
	Transforming technologies for planet and people	1	3	1,5	0	2	2	1,5	0	2	1	1	1	2	2,5	2,5	2	**1,56**	52%
	Overall alignment of expert report with CIMULACT topics (0-3)	**0,68**	**1,40**	**1,05**	**0,22**	**1,43**	**0,91**	**0,42**	**0,54**	**1,28**	**1,02**	**0,45**	**0,62**	**1,46**	**1,12**	**1,01**	**1,14**		
	Overall alignment of expert report with CIMULACT topics (approx. percentage)	23%	47%	35%	7%	48%	30%	14%	18%	43%	34%	15%	21%	49%	37%	34%	38%		

GRAND
CHALLENGE 1
Health, Demographic Change and Wellbeing

GRAND CHALLENGE 1: Health, demographic change and wellbeing

Three clusters, containing thirteen CIMULACT topics were arranged under Grand Challenge 1: Personal Development, Holistic Health, and Work-Life Balance and Well-Being. For an overview of Clusters, topics and the degree of coverage as well as the qualitative alignment metric, see table 5.

Table 5: Coverage of citizen-based topics within expert reports (GC1)

CIMULACT Cluster	CIMULACT R&I topic	Degree of coverage in expert studies	Alignment with CIMULACT Intention/ Expectation
Personal Development	*I am empowered to lead my changes*	*Medium (10)*	*40%*
	Rethinking (the new) job market needs	*Medium-High (12)*	*33%*
	Personal and organizational choice management	*Medium-High (12)*	*38%*
Holistic Health	*Dissemination and continuous exploitation of research and innovation in the healthcare system*	*Medium-High (13)*	*34%*
	Evidence-based personalized healthcare	*Medium-High (12)*	*45%*
	Access to equal and holistic health services and resources for all citizens	*Medium (9)*	*26%*
	Health empowerment through “Everyone’s science”	*Medium-High (11)*	*31%*
	Deconstruction of age	*Medium-High (11)*	*25%*
Work-Life Balance and Well-Being	*Technology as a means of wellbeing*	*Medium (9)*	*27%*
	Balanced work-life model	*Medium (8)*	*19%*
	Finding a balance in a fast-paced life	*Medium-Low (5)*	*18%*
	Promoting well-being through relating environments	*Medium-Low (6)*	*15%*
	(Business)Models for balancing time	*Low (1)*	*6%*

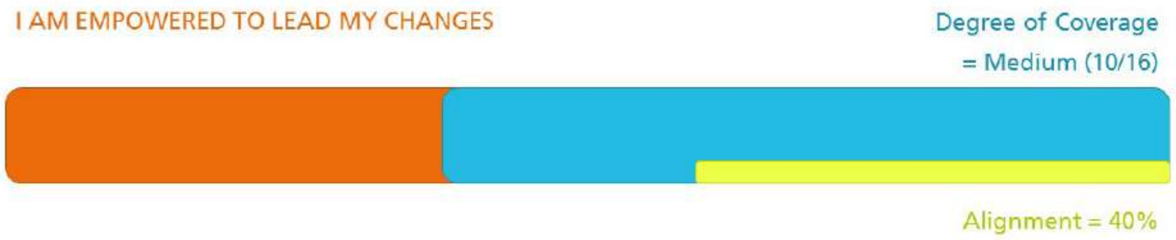
CIMULACT topics - Detailed Comparison

Cluster: Personal Development

The CIMULACT research topics categorized under the cluster of "Personal Development" were well represented in the expert studies, with related quotations being found in an average of 11/16 expert-based reports or around 71%. Additionally, the research topic area received an average Qualitative Assessment score of 1.11/3.00 or approximately 37% alignment.

The Personal Development cluster of CIMULACT topics related generally to questions of individual social agency in conjunction with the current and future states of large scale social institutions. These topics include mental health, educational preparedness for job market shifts, re-definition of social values and concomitant shifts in governing structures, and navigating decision making in uncertain times of abrupt social and technological change.

I Am Empowered To Lead My Changes



This CIMULACT research topic showed a medium representation in the expert-based studies, and was connected to citations in ten of the sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.19/3.0 or 40%.

One of the main components of the CIMULACT topic is cognitive conditions of individuals, and this issue goes unrecognized across most of the expert-based studies. CIMULACT sees individual mental health and physical stability as being core components of personal empowerment, and the capacity for individuals to confront uncertain futures through education and lifestyle choice. While labor market changes are mentioned in a number of expert-based studies, rarely are such mentions accompanied by the consequential impacts on the health of individual citizen, their family, and community. As such, the overall qualitative alignment of this topic remained medium to low.

Rethinking (The New) Job Market Needs

This CIMULACT research topic showed a medium-high representation in the expert-based studies, and citations in twelve of the sixteen reports were considered relatable. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.0/3.0 or 33%.

Employment and the job market are mentioned in a very large number of the analyzed reports, and this is also a critical component of the CIMULACT topic. The qualitative difference lies primarily in the perspective that most expert studies took and the policy suggestions (or lack thereof) that resulted for them. In many cases, changes in the job market (or even the possibility of change) are linked back to the trends in automation - many of which are still being hotly debated in terms of actual impact on unemployment or un-employability. Such discussions are sometimes accompanied by vague suggestions for re-training programs or new social welfare programs, but this was not standard. CIMULACT on the other hand, calls explicitly for educational ecosystem overhaul, and particular investment into social responsibility, ethical training, inclusiveness, and self-fulfillment, all of which are rarely mentioned in this context within expert-based reports.

Personal and Organizational Choice Management

This CIMULACT research topic showed a medium-high representation in the expert-based studies, and citations in twelve of the sixteen reports were considered relatable. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.13/3.00 or 38%.

Lifelong learning was a widely discussed topic among expert-based studies, as were the various technologies that could be employed to achieve such educational systems. However, these alone do not speak to the deeper dimensions of personal and organizational choice that are important to the CIMULACT topics. While some expert reports did mention changing values, they often did not contextualize it within personal choice or organizational decision-making. Very rarely did the expert reports connect changing values to redefined notions of social welfare and policy research that could inform such change. Therefore, while parts of this topic were discussed within many different reports, there was only a medium level alignment between the suggestions of the experts and those of CIMULACT.

Discussion: Cluster Personal Development

The Personal Development cluster of CIMULACT topics was well represented in terms of relatable content with the expert-based studies, but the low qualitative alignment points toward some areas of distinction between citizens' and expert research priorities. Within each of the CIMULACT topic comparisons we can identify patterns of difference between CIMULACT and expert-based reports.

For example, the issue of citizens' preparedness for a changing job market played an important role across the CIMULACT cluster, and was a key point for many of the expert based reports and provided the basis for a higher Degree of Coverage (DoC) score. There were, however, key qualitative differences in how this issue was framed, and what research priorities should emerge to address the issue. In some expert reports, automation trends would render many of today's jobs obsolete (and implicitly the personnel trained for them), and this was seen as a source of many secondary and tertiary social disruptions - fewer stable jobs, more income disparity, greater food insecurity and overall inequality, etc. This type of objective speculation was a common theme across numerous foresight reports - providing information about possible direction of trends and their implications, without relating such information back to a more explicit R&I strategy within the areas that are anticipated to be impacted.

CIMULACT on the other hand, while cognizant of trends within job markets, was less concerned with the impact such changes might have, and more immediately concerned with what types of institutional changes (education system, social organization and structure) could be the focus of experimentation in the upcoming framework program in preparation for trends and social developments like automation of work.

Our comparative readers viewed these differences in framing and strategic approach as indicative of a qualitative difference between CIMULACT research proposals and more general foresight reporting. The resulting Low QA scores, both for the individual CIMULACT topics and for the CIMULACT cluster overall, speaks to the differences in alignment that arch across this cluster.

Cluster: Holistic Health

The CIMULACT research topics categorized under the cluster of "Holistic Health" were well represented in the expert studies, with related quotations being found in an average of 11 expert-based reports or around 71%. Additionally, the research topic area received an average Qualitative Assessment score of 0.96/3.00 or approximately 32% alignment.

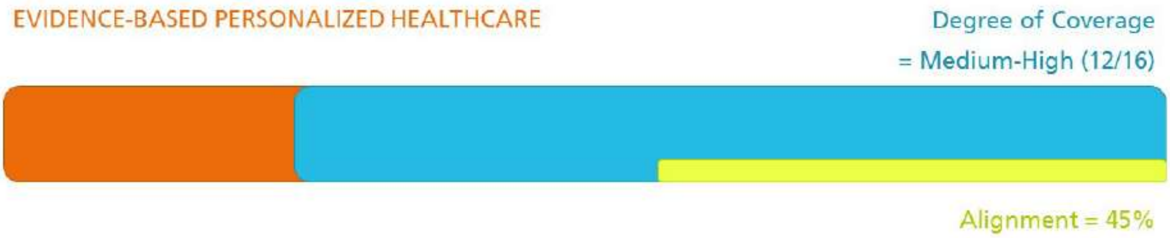
This cluster aggregates a number of research topics that address personal health and well-being, inclusive of both traditional healthcare systems and other forms of fostering healthy lifestyles. On one hand, the cluster includes advances in numerous technological fields - Big Data, personalized health monitoring, and advancements in genetic therapy - while recognizing fiscal, personnel, and other strains on current healthcare systems. This is coupled with calls for research into localized treatments and best practices, the development of social programs to combat mental and physical disease, and various forms of lifestyle promotion that can impact long-term quality of life.

Dissemination and Continuous Exploitation of Research and Innovation in the Healthcare System

This CIMULACT research topic showed medium-high representation in the expert-based studies, and citations in thirteen of the sixteen reports were considered relatable. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.03/3.00 or 34%.

In part, the degree of coverage for this topic is Medium-High because many of the expert reports mentioned some form of scientific research or technological development within the healthcare. However, the low alignment score reflects the very different framing of this topic area, related trends, and emerging technologies. While CIMULACT promoted research focus on more localized practices of healthcare, inclusive processes for research and program development, the expert based reports were often technology centered, and focused on national or international implications and strategies for policy development. This was the most common difference of alignment between expert reports and CIMULACT within this topic.

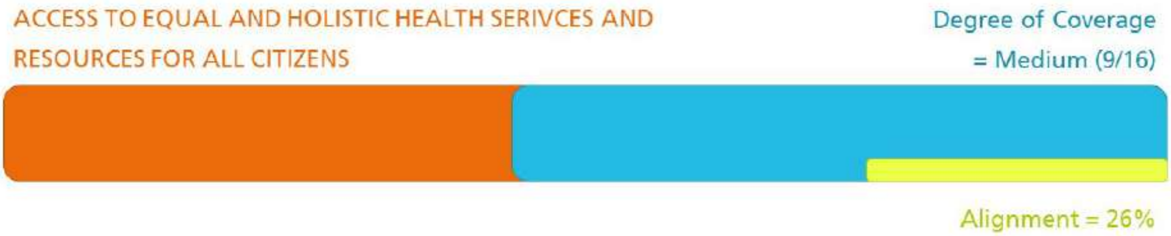
Evidence-based Personalized Healthcare



This CIMULACT research topic showed a medium-high representation in the expert-based studies, and citations in thirteen of the sixteen reports were considered to be relatable. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.34/3.0 or 45%.

Within this topic area, the medium Qualitative Alignment score is best attributed to expert reports mentioning one or more components of personalized healthcare, but framing the direction of research and policy direction in a less inclusive and education based manner. While many expert reports mentioned wearable sensors, genetic profiles, big (and personal) data for healthcare, or some combination of those three topics, these foresight studies rarely framed the impacts of policy proposals in "human-centric" terms called for in CIMULACT. One particular aspect of CIMULACT's proposals seemed to be never mentioned at all: the development of curricula for patients AND professionals to better learn the applications and dangers of personalized data, and to improve bi-directional communication between patients and healthcare professionals.

Access to Equal and Holistic Health Services and Resources for All Citizens



This CIMULACT research topic showed a medium level representation in the expert-based studies, and citations in nine of the sixteen reports were considered relatable. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.78/3.0 or 26%.

While a number of expert-based foresight studies mentioned current inequalities in healthcare coverage, and trends that are applying further pressure on existing systems as well as threats to create further inequality in the futures, few of the expert studies put forth legitimate research agendas or policy initiatives that could address such problems. CIMULACT, on the contrary, suggests research agendas, policy directions, and institutional creation that might be useful in addressing current and growing healthcare inequalities. This was the primary difference of alignment between expert-based studies and CIMULACT and led to the low average QA scores within this topic.

Health Empowerment Through "Everyone's Science"

This CIMULACT research topic showed a medium-high representation in the expert-based studies, and citations in eleven of the sixteen reports were considered relatable. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.94/3.0 or 31%.

This average qualitative alignment score within this topic was scored as low, primarily due to an important difference in the emphasis of the expert-based studies and the CIMULACT results. Overall, expert-based studies emphasized research models that favored large-scale institutional backing, technological apparatus, and an advanced knowledge of one or more technical and scientific skillsets (i.e. big data analysis, genetic engineering). CIMULACT on the other hand held science-society dialogues, a contextually sensitive co-development model of research, and revised medical curricula as central components of future healthcare research. In general, CIMULACT aligned more with the patients, whereas expert-based studies seemed to promote already existing institutions, technologies, and professionals without a closer look at their social impacts.

Deconstruction of Age

This CIMULACT research topic showed a medium-high representation in the expert-based studies, and citations in eleven of the sixteen reports were considered relatable. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.75/3.0 or 25%.

Many of the expert-based studies mentioned the overarching trend of "ageing populations" - wherein across the developed nations of the world sub-replacement level fertility rates over the past few decades have created societies wherein people +50 years old outnumber the societies youth. As a trend, this has wide ranging implications, but many expert-studies did not explicitly connect this trend to healthcare, and those that did generally took a technology centered stance. While technologies like gene-therapy, nano-medicine, and prosthesis may indeed prolong life, such technologies alone do not speak to the "quality of life" present in CIMULACT. CIMULACT promotes science alongside social interventions (intergenerational relationship building, lifelong learning, key lifestyle choices)in putting forth its research agenda priorities.

Discussion: Holistic Health

Overall, the "Holistic Health" cluster had a medium-high Degree of Coverage, indicating that health and healthcare are considered important topics to mention in foresight reports both expert-based and citizen generated. However, in our selection of expert-based foresight reports, two specific differences from CIMULACT emerged.

Firstly, expert reports tended to be far more interested in mentioning the technological developments that were currently occurring across the different fields of healthcare. Specific technologies, many of which do play an important role in fulfilling the visions of CIMULACT, cannot address the human-centric concerns and local, inclusive focus present in the CIMULACT topics. While many of these technologies may indeed save and prolong lives, their accessibility to the EU citizenry remains speculative at best due to their expense. Expert reports often neglect to mention the possibility that these technologies will only succumb to, or worsen, already existent inequalities in healthcare remains a persistent threat. CIMULACT research topics, on the other hand, tend to emphasize increasing equal access to technology, alongside technology co-training for and by patients and practitioners.

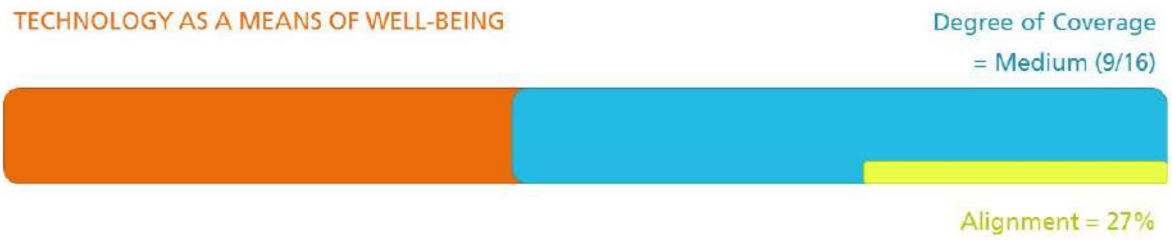
The second difference between CIMULACT and the expert-reports is primarily a difference in framing how, by whom, and for whom research is to be conducted. In many expert reports, ongoing clinical and scientific research was discussed within the context of institutionally backed and conducted proprietary research. Such research would not guarantee the types of localized and inclusive methods that CIMULACT espoused, nor would it necessarily allow for Open Data or Open Science frameworks that were central across a number of CIMULACT topics (both within and beyond Holistic Health). Finally, a large component of CIMULACT topics was related to education and curricula, both for healthcare professionals and patients/care receivers, to make communication of treatment, research process and findings, more accessible in a bi-directional dialogue.

Cluster: Work-Life Balance and Well-Being

The cluster of "Work-Life Balance and Well-Being" related CIMULACT Research topics is the lowest represented cluster within the expert-based foresight studies. Our readers found related quotations in only five of the 16 expert-based reports on average reports or around 30%. Compounding this lack of representative quotations, the Qualitative Alignment scores for this cluster were also very low, with an average 0.50/3.00 QA score equaling 17% alignment. Collectively, the research topics within this cluster are both the lowest represented and least aligned with regard to the expert-based foresight reports surveyed.

This cluster of research topics addresses numerous issues concerning daily life activities of citizens including work, social interactions, demands on time and time management, and the environmental contexts in which these activities take place. Well-being is understood as health lifestyles for the citizen's mind, body, and social relationships, all of which are balanced within a professional life that is changing due to many technological and economic factors.

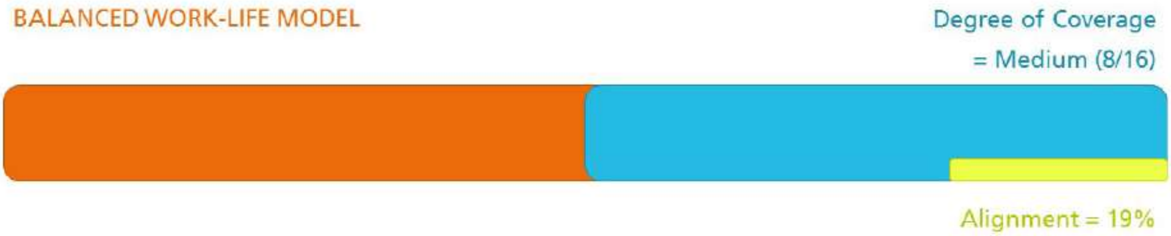
Technology as a Means of Well-Being



This CIMULACT research topic has a Medium representation in the expert-based studies, and connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.81/3.0 or 27%.

For this topic the average qualitative alignment score was low, mostly due to the fact that most expert-based foresight studies, while rarely failing to mention emerging technologies and scientific trends, often reflected upon technologies from a general economic or social impact perspective. Such a stance stands firmly opposed to CIMULACT's emphasis on the co-development of technologies to ensure better quality of life and experience. The human centered focus of technological innovation was central to the CIMULACT topic, and was complimented by education and awareness raising campaigns to create safer, better-informed end users. Technology education, particularly in the more general sense proposed by CIMULACT, was rarely mentioned in the expert studies.

Balanced Work-Life Model



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in eight of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.56/3.0 or 19%.

The most typical mention of this topic within expert-based foresight reports was in relationship to changing employment patterns due to technological developments, and most often with regard to fewer job opportunities in the economy. While this type of citation reflects a small portion of the intent of CIMULACT's proposal (flexible forms of work), it does not align with the overall trajectory as expert reports framed this as a problem area, exacerbating income disparity and social precarity. CIMULACT emphasizes a redefinition of work that includes tasks and sectors that are often excluded from employment numbers, and frames flexible forms of work as empowering to employees and their negotiations with employers. Additionally, CIMULACT emphasizes the distribution of work itself, and calls for various forms of research, particularly organizational, that can better achieve effective work without placing overbearing demands on small portions of the workforce. Thus, despite a medium degree of coverage, alignment between CIMULACT and expert reports remains quite low.

Finding a Balance in a Fast-Paced Life

This CIMULACT research topic showed a Medium-Low representation in the expert-based studies, and connected to citations in five of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.53/3.0 or 18%.

According to citizens, finding ways for individuals to find equilibrium between achieving fulfilling work and leading a life of quality is a critical component for people across the EU. Aspects of this balance include redefining and valuing work, providing more opportunities for work breaks, designing enjoyable work spaces, making allowances for people to value and foster relationships, and many other areas in which research can be produced. Of note is the relatively low degree of coverage and alignment with regard to this topic by the expert reports that were included in this study. With less than a third of compared reports having mentioned this topic at all, and the majority of those reports having low alignment, this CIMULACT priority issue serves as a potential signifier in terms of better defining citizen, and working towards, citizens' desired futures.

Promoting Well-Being through Relating Environments

This CIMULACT research topic showed a Medium-Low representation in the expert-based studies, and connected to citations in six of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.44/3.0 or 15%.

The CIMULACT report emphasized the importance of spatial design in influencing citizen mental states, and social behavior, and called for research into spatial design across multiple sectors of human activity. Environments in question include workplaces of all variety, community gathering areas and venues, and public spaces more generally. Of the few expert reports that made any mention of environmental design and its impact on the human psyche, an even smaller number of those made research suggestions similar to CIMULACT. Again, such a discrepancy points to an area that critical in the eyes of citizens, and mostly neglected by experts - a key highlight for future framework shapers.

(Business) Models for Balancing time

This CIMULACT research topic has a low representation in the expert-based studies, and connected to citations in only one of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.19/3.0 or 6%.

This CIMULACT topic also represents the least covered and aligned of all topics across all expert reports. As such, this area requires particular follow up investigation, as such widely neglected citizen based ides about desirable futures presents both policy makers and future researchers with an enigma that must be addressed. Citizens' visions clearly involve multiple forms of work, and in research topics like this one, appear business and workplace friendly. That expert reports do not consider this topic as a trend or emerging issue in need of address, might say a lot about current blind spots in policy research.

Discussion: Cluster Work-Life Balance and Well-Being

In considering the overall scoring of this cluster, it would appear that well-being, work-life balance, and related aspects of the citizen desires expressed in their visions are systematically ignored by some component of the expert-based foresight process. It is also important to consider, that the framing of these issues within CIMULACT was neither anti-business, nor anti-work. These themes rather could be found across numerous topics within this field, and it cannot be said that citizen visions were constructed as vague utopias concerning work or lifestyle. Rather, CIMULACT research topics were pointedly searching for research paths that could lead to both better work efficiency, work place cooperation and collective production, and profitable ways to achieve these citizen desires.

The discrepancy between citizen visions and expert-based foresight might be traceable to the different types of stakeholders involved in the research project or the methods employed to address alternative futures. As CIMULACT is driven by 1000s of citizen interactions, and personal visions of desirable futures, it may be that individual daily-life struggles become central to imagining improved conditions. Research topics in the cluster prioritize the subjective terms "balance" and "well-being," so whereas an expert-based foresight report might be grounded in large-scale trends, these numbers might not accurately account for the qualitative changes in daily life activities that citizens desire.

Take for instance the research topic "(Business) Models for Balancing Time" - the lowest represented and aligned topic according to our research - as it calls for research into areas like worker autonomy and quality of life, psychological acceptance of work, or work-life balance policies. This CIMULACT research topic calls for pilot programs to investigate these areas, in part because of the inherently personal and individual judgements that must be assessed to answer questions concerning whether a work feels balanced, autonomous, or fulfilled. International foresight studies tend to focus on macro-level trends through which individualized "feelings" are overshadowed.

We believe that this cluster in particular should be the focus of further research, if only due to the unique differences in prioritization that these research topics seem to illuminate. It may be that expert-based foresight reports, in their efforts to remain objective, are either biased against, or unable to account for, the vast differences in life-styles of individuals as a valid field for R&I. It could also be that this seeming outlier cluster, holds important advice for organizations wishing to learn more about how their members approach defining and living a quality life.

GRAND CHALLENGE 2
Food Security, Sustainable Agriculture and Forestry, Marine and Maritime and Water Research, and The Bio Economy

GRAND CHALLENGE 2: Food security, sustainable agriculture and forestry, marine and maritime and water research, and the bio economy

With regard to Grand Challenge 2, CIMULACT produced four topics, aggregating to the cluster Agriculture and Food Research. For an overview of Clusters, topics and the degree of coverage as well as the qualitative alignment metric, see table 6.

Table 6:Coverage of citizen-based topics within expert reports (GC2)

CIMULACT Cluster	CIMULACT R&I Topic	Degree of coverage in expert studies	Alignment with CIMULACT Intention/ Expectation
Agriculture & Food Research	*Good quality food for all*	*Medium-High (13)*	30%
	Evolving food culture in growing cities	*Medium (8)*	19%
	Good food research	*Medium-High (11)*	35%
	Responsible use of land	*Medium-High (11)*	36%

Detailed Comparison

Cluster: Agriculture and Food Research

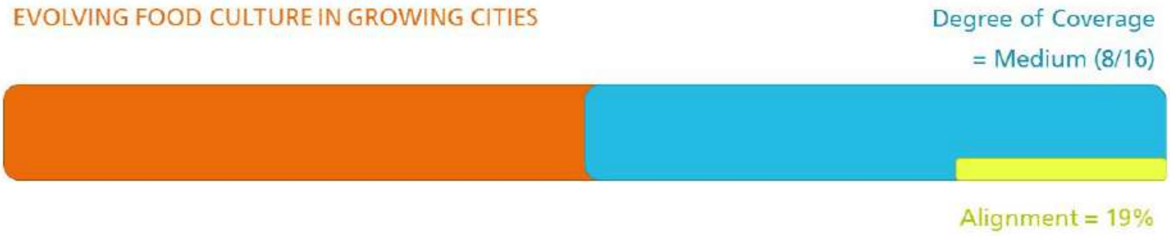
The *Agriculture and Food Research* cluster is composed of four CIMULACT research topics with an average Degree of Coverage score of Medium-High (11/16), and an average Qualitative alignment score of 30% according to our comparison. The cluster itself is primarily focused on understanding what constitutes "good" food in terms of food availability, culinary diversity, resource demands for agriculture, and planning policy for continued development of the agriculture and food services sectors. Sustainability play an important role in each of these research areas - promoting more localized agricultural sourcing, improved agricultural techniques to avoid waste, and investigating logistical systems that drive supply chains for urban areas.

Good Quality Food for All

This CIMULACT research topic showed a Medium-High representation in the expert-based studies, and connected to citations in thirteen of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.91/3.0 or 30%.

The major difference in alignment between expert foresight studies and CIMULACT was in the approach to outlining food issues. CIMULACT prioritizes local agriculture knowledge in combination with nutrition education, sustainability issues, and a localized understanding of food insecurity. Expert-based foresight on the other hand tends to take a more global outlook - highlighting global trends in food insecurity, prices fluctuations in global markets, macro-scale impacts of climate change, and, in some cases, national or international policy approaches for consideration. CIMULACT espouses a bottom up, contextualized approach to addressing food inequalities through research (to understand drivers) and policy (to experiment with solutions). In general, the expert studies mentioned food insecurity as an issue to monitor, and when they did suggest research approaches, those suggestions showed considerable confidence in top-down governance models that weren't shared in CIMULACT.

Evolving Food Culture in Growing Cities



This CIMULACT research topic has a Medium representation in the expert-based studies, and connected to citations in eight of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.56/3.0 or 19%.

While many expert-based reports mentioned of the growing cultural diversity that is accompanying widespread urbanization trends, very few of those reports even mentioned how such diversity related to food, and food logistics, within the city. CIMULACT research suggestions include: social research on food as an enabler for social inclusion and community cohesion, nutrition flows during migration, sustainable urban food production and consumption, the development of policy tools, and urban planning that is sensitive to different food needs. In most expert foresight studies, these ideas could only be inferred from relatively ambiguous statements that covered pressures of urbanization, and none of those studies suggested a detailed research outline as found in CIMULACT.

Good Food Research

This CIMULACT research topic has a Medium-High representation in the expert-based studies, and connected to citations in eleven of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.06/3.0 or 35%.

For the most part, "Food Research" as understood by expert foresight studies is focused on genetic engineering of food (to produce more food under harsher conditions), continued automation of various agricultural processes, and the deployment of various sensor arrays to provide data pools for big data analysis. The technological focus of these reports is neither surprising nor inappropriate to the topic area, but it does show little alignment with the mode and focus of research espoused by CIMULACT. In the citizen-derived vision for "Good Food Research" we see calls for research and innovation concerning monitoring of genetically engineered foods and assessment of the broad scale impact. We also see the call for the generation and dissemination of a knowledge base that can be used to both inform (and monitor) policy and regulations, and deployed in the service of educational programs aimed at teaching and providing better nutrition to students.

Responsible Use of Land

This CIMULACT research topic has a Medium-High representation in the expert-based studies, and connected to citations in eleven of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.09/3.0 or 36%.

For the most part, "Responsible Use of Land" as understood by expert foresight studies is focused on urban planning efforts or the automatization of agricultural monitoring. In both instances, there is more emphasis on 'land use' in regards to economic productivity, than on the complex ramifications that land use policy has across a community. The CIMULACT research topic takes up responsibility as a multi-purpose phrase as it calls for more inclusive planning policy decisions. Responsibility extends to ecological responsibilities, social responsibilities, and economic responsibilities to be key talking points in open community discussions concerning the future use of land. While expert-based reports often mentioned advances in monitoring technologies (drone or satellite sensors, big data analytics) to improve crop yield, few of these reports addressed the greater social context of which land use policy is a part.

Discussion: Cluster Agriculture and Food Research

In general, expert foresight studies and CIMULACT widely agreed that food security and various influencing factors were of great importance for future research and innovation agendas to address. Overall, expert studies tended to emphasize technological solutions (genetic engineering for crop yield, automation, sensors, and big data analysis) as primary means for addressing food security under duress of continued climate change. Expert studies also tended to provide more current statistical data as a means to substantiate the trends that they identified (water scarcity, threats to food supply, etc), and these reports tended to address audiences with solutions that are international or global in nature. Research suggestions emanating from expert reports were typically focused on large-scale operations, and they largely implied top-down policy mechanisms to spur investment and technological development.

CIMULACT's suggestions, while often targeting the same general concerns as the experts, were grounded in a local approach to conducting research and innovation activities. By aligning local and regional knowledge and practice with researchers, CIMULACT aims to uncover solutions by working within a cultural context - solutions that can be deployed and scaled up when and where it is appropriate. This emphasis on localization also applied to CIMULACT's calls for experimentation and research into multi-level governance mechanisms that can be used in decision-making process - a theme that few expert reports mentioned in direct connection to food security and or land-use. Finally, CIMULACT saw diverse urban food cultures as a significant arena for future food research, and suggested examining everything from food logistics to food as a center point for community building across cultural diversity. This area of research was unique to CIMULACT, particularly in terms of the number and type of research and innovation agenda items that were proposed within that topic area.

In general, elements of this cluster were well represented within the expert-reports, emphasizing the importance of food production and distribution within future research agendas. However, overall alignment between CIMULACT and expert-studies remained low due to differences in research approach, and whole segments of CIMULACT research proposals being neglected within expert-based studies. CIMULACT then provides a unique perspective into the types of research and innovation programs that could better address citizen concerns and desires.

GRAND CHALLENGE 3

Secure, Clean and Efficient Energy

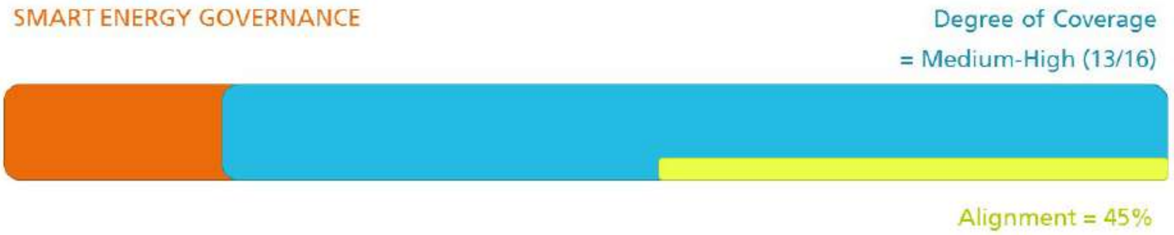
GRAND CHALLENGE 3: Secure, clean and efficient energy

Only one CIMUALCT topic is directly concerned with energy, therefore adhering to Grand Challenge 3. For degree of coverage as well as the qualitative alignment metric, see table 7.

Table 7: Coverage of citizen-based topics within expert reports (GC3)

CIMULACT Cluster	CIMULACT R&I Topic	Degree of coverage in expert studies	Alignment with CIMULACT Intention/ Expectation
Smart Energy Governance	***Smart Energy Governance***	*Medium-High (13)*	*45%*

Smart Energy Governance



This CIMULACT research topic has a Medium-High representation in the expert-based studies, and connected to citations in thirteen of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.81/3.00 or 45%.

In general, expert foresight studies all found agreement in the importance of the energy sector to all future research projects. This includes energy supply technologies, energy storage and distribution options, and policies that can encourage infrastructure development. The critical differences between expert reports and CIMULACT suggestions was CIMULACT's emphasis on two important areas for research: distributed governance of energy grids, and the impacts of prosumerism. Governance issues in particular were rarely mentioned in expert reports, and –when mentioned - were often framed within a continuation of existing power structures. This omission accounts for a significant part of the misalignment noted by the readers. Also, while expert reports tended to emphasize national and international production and supply logistic systems, CIMULACT emphasized the potential for modular energy generation and provision as built at an individual or community level.

Discussion: Smart Energy Governance

Perhaps the first issue in need of address is that, according the CIMULACT's categorization scheme, ***Grand Challenge 3: Secure, Clean, Efficient Energy*** was assigned only one research topic. While that research topic, *Smart Energy Governance*, is quite thorough in its descriptive language and its scope of research, it would seem that energy's ubiquitous role in our lives and lifestyles (from technology, to transport, to economics, and environmental interactions of all kind) seems rather downplayed within CIMULACT itself.

It is possible that CIMULACT's methodology during the Pan-European conference process contributed to this discrepancy. It was during this conference that selection and refinement of final research topics took place, and among the attendees were three representatives from the EU DG Energy. It is possible that categorization choices made during the workshop portion of the conference had the unintentional consequence of leaving this Grand Challenge seemingly under addressed by citizens. It is also possible that the ubiquity of energy itself led to citizen research suggestions becoming more focused on the context of energy use (sustainable cities, or transportation), and less invested into the more general theme of energy. Energy does play a role in citizen-derived research topics that concern transportation, and sustainable cities, but it is classified, perhaps correctly, as one component of the complex systems these research topics are investigating.

Regardless of the reason that only one CIMULACT research topic is located within this Grand Challenge, its Degree of Coverage score was very high due to Energy's - particularly traditional and alternative energy sources, energy grids, and novel developments in energy systems - importance within a majority of expert-based foresight reports. This signifies that CIMULACT is still cognizant of Energy's impact on future-oriented change, and thus remains relevant within policy oriented discussion concerning the future R&I agenda for this sector.

However, what becomes striking is the relatively low level of alignment that these expert-based reports have with the CIMULACT research topics. At less than 50%, the alignment score indicates that while many reports were discussing issues and trends that will impact the Energy sector, they were not speaking about future R&I in the same way that CIMULACT. Of particular note here is the citizen's call for self-regulated, prosumer based governance schema. While many expert-based reports discuss trends in oil and natural gas resources, economic issues related to energy supply, and occasionally data-driven electricity grid management, they rarely espouse a R&I agenda that could be the basis of policy. Furthermore, distributed governance schema for energy, as promoted by CIMULACT, are not taken up by experts either as a trend nor as a focus for research activities.

In general, this Grand Challenge highlights a common theme within our comparison. Despite broad coverage of the Energy topic across all expert-based reports and CIMULACT itself, the solutions to addressing this challenge are presented from very different perspectives if they are presented at all. Citizen derived visions of the future tend to focus on individual empowerment and localized measures for future research, whereas expert-based reporting tends to be overly techno-centric in regards to solutions, and conducts global scale reporting of trends and issues.

GRAND CHALLENGE 4

Smart, Green and Integrated Transport

GRAND CHALLENGE 4: Smart, green and integrated transport

CIMUALCT produced three topics mainly dealing with transport issues related to this Grand Challenge, which were aggregated into the cluster titled *Transportation & Lifestyle*. For an overview of topics, the degree of coverage as well as the qualitative alignment metric, see table 8.

Table 8: Coverage of citizen-based topics within expert reports (GC4)

CIMULACT Cluster	CIMULACT R&I-Topic	Degree of coverage in expert studies	Alignment with CIMULACT Intention/ Expectation
Transportation & Lifestyle	*Sustainable transport solutions that enable us to live where we choose*	*Medium (10)*	32%
	Freedom to choose where to live	*Medium (10)*	35%
	Moving together (more collective transport options)	*Medium (8)*	19%

Cluster: Transportation and Lifestyle

The Transportation and Lifestyle cluster encompasses three distinct CIMULACT research topics, Their collective focus for future research can best be described as addressing some primary questions: Where will people choose to live? What will they choose to do at home and in other locales? And, how will they move between different locations to conduct daily life? In addressing these questions the CIMULACT research topics also relate to other Grand Challenge areas including energy, sustainability, resource usage, work, and economic development. In total, this cluster was moderately covered by expert-based reports, with low average alignment between the research agenda proposed by CIMULACT and the information presented by the compared reports.

Sustainable Transport Solutions That Enable Us To Live Where We Choose

This CIMULACT research topic showed a Medium representation in the expert-based studies, and connected to citations in ten of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.97/3.0 or 32 %.

Many expert reports discussed emerging transportation technologies and platforms like fleets of autonomous vehicles, electric car infrastructure, and urban planning initiatives for new transport systems. However, in many cases, reports tended to focus on individual technologies and not on the systemic integration of such technologies. Another recurring trend was the generalist claim that such technologies would come and revolutionize urban transport, without concrete research plans on how such things could be implemented, how policy can transform a transport system (or fail to). Critical to CIMULACT was the notion of not just new modes of transport, but systems of transportation that enabled people and communities to command agency over their lifestyle (the spending of time, the building of relationships, etc.) - this area of citizen concern did rarely appear in expert reports, and our comparative readers viewed this as a critical distinction.

Freedom To Choose Where To Live

This CIMULACT research topic has a Medium representation in the expert-based studies, and connected to citations in ten of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.06/3.00 or 35 %.

Expert based foresight studies focused on the technological developments within transportation that demonstrate the capacity to create systemic change, but rarely do they outline how future research should be conducted, nor do they mention the larger social implications that such technologies could have in regards to enabling individual freedom. Similar to the previous topic area, personal agency played an important role in CIMULACT, and the citizen descriptions of the type of transportation systems they would like to see targeted for research, innovation, and development. A critical component of this individual freedom is the capacity to live according to values, and alongside communities who share those values, regardless of geo-spatial location. Therefore, the technology-centric perspective of expert foresight reports did not result in a high degree of alignment with CIMULACT, despite a relatively high degree of coverage.

Moving Together (More Collective Transport Options)

This CIMULACT research topic has a Medium representation in the expert-based studies, and connected to citations in eight of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.56/3.0 or 19 %.

Community-based, self-organized, collective transportation systems were not the focus of most expert foresight studies when they discussed changes in the transportation sector. Expert studies mention of some technologies that could play a role in such systems, but rarely extended their analysis to explaining how such a system could be researched. Particularly lacking in the expert based reports was the idea of community-organized systems that would allow R&I to meet more site-specific needs - a central component to this CIMULACT topic. This omission led to the dramatically lower alignment scores in the opinion of our comparative readers, and again points to a critical area in which citizen-derived visions, and the R&I agendas that result from them, advocate strongly for future policy making efforts.

Discussion: Transportation and Lifestyle

Generally, within the CIMULACT cluster of research topics related to Transportation and Lifestyle, despite a medium degree of coverage by expert reports, it would seem that citizens encourage a very different trajectory in terms of future R&I policy. While expert reports focused on technological developments within the transportation sector, this emphasis missed the essential components of human agency and personal freedom that were essential to CIMULACT's research proposals. The human-centric emphasis across CIMULACT topics indicated very different modes of research and development - more localized and experimental research providing results that could be translated and used across communities with similar needs.

Expert-based reports, on the other hand, typically took a research perspective in which 'the city' became the smallest unit of analysis, and city systems could be developed with little regard to the demographic and cultural differences that each city would present. This focus fails to recognize the importance of individual choice that is at the heart of CIMULACT's research topics, and as such renders reconciliation between the content of the expert-based reports and that of CIMULACT difficult. Though transportation systems, urbanization, and urban lifestyles are mentioned quite often across the expert-based reports, by excluding the concept of personal agency that underpins much of the CIMULACT research topics the recommendations of expert-based reports seem to hide their impact of humans behind a mask of ambiguity. CIMULACT, by contrast, would position these impacts as the focal point of future research - interested in exploring new transportation systems, but firstly with the goal of examining the types and quality of life that they enable.

GRAND
CHALLENGE 5
Climate Action, Environment, Resource Efficiency and Raw Materials

GRAND CHALLENGE 5: Climate action, environment, resource efficiency and raw materials

Under Grand Challenge 5, there are two clusters of CIMULACT topics, *Sustainable Consumption*, and *Urban and Rural Development*, containing a total of five topics. For an overview of topics, the degree of coverage as well as the qualitative alignment metric, see table 9.

Table 9: Coverage of citizen-based topics within expert reports (GC5)

CIMULACT Cluster	CIMULACT R&I Topic	Degree of coverage in expert studies	Alignment with CIMULACT Intention/ Expectation
Sustainable Consumption	*At one with nature*	*Medium (10)*	33%
	Consume smarter, in-crease wellbeing	*Medium-High (11)*	35%
	Production awareness	*Medium-High (12)*	41%
Urban and Rural Development	*Urban-rural Symbiosis*	*Medium (9)*	32%
	Making dense and growing urban areas more sustainable and liveable	*Medium-High (12)*	50%

Detailed Comparison

Cluster: Sustainable Consumption

The cluster of *Sustainable Consumption* includes three CIMULACT research topics that seek to explore systems and behaviors that can balance non-human ecological health and the needs and desires of anthropocentric daily life. This includes the design of systems that enable more symbiotic co-existence between humans and their environmental networks. These include governance policies for resource extraction and allocation, systems for knowledge dissemination, and the encouragement of individual behaviors that hinge on less exploitative production and logistics. Overall, this cluster received Medium to Medium-High DoC scores, with an average alignment score of 36%.

At One With Nature

This CIMULACT research topic showed a Medium representation in the expert-based studies, and connected to citations in ten of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.0/3.0 or 33 %.

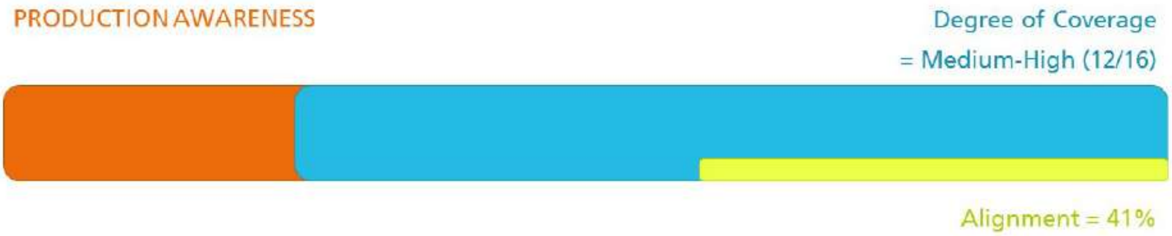
Nature and environmental concerns played an important role in many expert based foresight reports, but were primarily presented within a discussion of the socio-economic implications of continued climate change and related trends. The concept of creating social policies and practices that could better encourage sustainable lifestyles was not as central to the expert discussions, but was essential to CIMULACT. In many expert reports, policy was addressed at the national or international level, and was often centered on addressing the impacts of climate change, not its mitigation nor the development of more sustainable lifestyles and systems that could support them. Obviously, expert reports did not ignore these avenues of research, but the alignment score reflects the uneven distribution of such discussions across the selected reports. CIMULACT, however is quite clear on areas for social and behavioral research that could compliment the development of more sustainable communities, cities, and nations, whereas expert foresight studies rarely discuss these issues in the same light, if at all.

Consume Smarter, Increase Well-Being

This CIMULACT research topic showed a Medium-High representation in the expert-based studies, and connected to citations in eleven of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.06/3.00 or 35 %.

Consumer patterns were often mentioned in foresight reports, but usually they were contextualized within a specific category (food, energy, or as a general economic actor "consumers"). This allowed for a relatively high degree of coverage score, as multiple studies discussed some different forms or another of consumerism with regard to future possibilities. CIMULACT again distinguishes itself by calling for specific research areas, and targeted goals within those areas, specifically to promote the creation of a more informed and actively conscious consumer. In CIMULACT we find calls for policy frameworks (macro), social innovation and education programs (meso), and consumer behavior research (micro), all aligned to provide a comprehensive approach to building new social values and actions. Expert reports typically track toward one level of analysis, and are hesitant to outline specific research areas as can be found in CIMULACT.

Production Awareness



This CIMULACT research topic has a Medium-High representation in the expert-based studies, and connected to citations in twelve of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.22/3.00 or 41 %.

In many cases, expert foresight reports were credited with discussing this topic area if they mentioned various new production technologies (3D printing, Industry 4.0 technologies, etc.); this explains the relatively high degree of coverage score. However, these technologies alone do not achieve the goals stated in the CIMULACT research topic or its related citizen visions. There remains much research to be done in order to achieve that 3D printing or automated production technologies are any "cleaner" or more sustainable, as are required by CIMULACT research. Furthermore, only a small portion of expert studies called for the same level of design regulations (i.e. cradle-to-cradle) that would generate more circular resource flows, and could allow consumers to promote and sustain systemic change in production processes. These differences resulted in a relatively low alignment score between CIMULACT and the expert reports.

Discussion: Cluster Sustainable Consumption

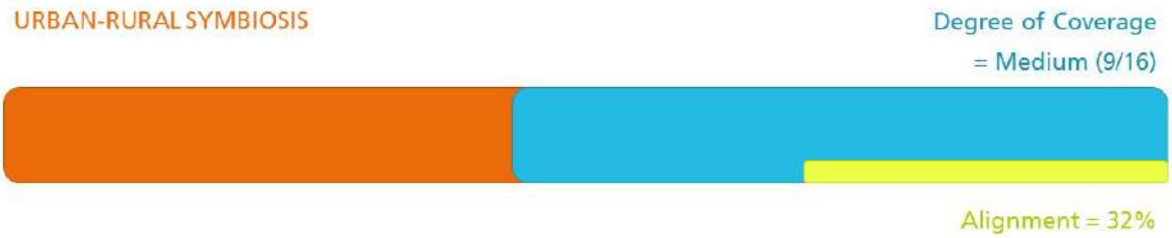
The Sustainable Consumption cluster was one of relatively high Degree of Coverage scores and Qualitative Alignment, when compared to other clusters across this study. This type of result indicates that issues at stake in citizen visions are in line with the thinking of many experts in foresight research. Differences in perspective and approach account for the low-medium qualitative alignment scores, and it is here that critical analysis can be most beneficial to further delineating the unique contributions of non-expert citizens.

The most striking demarcation line comes from the CIMULACT research topics, which repeatedly espouse research vectors that examine consumer behavior, policy frameworks, and learning systems - all hallmarks of a human-centered approach towards research and innovation. As opposed to both the more techno-centric and econometric approach evident in the expert-based reports, CIMULACT proposes research that aims various forms of social innovation (novel legal frameworks and contracts, community maker hubs, experimental communities, etc.), alongside experiments in technological adoption. The prioritization of human-centered design over technological development rings true across each of the CIMULACT research topics, and clearly defines a citizen position that both accepts responsibility for citizens' role in supporting existing, asymmetrical information relationships as consumers, and actively proposes research to help change that role into knowledgeable, conscientious, and empowered prosumers.

Cluster: Urban And Rural Development

The *Urban and Rural Development* cluster promotes two specific areas for future research, and their constituent components. Firstly, this cluster calls for a reinvigoration of the economies of rural areas and the opportunities afforded their residents through tighter connectivity with nearby urban hubs. Secondly, acknowledging the likely continuation of urbanization, CIMULACT calls for research into urban infrastructure and policy that can transform cities, and their logistics, into central nodes in localized circular economies. The degree of coverage for these issues was Medium to Medium-High, with most reports taking up cities and urban development as important influences on the future. Qualitative Alignment scores in this cluster, however, were relatively low at an average score of 41% (1.22/3.00), particularly with regard to plans or trends that are affecting rural communities and research that could be conducted to improve the urban-rural balance.

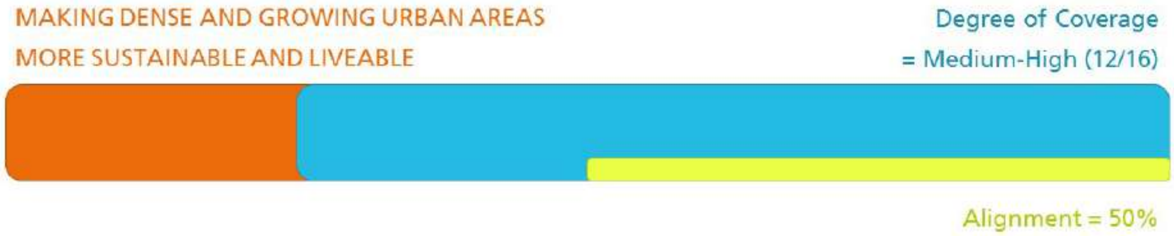
Urban-Rural Symbiosis



This CIMULACT research topic showed a Medium representation in the expert-based studies, and connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.97/3.00 or 32 %.

Urbanization was a widely-discussed issue across expert foresight reports, but urbanization's connections to trends in rural areas (brain drain, economic regression, unequal distribution of opportunities, etc.) was not always articulated or well-detailed within those reports. Some expert reports were content with mentioning economic hardships confronting rural communities with declining populations, but rarely were such challenges investigated in much depth nor did they become the focus of a research agenda as we find in CIMULACT. CIMULACT calls for specific research channels regarding the definition and development of future rural-urban relationships, including ethnographic studies, infrastructural studies, logistical studies, and a broad array of sociological studies. CIMULACT also presents the idea of co-development in a proactive stance, positioning it as an arena for actionable research and economic opportunity.

Making Dense And Growing Urban Areas More Sustainable And Liveable



This CIMULACT research topic showed a Medium-high representation in the expert-based studies, and connected to citations in twelve of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.50/3.00 or 50 %.

Urbanization, coupled with the challenges and opportunities (within the cities) that accompany this global trend, were notably consistent across a majority of expert foresight reports. Particular areas of interest include resource demands, use and efficiency; infrastructure needs and development processes; and various social inequalities that dense urban areas seem to exacerbate. The challenges in designing and integrating various urban systems in a fashion that is 'sustainable' requires a great deal of compromise between the various optimized setting of individual systems, and the need for comprehensive integration. The complexity of the challenge outlined in CIMULACT was of a much more granular nature when compared to a majority of the reports, and once again, CIMULACT was explicit in its call for research and innovation. While this topic had one of the highest qualitative alignment sores of all CIMULACT topics, expert studies were less comprehesive in general.

Discussion: Cluster Urban and Rural Development

In considering this cluster's comparative results with regards to expert-based studies, it is important to keep in mind the two general concerns promoted by the CIMULACT research topics. Again, finding balanced development plans that can recharge the economic prospects for rural communities is the first key motive.   This is meant to address the impact that urbanization has had on the people and industries of non-urban areas - eliminating job opportunities, removing important demographic sectors from communities, and reducing social, economic, and political activity more generally. Expert-based reports, on the other hand, were wont to mention the changes taking place in rural communities, and seem more focused on reporting challenging trends than proposing ways to find solutions to those challenges. The difference then between CIMULACT and expert-based reports concerning rural communities and their inhabitants, over a quarter of the EU's total population[9], becomes a critical point of divergence. The plight of rural communities seems under-represented in expert-based reports (low DOC score), and rarely framed as a challenge area for research and innovation when it is mentioned (low QA scores).

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[9] http://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_rural_areas_in_the_EU#Population_distribution_by_degree_of_urbanisation

Secondly, crucial to future cities within CIMULACT is the development of multi-culturalism, sustainable collective social behaviors, and finding scalable localized solutions within communities. While urbanization and cities was prominently mentioned across a number of expert-based reports, these publications tended to report on trends and issues that were quantitative in nature. As has been the case in other clusters across this report, CIMULACT's promotion of human-centered R&I is aimed to address the role that individuals and communities can play in solving urban challenges. With regard to sustainability of systems for instance, CIMULACT approaches research into best practices regarding individual behavior and lifestyle choice. This contrasts the general approach to sustainable system development found in expert based reports, which relies more heavily on the advancement of technical systems and technologies more broadly. It is worth noting that urbanization, when framed as a human-centric phenomenon, calls for radically different approaches to its analysis.

GRAND CHALLENGE 6

Europe in a Changing World - Inclusive, Innovative and Reflective Societies

GRAND CHALLENGE 6: Europe in a changing world - inclusive, innovative and reflective societies

Overall, eighteen CIMULACT topics aligned with Grand Challenge 6 objectives. This is by far the Grand Challenge under which the most research topics were aligned. Topics were related to four clusters: *Community Building*, *Participatory Governance*, *Economy*, and *Education*. For an overview of clusters, topics, degree of coverage as well as the qualitative alignment metric see table 10.

Table 10: Coverage of citizen-based topics within expert reports (GC6)

CIMULACT Cluster	CIMULACT R&I Topic	Degree of coverage in expert studies	Alignment with CIMULACT Intention/ Expectation
Community Building	*Empowering diversity in community*	*Medium (10)*	42%
	Evidence- based community building	*Medium (9)*	27%
	Community building development	*Medium-High (12)*	33%
Participatory Governance	*Empowered citizens*	*Medium (10)*	32%
	Meaningful research for community	*Medium-High (12)*	38%
	Snakes and ladders- Connecting scales of issues and actors	*Medium (10)*	41%
	The transparency toolbox	*Medium (9)*	31%
Economy	*Debating alternative economic models*	*Medium (8)*	28%
	Social economy	*Medium (9)*	28%
	Basic universal income so nobody is left behind	*Low (2)*	10%
	Alternative economic model	*Medium (9)*	32%
	From wall street to main street	*Medium (8)*	22%
Education	*Educational ecosystem as a driver of social innovation and local development*	*Medium (7)*	26%
	Design thinking and doing and life skills for all	*Low (3)*	6%
	Learning for society	*Medium (9)*	25%
	SWOT (Strengths, Weaknesses, Opportunities, Threats) Technological empowerment	*Medium (10)*	30%
	Ecological future education	*Medium (8)*	29%

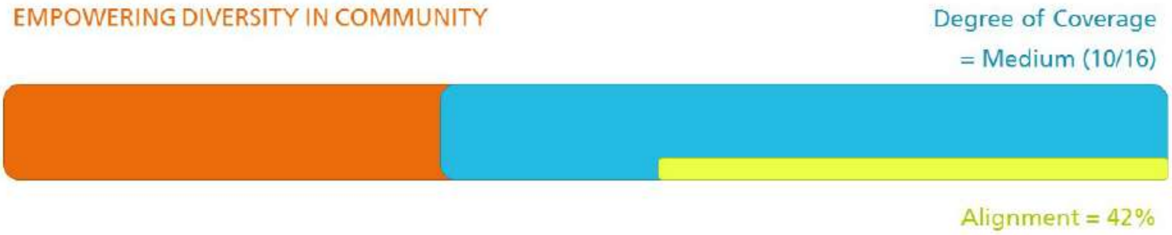
Detailed Comparison

Cluster: Community Building

The CIMULACT research topics categorized under the cluster of "Community Building" were well represented in the expert studies, with related quotations being found in an average of 10/16 expert-based reports. Additionally, the research topic area received an average Qualitative Assessment score of 1.0/3 or 33% alignment.

The *Community Building* cluster of CIMULACT topics related generally to questions of how research and innovation can contribute to shape stronger, more resilient communities at various levels of organization, being mainly concerned with handling diversity in its various expressions.

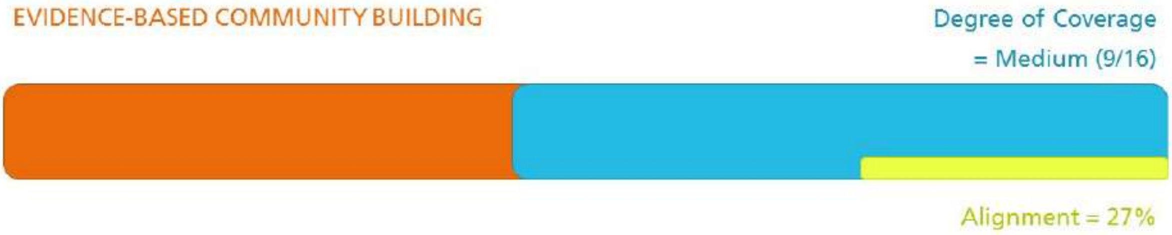
Empowering Diversity In Community



This CIMULACT research topic has a medium representation in the expert-based studies, and connected to citations in ten of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 42%.

This alignment score may result from the fact that this topic directs research to investigate factors and create models in order to derive a better understanding of how diversity shapes communities, and the societal conditions for achieving inclusion. Overall, expert reports, if they mentioned the topic of diversity, focused more on migration as a driver for increasing diversity and often considered how to harness this for economic growth.

Evidence-Based Community Building



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 27%.

This low alignment results from the fact that this CIMULACT topic describes a broad frame of how to foster evidence-based policy making regarding the subject of building better communities, i.e. with reduced prejudices. It focuses on models and mechanisms for changing people's mindsets towards becoming increasingly considerate of cultural differences, and valuing evidence as basis for decisions. Expert reports rarely, if ever, make the connection between increasing information and data availability, the corresponding need for educating people in their use of data, and its application for community building. Expert reports more often mention single aspects or technologies that could be applied to aid such a scheme the CIMULACT topic lays out.

Community Building Development

This CIMULACT research topic showed a medium-high representation in the expert-based studies, and connected to citations in twelve of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.0/3.0 or 33%.

This CIMULACT topic mainly focusses on fostering long-term research on infrastructures that can support inclusion, cohesion and collaboration in highly diverse communities and lays out several areas in which research should contribute, such as local community research, citizen involvement in decision-making, and creation of social spaces. Expert reports rather mention particular technologies or social developments aligning only with certain parts of the topic, such as increasing self-organization, flattening hierarchies or gamification for problem solving. This results in the relatively low alignment of expert reports.

Discussion: Cluster Community Building

The Community Building cluster of CIMULACT topics was well represented in terms of relatable content from the expert-based studies, but the low qualitative alignment points toward some areas of distinction between citizen and expert research priorities. Within each of the CIMULACT topic comparisons we can identify patterns of difference between CIMULACT and expert-based reports. Generally, each of the CIMUALCT topics set out to provide a broad scope for research to explore several directions for fostering stronger, more resilient, more just, more collaborative and participatory communities, arguing that this is necessary to deal with the increasing diversity of communities. Interestingly, the issue of migration is not explicitly addressed; it is rather implicitly mentioned and circumscribed with diversity, encompassing a larger set of diverse actors than just migrants. In relation, expert studies often mention single issues, or they particularly dwell on challenges and opportunities of migration. Empowerment for instance is often adhered to an individual perspective. Generally, CIMULACT topics frame the challenges differently, and the impetus of citizens' visions is very detectable, resulting in research topics that frame research and innovation from a society-centric position.

Cluster: Participatory Governance

The CIMULACT research topics categorized under the cluster of "Participatory Governance" were well represented in the expert studies, with related quotations being found in an average of 10/16 expert-based reports or around 63%. Additionally, the research topic area received an average Qualitative Assessment score of 1.01/3.00 or approximately 33% alignment.

The Participatory Governance cluster of CIMULACT topics related generally to questions of empowering citizens to take part in decision-making, making research responsive to societal needs, increasing collaboration, and fostering transparency.

Empowered Citizens

This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in ten of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.97/3.0 or 32%.

The alignment of the expert reports with the CIMULACT topic is considerably lower than the degree of coverage may suggest. While CIMULACT and expert reports largely agree on describing the challenge and necessity of fostering a more and qualitative better engagement of citizens in political and other decision making, they only partially align with respect to the sought solutions. In the expert reports, empowerment of citizens is often seen from a technological-enabling perspective, pushing technological solutions for engagement, while the CIMULACT topic focusses of deriving an understanding of the underlying factors and requirements that foster or hamper participation in various contexts.

Meaningful Research For Communities

This CIMULACT research topic showed a medium to high representation in the expert-based studies, and connected to citations in 12 of 16 reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.2/3.0 or 38 %.

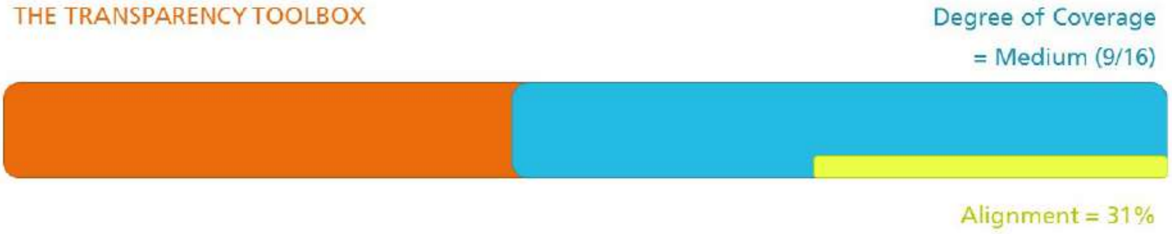
The topic *Meaningful Research for Communities* promotes the idea that research and innovation endeavors should be selected and prioritized according to an evaluation scheme that examines potential benefits for society, and the proposed endeavor's ability to contribute to a sustainable development. Many expert reports discuss issues such as co-creation processes, participatory design and innovation, and technical capacities to expand various forms of participation, but they rarely if ever connect these issues to the concept of sustainability and especially not in connection to the evaluation of research proposals, hence the relatively low alignment score of 38 %.

Snakes And Ladders - Connecting Scales Of Issues And Actors

This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in ten of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.22/3.0 or 41%.

The basic idea of this topic is fostering interconnections of actors from various groups and levels in response to shared challenges in order to conduct a transdisciplinary development of practical, methodological and technological experiments with regard to new governance structures, transparency policies, and decision-making processes. Again, expert reports mention some of the singular issues, such as the need for increasing political participation or they align with describing the challenge that complex problem solving needs new forms of strategy and processes. The relatively low score of 41% of alignment with the intentions the CIMULACT topic has, depicts how this area is rarely tackled with such a comprehensive approach.

The Transparency Toolbox



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.94/3.0 or 31%.

The transparency toolbox, in short, asks for research to explore ways to promote transparency as a crosscutting theme in society, improving various social settings and accessibility of governance processes. The demand or the suggestion to enhance governance through increased transparency is found in several expert reports, but very often in connection to electronic participation technologies or decision-making based on big data. The CIMULACT topic discusses a broader research area, also calling for investigation of current barriers, restrictions and enablers that hamper transparent governance.

Discussion: Cluster Participatory Governance

Generally, the Participatory Governance cluster of CIMULACT topics was well represented in terms of relatable content from the expert-based studies, but the low qualitative alignment points toward some areas of distinction between citizen and expert research priorities. Within each of the CIMULACT topic comparisons we can identify patterns of difference between CIMULACT and expert-based reports.

While some expert-based reports describe extensively emerging challenges such as a loss of trust in government or science, they either do not describe solutions or focus on technological enablers of participation as solutions, such as e-democracy tools, spreading internet access and thereby access to information. Some present co-creation of (public) services and goods as well as science as solutions, but those proposals are rarely aligning well with the extended scope of CIMULACT topics. While the citizen-based research topics of CIMULACT often apply a society-centric point of view regarding communities and solving shared challenges as priority, expert reports often consider governance at the level of state and organizations.

Cluster: Economy

The CIMULACT research topics categorized under the cluster of Economy had a medium representation in the expert studies, with related quotations being found in an average of 7/16 expert-based reports or around 43%. Additionally, the research topic area received an average Qualitative Assessment score of 0.73/3.00 or approximately 24% alignment.

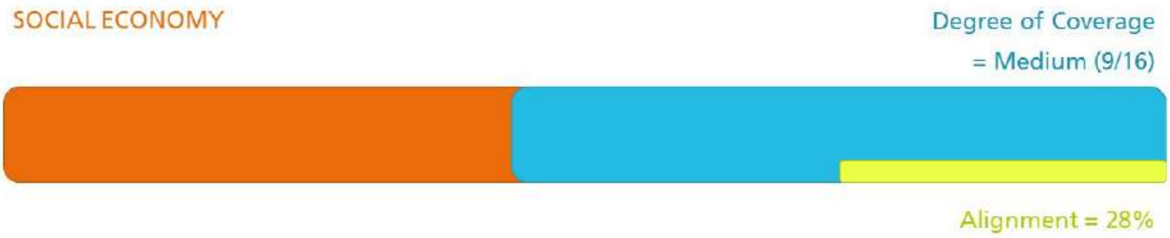
A common thread across many of these CIMULACT research topics, various modes of alternative economic systems were proposed as the focus for inclusive social discussion, community experimentation, and analysis regarding their effects on traditional economic exchange systems. This includes topics like Social Economy, Universal Basic Income, and also addresses some of the policy changes that might be necessary both for economic transition, and in better regulating existing economic exchange.

Debating Alternative Economic Models

This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in eight of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.84/3.0 or 28%.

The topic 'Debating Alternative Economic Models' calls for a Coordination and Support Action (CSA) that aims at connecting various actor groups to facilitate a Europe-wide deliberation process to discuss and find strategies to facilitate implementation of emerging and already available alternative economic models on the basis of a common knowledge base built prior to the process. Calling for such an endeavor is unique compared to all investigated expert reports, which at times either describe emerging alternative economic models in concrete terms, such as sharing economy or circular economy, or they mention challenges arising from the current prevailing economic system and state a need for finding solutions. The low qualitative alignment score of 28 % thus is due to a none-representation of CIMULACT's idea to facilitate such a dialogue for identifying solutions and helping with implementation.

Social Economy



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.84/3.0 or 28%.

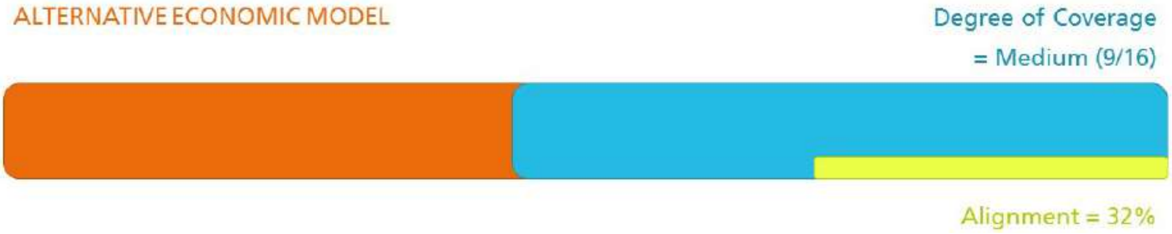
This topic overlaps with the topic above, calling for investigation of alternatives to the current status quo of the economic system, emphasizing models that are oriented mainly towards increasing sustainability, education, equality and environmental protection. Some expert reports mention alternative indicators to GDP for measuring prosperity and state challenges for development and security such as increasing inequalities in Europe, or they focus on economic trends likely to shape the near future. Yet, these reports rarely emphasize experimentation with or moving towards more socially oriented models of economy, therefore the low qualitative alignment with the CIMULACT topic.

Basic Universal Income So Nobody Is Left Behind

This CIMULACT research topic showed a low representation in the expert-based studies, and connected to citations in two of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.31/3.0 or 10%.

This CIMULACT topic encourages widespread experimentation with universal basic income (UBI) immediately to find out the various social, cultural, and other localized factors that can make (UBI) schema fail or succeed. Expert reports rather dwell on the factors and challenges leading to a situation where a basic universal income scheme could work as solution, e.g. continuing increase of inequalities with regard to wealth distribution or large-scale automatization and arising unemployment, both with possibilities of resulting in decreasing social cohesion and unrest. Overall, the Basic Universal Income topic is one of the least represented and least aligned topics of all 46 CIMULACT topics, making it very unique. On the one hand it describes emerging challenges, that many experts reports agree upon, yet on the other hand this topic presents a concrete solution for dealing with those challenges, where expert reports mostly do not offer such solutions

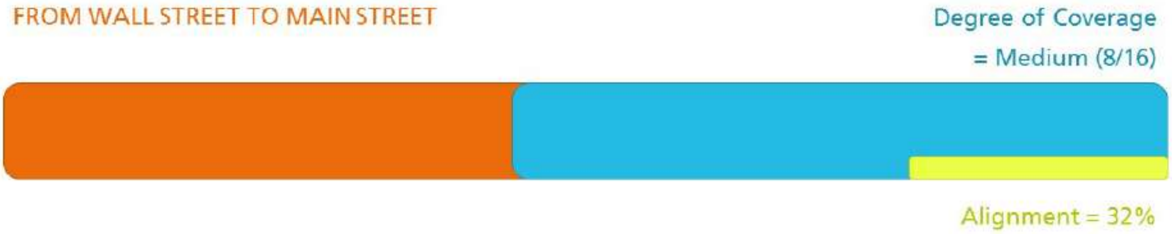
Alternative Economic Model



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.97/3.0 or 32%.

This topic again deals with alternative economic models, emphasizing on pushing research to investigate the most relevant and efficient models promoting sustainability, comprising a comprehensive catalogue of indicators to help facilitating a shift away from the current economic system. Examples include investigating basic income, economics of happiness or exploring reward systems for helping others. Expert reports largely mention circular economy in connection to alternative economic models geared towards increasing sustainability or describe potential social and economic risks arising from increasing inequalities, but do not call for a broad experimentation as CIMULACT topic does.

From Wall Street To Main Street



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in eight of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.66/3.0 or 22%.

This CIMULACT topic suggests research into policy based reform to incentivize financial institutions to act sustainably, and in a socially responsible and inclusive manner. Expert reports highlight the powerful role of the financial services sector thus a medium representation score, and at times point to technologically driven disruption within the sector, yet, do not align with the topic's intention for investigating how a profound reform of the financial sector could be achieved.

Discussion: Cluster Economy

Generally, the economy cluster of CIMULACT topics was medium well represented in terms of relatable content from the expert-based studies, but the low qualitative alignment points toward some areas of distinction between citizen and expert research priorities. Within each of the CIMULACT topic comparisons we can identify patterns of difference between CIMULACT and expert-based reports.

All topics in the CIMULACT cluster ‘economy’ take a position in aiming to reform the current economic system with its prevailing models, namely capitalism. In this sense, the citizen-based topics point towards taking stock of alternatives, investigating best options to gear economy towards being sustainable on all of the concept’s levels, respecting social, economic, environmental and organizational issues. Overall, these topics describe shortcomings of the current status quo and summarize challenges such as increasing inequality, and an economy that does not predominately benefit society, but only very few people. The CIMULACT topics do not stop at diagnosing the situation, but set out to find solutions or in some cases to experiment and implement solutions that have been largely neglected by decision makers, such as basic universal income. Expert reports often mention circular economy as one alternative model, mainly considering resource efficiency, less considering social factors.

Cluster: Education

The CIMULACT research topics categorized under the cluster of Education were medium represented in the expert studies, with related quotations being found in an average of 7/16 expert-based reports or around 46%. Additionally, the research topic area received an average Qualitative Assessment score of 0.7/3.00 or approximately 23% alignment.

The CIMULACT research topics presented within this cluster address various components of the education landscape: technological integration, curriculum design, systemic changes to accreditation and certification procedures, and education's role with regard to a changing professional employment arena. General themes that tie this cluster together include inclusivity in design of educational changes, expanding the concept and context of education, and redefining the value by which education is organized at systemic and pedagogical levels.

Education Ecosystem as a Driver of Social Innovation and Local Development

This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in seven of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.78/3.0 or 26%.

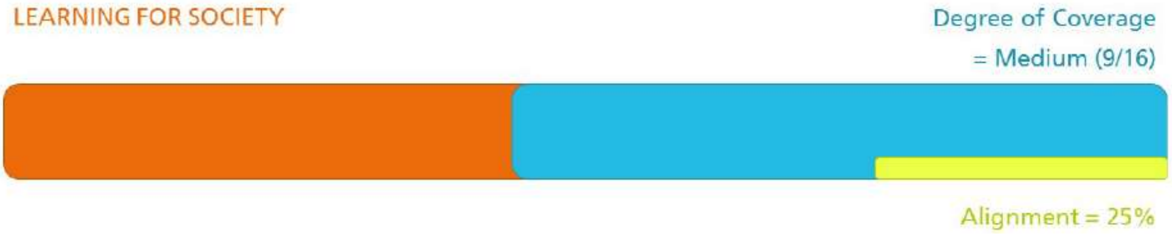
This topic aims at investigating how reshaping the education system could benefit co-creation, social innovation and local development to promote cohesion and inclusion. Interestingly, there are very few expert reports with an individual medium or low alignment score, as many of the sixteen reports have no alignment, while very few others show high alignment, resulting in a low overall score.

Design Thinking and Doing For All

This CIMULACT research topic showed a low representation in the expert-based studies, and connected to citations in three of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.19/3.0 or 6%.

This CIMULACT topic also aims at directing research to improve education, especially considering the concept of design thinking to foster creativity and problem solution capabilities in learners. Very few expert reports take up single details of this approach, but barely align in scope, direction or content with this CIMULACT topic, making one of the least represented as well as the least aligned topic out of the 46.

Learning for Society



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.75/3.0 or 25%.

This CIMUALCT topic is broad in scope, exploring several starting points to improve education to foster more sense of community, orientation towards common good, collective work, better intergenerational connections as well as lifelong learning, and in general to improve community building. Expert reports often focus on education as a tool for inclusion of migrant workers, or mention other singular issues the CIMULACT topic comprises, but not this scope and not with the orientation to improve community building.

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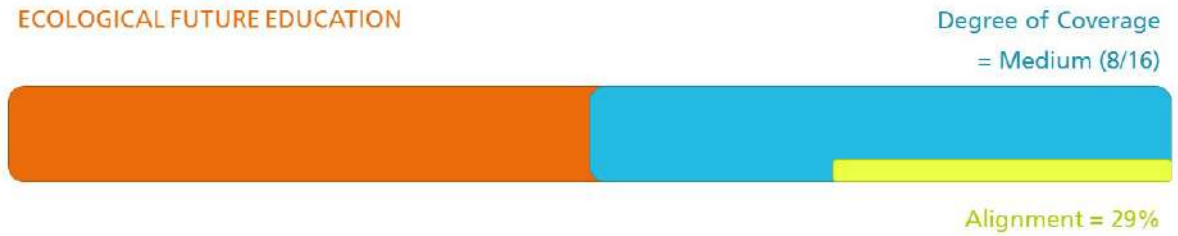
SWOT (Strengths, Weaknesses, Opportunities, Threats) Technological Empowerment

This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in ten of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.91/3.0 or 30%.

The CIMULACT topic encourages the co-development of new educational technologies with all stakeholders (hardware and software producers, educators, learners), applying those in the educational system, and bolstering creativity as primary learning goal. Many expert reports partially align, but primarily focus on new (already existing) technologies and new pedagogies that are enabled through those technologies. CIMULACT diverges from those superficial alignments by proposing the discussed co-development scheme.

Ecological Future Education



This CIMULACT research topic showed a medium representation in the expert-based studies, and connected to citations in eight of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.88/3.0 or 29%.

CIMULACT calls for systems thinking integration into curricula and innovative learning methods (narrative-action paths) as specific areas for research with the aim of transferring knowledge on ecosystem services and ultimately achieve ecological sustainability of human systems. Expert reports are more general, noting that education will be important in addressing the general socio-ecological evolution of EU and more specific in emphasizing (certain) new technologies and new pedagogies that are enabled through those technologies.

Discussion: Cluster Education

Overall, the Education cluster of CIMULACT topics was medium represented in terms of relatable content from the expert-based studies, but the low qualitative alignment points toward some areas of distinction between citizen and expert research priorities. Within each of the CIMULACT topic comparisons we can identify patterns of difference between CIMULACT and expert-based reports.

Especially one topic (Design thinking) was very lowly represented and aligned, while the four others show medium representation but also rather low alignment. The CIMULACT topics in this cluster align with each other in applying educational reforms and technologies to solve current challenges in environmental protection or community building, or more generally in creative problem solving. Many expert reports mention technological development in education as a relevant topic, but often focus on already existing technologies such as massive open online courses (MOOCS), or virtual reality devices enabling virtual teaching concepts, for instance for remote areas. Overall, education was one of the crosscutting issues mentioned in CIMULACT, and many more topics could have been filed under this cluster as they frequently mention educational measures as part of solutions to deal with many described challenges.

GRAND
CHALLENGE 7
Secure Societies - Protecting Freedom and Security of Europe and its Citizens

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe and its Citizens

One CIMULACT cluster with three topics connects to issues in this Grand Challenge. The topics are 'Data for all', 'Here , there and everywhere', and 'Transforming technologies for planet and people'. For an overview of clusters, topics, degree of coverage as well as the qualitative alignment metric see table 11.

Table 11: Coverage of citizen-based topics within expert-reports (GC7)

CIMULACT Cluster	CIMULACT R&I Topic	Degree of coverage in expert studies	Alignment with CIMULACT Intention/ Expectation
Technology & Social Impact	*Data for all- Share the power of Data*	*Medium-High (13)*	56%
	Here, there and everywhere	*Medium (9)*	26%
	Transforming technologies for planet and people	*High (14)*	52%

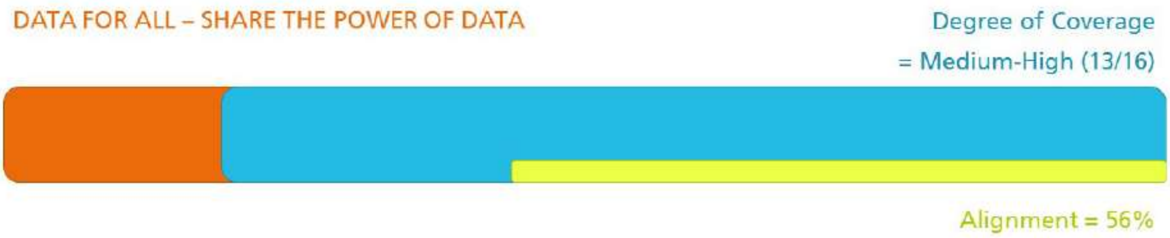
Detailed Comparison

Cluster: Technology And Social Impact

The CIMULACT research topics categorized under the cluster of "Technology and Social Impact" were well represented in the expert studies, with related quotations being found in an average of 12/16 expert-based reports or around 75%. Additionally, the research topic area received an average Qualitative Assessment score of 1.11/3.00 or approximately 37% alignment.

This cluster is loosely organized according to technological affordances that global connectivity has enabled. First, the ability to gather and share data from around the planet is viewed as enabling new forms of social, environmental, and economic analysis, even as it might be used to threaten ideas of security and personal privacy. Also, Real-time communication of various types of data that can radically change human agency have a transformative capacity that must be investigated to ensure it is utilized for the greater social good.

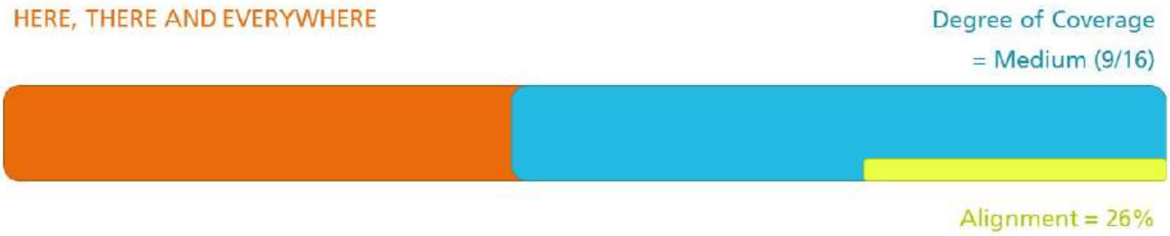
Data For All - Share The Power of Data



This CIMULACT research topic showed a medium-high representation in the expert-based studies, and was connected to citations in thirteen of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.69/3.0 or 56%.

This topic sets out to investigate how abundant data can be used to improve individual decision making and collective decisions. The topic sketches out numerous challenges that need to be overcome before data can be safely, and securely, used this way, discerning people- and data-centered challenges. The former include improving data literacy, privacy, access and ethical data use, while the latter deal with issues such as assessing quality of data, openness of data or standardization. The high degree of coverage of this topic within the expert studies, with a corresponding medium alignment regarding the qualitative aspects of the comparison show that the issues in this topic were highly anticipated by all types of studies. Alignment mostly diverges where CIMULACT specifically defines the challenges to be addressed from a society-centric perspective, whereas expert reports often portray more techno-optimism with regard to big data applications.

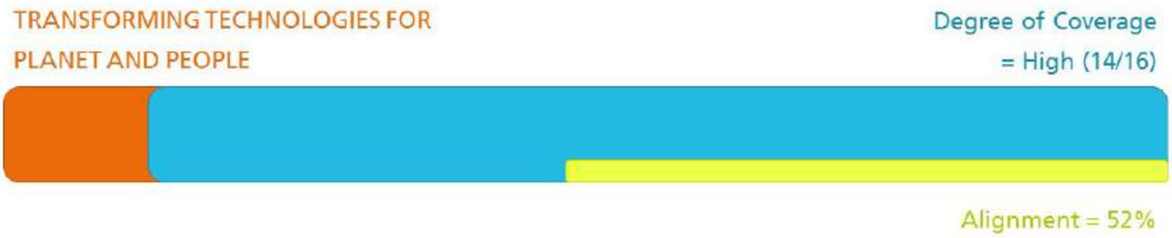
Here, There, Everywhere



This CIMULACT research topic showed a medium representation in the expert-based studies, and was connected to citations in nine of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 0.78/3.0 or 26%.

CIMULACT topic generally focusses on improving infrastructure and internet access for citizens to be able acquire a broadened horizon through virtual reality tools, but also through physical mobility. These are the aspects that align very well with many expert reports that mention such issues. CIMULACT is broader and sets this development into the context of day-to day life and additionally asks research to investigate medical and psychological risks and effects of such an increased mobility and raise awareness about them. This part of the topic is nearly not found anywhere in the expert reports.

Transforming Technologies for Planet and People



This CIMULACT research topic showed a high representation in the expert-based studies, and was connected to citations in fourteen of sixteen reports. The overall alignment between the content and intention of the CIMULACT research suggestion and that of the expert-reports was 1.56/3.0 or 52%.

CIMULACT topic diverges from experts reports qualitatively with regard to asking research to investigate a participatory development-scheme for technologies, which is predominately geared towards sustainability and wellbeing, whereas many expert reports predominately address the development of specific technologies for instance for cleaner production.

Discussion: Cluster Technology and Social Impact

In average, the Technology and Social Impact cluster of CIMULACT topics gained a medium to high representation in terms of relatable content from the expert-based studies, and a medium qualitative alignment points toward few areas of distinction between citizen and expert research priorities. Within each of the CIMULACT topic comparisons we can identify patterns of difference between CIMULACT and expert-based reports.

The first and the third topic (Data for all; Transforming Technologies) are both well represented within the expert based studies and also show a corresponding medium alignment of scores above 50%. Compared to all other topics in CIMULACT, these qualitative alignment scores are the highest ones of the entire sample, showing that those two topics include many issues shared and expressed by both expert based studies as well as CIMULACT's multi-actor approach. Yet around 50 % alignment still means that there are considerable differences between the ways the issues were approached. While many expert reports agree with CIMULACT on technological parts of the topics, such as the need for bolstering internet access, improving virtual reality tools or developing technologies for improving society and environment, they are often not setting these issues into an societal context. Here, CIMULACT topics diverge with regard to asking research to investigate a participatory development-scheme for technologies, predominately geared towards sustainability and wellbeing. Additionally CIMULACT calls for the assessment of the physical and psychological impacts of heightened virtual and physical mobility. In contrast, many expert reports predominately express fostering innovation as a requirement to improve competitiveness and economic growth, being more techno-optimistic, and less considerate of the possible negative impacts for society.

4

CONCLUSIONS Expert- and Citizen-based foresight for policy

4. Conclusions

In general, elements of the CIMULACT research topics were well represented within the expert-reports, emphasizing the importance of the respective singular issues. However, overall alignment between CIMULACT and expert-studies remained on average low to medium due to differences in research approach, and whole segments of CIMULACT research proposals being neglected within expert-based studies.

Some key thematic differences include, but are not limited to:

- Governance issues were seldom mentioned and typically framed as a continuation of existing power structures within expert-based reports. In contrast, CIMULACT results present distributed forms of governance as critical spaces for experimentation across all major societal sectors. This omission accounts for a significant part of the misalignments.

- Citizen visions for a desirable and sustainable future forms the baseline for proposed research topics, resulting in a society-centric frame for future research and innovation.

- The focus of expert-based reports often fails to recognize the importance of individual choice that is at the heart of CIMULACT's research topics, and as such renders reconciliation between the content of the expert-based reports and that of CIMULACT difficult. By excluding the concept of personal agency that underpins much of the CIMULACT research topics, the recommendations of expert-based reports seem to hide their impact of humans behind a mask of ambiguity.

- Overall, each of the CIMUALCT topics set out to provide a broad scope for research to explore several directions for research and innovation activities. This perspective reduces technocratic solutionism, and presents research areas and goals couched within scenarios that reflect the plurality and diversity that compose the EU's citizenry.

- Education was a major crosscutting issue mentioned across numerous CIMULACT research topic, as educational measures were frequently part of solutions to challenges. However, education (both formal and informal) was distinctly under-represented in many expert-based reports, particularly with regard to addressing social challenges.

- The Basic Universal Income topic is one of the least represented and least aligned topics of all 46 CIMULACT topics, making it a very unique contribution to research policy-oriented discussions.

The following figures present an overview of all CIMULACT topics ordered descending by the degree of coverage metric (Figure 6) and the qualitative alignment score (figure 7)[10]. Figure 5 is a legend for reading the visual data showing the overall

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[10] For definitions of these two metrics, see p.28-29

degree of coverage and qualitative alignment of all 16 expert based foresight report with all of CIMULACT's research topics.

Figure 5. Overall degree of coverage and qualitative alignment of expert-based forsight studies with CIMULACT topics

* This bar represents the content of the CIMULACT research topic. It is presented here as the primary metric by which all expert-based reports are to be assessed.

** This bar represents the number of expert-reports containing one or more references to a given CIMULACT topic. This bar is divided into 16 portions, concomittant to the number of foresight reports included in the comparison.

*** This bar represents the qualitative comparison of CIMULACT research suggestions with that of expert reports. It is presented as a percentage, based on the Qualitative Alignment scoring rubric along a 0-4 scale.

Figure 6: CIMULACT topics ordered descending by Degree of Coverage (blue bar)

Figure 7: CIMULACT topics ordered descending by qualitative alignment (green bar)

Expert- and Citizen-based foresight for policy: Similarities and Contrasts

During our comparative reading, patterns of difference emerged that summarize the contrast between expert-based and participatory foresight. Individually, these patterns point toward qualitative gaps in the results that these foresight projects produce, and consequentially, in the value that they provide to policy shaping audiences. The patterns we observed are related to fundamental differences in perspectives and approaches to identifying problem areas and proposing outlines for work towards solutions. Below you will find brief discussions concerning these emergent patterns and our attempt to name them in an accessible way.

Human vs. Techno-centricity

Firstly, expert reports tended to be far more interested in mentioning the technological developments that were currently occurring across the different fields. Specific technologies, many of which do play an important role in relation to the topics of CIMULACT, cannot address the human-centric concerns and local, inclusive focus present in the CIMULACT topics.

A good example of this discrepancy can be found in different approaches to future food research. Expert foresight studies and CIMULACT widely agreed that food security and various influencing factors were of great importance for future research and innovation agendas to address. Overall, expert studies tended to emphasize technological solutions to address food security and provided more current statistical data as a means to substantiate the trends that they identified. Thus, research suggestions emanating from expert reports were typically focused on large-scale operations, top-down policy mechanisms, and investment and technological development on a global scale. This is in stark contrast with the research agenda outlined within CIMULACT that repeatedly espouses research vectors that examine consumer behavior, localized policy framework experimentation, and learning systems - all hallmarks of a human-centered approach towards research and innovation. CIMULACT proposes research that aims various forms of social innovation at addressing food security and local sustainability, while utilizing food diversity as a way to build and support communities.

The prioritization of human-centered design over technological development rings true across each of the research topics, and clearly defines a citizen position that accepts responsibility for citizens' role in supporting the existing asymmetrical relationships of power and agency concerning societal sectors. CIMULACT research topics actively propose research to help change the role of citizen into active participant in experimentation, education, and the fostering of a strengthened social contract.

Local innovation and development

The second difference between CIMULACT and the expert-reports is primarily a difference in framing how, by whom, and for whom research is to be conducted. In many expert reports, ongoing research was discussed within the context of institutionally backed facilities or contexts, and focused on conducting proprietary research with social benefits that could be extracted through the global marketplace. Such research would not guarantee the types of localized and inclusive methods that CIMULACT proposes, nor would it necessarily allow for Open Data or Open Science frameworks that were central across a number of CIMULACT topics.

CIMULACT's suggestions, while often targeting the same general concerns as the experts, were grounded in a local approach to conducting research and innovation activities. By aligning local and regional knowledge and practice with researchers, CIMULACT aims to uncover solutions by working within a cultural context - solutions that can be deployed and scaled up when, where, and for whom they are deemed appropriate. This emphasis on localization also applied to CIMULACT's calls for experimentation and research into multi-level governance mechanisms that can be used in decision-making process - a theme that few expert reports mentioned.

The consistent emergence of this difference across CIMULACT research topic proposals is notable with regard to the inherent diversity of the EU citizenry, particularly as local populations report feeling removed from, and sometimes alienated by, larger EU governing structures. This pattern clearly outlines a popular interest in solving portions of the Grand Challenges the EU faces, but underscores CIMULACT participants' investment in the agency and empowerment that localized, inclusive research can provide.

Designed Education & Implied Adaptation

A large portion of CIMULACT research topics included education and curricula development as integral components to addressing challenges. This includes issues relating to healthcare, environmental systems, intergenerational communities, political participation, technological change, consumer behavior, and energy management. The CIMULACT topics aim at applying educational programs to address current challenges by way of enabling informed, inclusive, and creative problem solving. In positioning learning and education as primary enablers of systemic change, the CIMULACT participants again turn the tables on who is expected to contribute to shaping new futures, and the processes by which necessary change can take place.

By contrast, education and awareness raising programs do not play a significant role across the majority of expert-based foresight reports. For the most part, when education needs are addressed within expert based foresight reports, they are aimed at furthering ongoing research agendas and institutions, not in building community learning centers that can train citizens to be literate and active in data analysis, product design, and policy discussions. And lastly, the opinion within expert-based reports that describing technologically enabled change, without addressing the new educations needs they imply, is a recurrent theme, implying that somehow, societies and their citizens will "adapt" to technological change - a dangerous positioning of social and political power.

CIMULACT promotes many different forms of education and learning, each specified within the context of the issue at hand (i.e. doctor/patient training in healthcare situations, citizen scientist development for community empowerment). This proactive stance enables future inclusivity, while acknowledging and empowering the 'social' component of socio-technological change.

Aligning with regard to challenges, divergent in solutions

Another delineation between CIMULACT and expert-based reports was the mode in which research was to be arranged and executed with regard to common issues. This difference was a primary shaper of the low Qualitative Alignment scores across the entirety of our study. While CIMULACT and expert-based reports might have highlighted similar concerns, the solutions proposed (or research fields find solutions) were sharply divergent.

A key example of this pattern can be found in the concerns of automation in the workplace, job (in)security, and changing definitions of work more generally. This group of issues was discovered in nearly 75% of expert-based reports, and touched on CIMULACT research topics across three different Grand Challenges. The shared view was that the workplace is currently undergoing change, and that change is expected to continue if not increase thanks to technological influences like task automation. However, from this common point of interest we quickly begin to see divergent views on what, if anything, is to be done.

Generally speaking, expert-based reports tended to present objective views of trends, and approach each problem from more top-level governance mechanisms and institutions. Through such channels then they suggest rethinking of social welfare and healthcare systems, changes to tax policies, and big-data analysis to understand the developing trends related to mass under employment. To their credit, in some instances the solution paths were quite nuanced and couched within contemporary literature, and this deliverable's only purpose is not to judge the quality of these proposals, but to compare them with those of CIMULACT.

CIMULACT's proposed research topics, strike a very different approach to addressing the changes in employment and the workplace - life-long learning and re-training programs, recognition of various forms of traditionally unpaid work, universal basic income schema, and even redefinition of work itself among others. Within CIMULACT then we find completely different avenues of exploration in response to an otherwise common root problem set. It cannot be said that citizen visions were not constructed as vague utopias concerning work or lifestyle. Rather, CIMULACT research topics were pointedly searching for research paths that could lead to both, better work efficiency, work place cooperation and collective production, and profitable ways to achieve inter-related citizen desires.

This type of divergent thinking was emergent across most CIMULACT research topics, and though it might be attributed to other patterns of difference discussed in this section, it is itself a notable phenomenon. In regards to the utility that the CIMULACT project may provide in future policy design, we believe that the divergent thinking outlined here makes this report invaluable to social agenda setting, and is good evidence for broad, participatory foresight as a necessary methodological component of organizational and social foresight more generally.

Different Scales

Framing the scale of an issue, and the extent of its complexity, was another common difference observed during our comparison. In part, this is related to the localization pattern discussed above, but there are additional facets that extend this difference and make it worth of note. According to our readers, expert-based reports typically took a research perspective in which systems, organizations, or 'the city' became the smallest unit of analysis in regards to trends, emergent technologies, or other issues. While conceiving of such entities is useful within some contexts, such a practice also homogenizes both these entities, and their constituents. This in turn promotes the illusion that singular solutions can be found, and should be the focus of research.

CIMULACT, on the other hand, regards the individual, their support network, and overarching communities as essential units of analysis and action across research topics proposed. This move invites them to be participants, not just benefactors, in the creation of designs, systems, and knowledge that will come to affect their daily lives. At least within CIMULACT, these initiatives are often coupled with platforms for engaging communities, to promote the sharing and adoption of social experiments and innovation. While such an approach may at first appear to be inefficient, by targeting smaller scale actions for initial research, from more distributed experimentation a productive menagerie of solutions might emerge - one that is, perhaps, more representative of the heterogeneities that define the EU experience.

Target Setting: Sustainability and Wellbeing

A final line of deviation between CIMULACT and the reviewed expert-based foresight reports concerns both the level of target setting, and the general focus of targets when they are expressed. Perhaps due to CIMULACT's methodology, as negotiations between alternative future visions became the foundation for research topic formulation, the desirable end-states of those visions were translated into focused targets for research and innovation. By clearly stating what citizens hoped to achieve with regard to future advancements, the visions enabled the creation of a broad ranging R&I agenda with refined goals (i.e. more sustainable systems, more equal social welfare, greater diversity, stronger communities, etc.).

Many of the expert-based reports either lacked robust alternative futures altogether due to methodological selection, or failed to clearly state which of the scenarios could be considered desirable and by whom desirability would be measured. This led to a recurrent theme in most expert-based reports: the act of target setting either is neglected altogether, or stems from an influential field (institutional focus, theoretical background, etc.) that can be read across their inherent research proposals. Thus, while CIMULACT presents readers with a coherent set of targets that research should be working towards, the expert-based reports offer sporadic, and often divergent, proposals for future research and innovation.

For example, with regard to topics such as transportation, urban development, energy, food, and even education, sustainability and ecological awareness and sensitivity play a significant role in shaping the CIMULACT research topics.

While these words might mean different things within the context of each research proposal, the core value of sustainability is consistently represented across the CIMULACT report. Similarly, 'well-being' as it relates to both the individual and communities, is a constant theme that arcs across research topics concerning personal development, lifestyle choice enabling, education and training, healthcare and nutrition, and others.

By contrast, it would be difficult to find such a cohesive band of advice across the majority of expert-based reports, with exceptions coming from those reports produced by institutes within a specific field. For instance, those foresight reports commissioned or conducted by institutes grounded in formal economics would often frame issues, and potential solutions, within the language and methods of the field. If a problem area was identified, then an economic approach to understanding the problem and imitating solution-focused research would be embraced. Generally speaking however, it was difficult to find the same level of targeted research proposals within the expert-based studies as compared to CIMULACT.

Expert-based topics

While this report is primarily focused on the presentation of CIMULACT research topics as represented within expert-based reports, our research also discovered a number of research topics mentioned in expert reports that were not included in the CIMULACT results. These topics are listed under the appropriate cluster within each of the comparative templates on which data was compiled (see Annex 4).

In many cases, the research areas brought up in expert-based reports can be considered as adhering to a different degree of specificity than that of CIMULACT. Across a number of technological developments and scientific fields, expert-based foresight often wrote more detailed analyses of implications and, in some cases, how to pursue future research. As there is certainly a place for such research areas within future EU R&I agenda setting procedures, we classified and recorded these topics for further review. For the purposes of this report we will mention only the more exceptional cases of research topics that are not explicitly mentioned within CIMULACT.

Interestingly, the issue of **Migration** is not explicitly addressed within CIMULACT research topics. Though it is implicitly mentioned and circumscribed within the language of 'diversity', encompassing a larger set of diverse actors than only migrants, it remains a notable exception within CIMULACT, particularly in light of the prominence it played across a number of expert-based foresight reports.

Climate Change is another research area that seems to be missing from the CIMULACT report. Even as many of its research topics are related to the idea of sustainability - a term that will take on new meaning as climate change progresses - the CIMULACT research topics in their final form rarely mention climate change explicitly.

Gender and Minority Inequality issues are also not explicitly addressed within CIMULACT. Particularly with regard to educational opportunities, employment and professionalization, and income disparities, the call for research and experimentation with policies to address these issues is strangely lacking within CIMULACT.

What Futures for Participatory Foresight in R&I Policy

Throughout this research has been the constant concern that citizen visions and research topics would not be comparable to the foresight conducted by professional institutions. According to our research, this concern was unfounded as the evidence overwhelmingly suggests that the CIMULACT research topics are both intelligently rendered visions of desirable futures, and the coherent foundation for a comprehensive R&I agenda. It is our conclusion that CIMULACT provides a unique perspective into the types of research and innovation programs that could better address citizen concerns and desires across the entirety of the EU member states. It follow then, that CIMULACT's success, alongside other participatory governance programmes, should pave the way for a broadened utilization of methods that include diverse voices from multiple stakeholder groups.

Additionally, through a broader critical lens, the results of CIMULACT call into question the current governance structures and processes by which many policy decisions are made. If there is a clear disjunction between multi-actor and expert-based knowledge generation, and one is more heavily influential in policy decisions, what steps can be taken to balance the machinations of governance? How can under-represented actor groups find an effective voice, and what structures must be changed to facilitate those ends? And lastly, given the shortfalls in techno-economic foresight outlined in this research, is it accurate to assert that an expansion of participatory processes will satisfy the lacunae in governance models? And if not, what other reforms might be the scene of continued socio-political experimentation to better address the plurality of futures harbored across Europe?

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ANNEX

1

The 23 citizen-based research topics posters refined with project officers of the Commission at the CIMULACT Pan-European Conference

1. Personal Development

I'm empowered to lead my changes

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing
C4. Smart, green and integrated transport
C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

Uncertainty is rising due to a rapidly changing living and working environment and there is a shift of risks and responsibilities from the state and employer to (vulnerable) individuals. Today's life-job-education pathways do not respond to the need of acquiring new skills and knowledge for having a fulfilled life. Citizens need technical, social, individual skills and an entrepreneurial mindset to stay competitive in the labor market and be able to adapt to a changing environment. They need to be able to make individual choices to cope with the quest for flexible and adaptive careers over a lifetime. There is not enough psychological knowledge on barriers for changing life-job-education paths and for dealing effectively with uncertainty. Responsibilities of state, businesses, individuals and other actors are dissolving and new mechanisms for coping with these challenges are needed.

SCOPE

Research should underpin the set-up of experiments with new models of coping with changing environments. Research could focus on one or more of the following key aspects:

- Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion
- Better understanding the labor market and its future changes through theories, models and foresight approaches
- New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology)
- Exploring possible roles of communities for enabling alternative life-job-education pathways

Citizens of all ages should be involved not only in the research but also in the implementation phase. Particular attention should be paid to differences between different generations.

EXPECTED IMPACT

Online consultation rating ★★

- Means are available that empower individuals to harmonize life choices in a changing world
- Improved personalized education
- A more flexible job market with the individual in the center
- Possible models are developed for introducing alternative life-job-education pathways, which involves different actors and shares responsibilities (e.g. communities, NGOs, CSOs, businesses, etc.)

2. Holistic Health

Dissemination and continuous exploitation of research and innovation in the healthcare system

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing
C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

There is a gap of awareness at the local level about the research and innovation achievements at the European level. In fact, research and innovation actually occur in the healthcare system but they do not come easily available to the local service providers, citizens and other relevant stakeholders. This can be due to the inherent complexity of the system, but also to a lack of dissemination and exploitation. Therefore, there is a need of doing actual exploitation at a granular level and of creating local awareness, through local actions, about the results of research.

SCOPE

A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting on-going research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.

EXPECTED IMPACT

Online consultation rating ★★★

- Better exploitation of research and innovation at a local level
- Increased availability of services and solutions for the citizens
- Increased awareness of science progresses and achievements
- Better understanding of the role of EU research and innovation programmes
- Improved roles of national contact points

2. Holistic Health

Evidence-based personalized healthcare

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

C6. Europe in a changing world - inclusive, innovative and reflective societies

C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

Today, almost everyone gets a "standard" treatment for a specific symptom and not a personalised one, whilst new technologies may realise healthcare for all which is more equal, of higher quality and more personalised. Additionally, e-health can secure digitalised medical documentation and facilitate common policies overcoming the issue of fragmented data, which hinders linkages across countries/ sectors/systems. This can enable faster diagnostics, and therapy can be more effective, whilst saving resources. This needs to go together with a redefinition of responsibilities and duties of every type of medical staff in order to avoid misunderstanding and confusion, while increasing the capacity of the doctors to humanise the relationship with the patient and the way in which information is shared. Finally, this can bring about a more holistic approach to healthcare, that is considering patients' symptoms in the context of overall health conditions and curtail treatments that concentrate merely on symptoms. This should help building trust between patients and doctors.

SCOPE

Research should explore the conditions for evidence-based, personalised and human-centric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to:

- For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other
- For the citizens to be trained on health and digital literacy

Research should finally explore ways to make health-related data from diverse sources and destinations interoperable, and to investigate new processing techniques for personalised analysis and reporting.

EXPECTED IMPACT

Online consultation rating ★★★

- Effective use of data for personal health
- Individuals enabled to take care of themselves
- Contributing to treat patients comprehensively, not only to solve an acute proble
- More satisfied patients and among health staff
- New economic and financial indicators of effectiveness
- Reduction in primary care in the long term
- Awareness of personal health through data
- More human relationship between the doctor and the patient

2. Holistic Health

Access to equal and holistic health services and resources for all citizens

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

EU citizens do not receive the same standards of health. There are huge differences in EU countries regarding:

1_**Equity**: Access to health services, availability of drugs and non-pharmaceutical interventions, access to rehabilitation and nursing.

2_**Awareness of health**: health promotion and healthy living to prevent illness, locus of control, how people can help themselves, public health strategies, methods of addressing mental health, knowledge access and education of health professionals, etc..

3_ **Holistic approach**: what is this about in the different cultures and circumstances, and how to achieve truly patient-centred healthcare

Finding solutions to this challenge can prioritize humanity over money, but can also minimize the negative economic impact of bad health. Moreover, they can create better links between the European and the local levels, and add value to local healthcare approaches, yet complying with the European standards.

SCOPE

Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply:

1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care.

2) Understanding and developing the local knowledge about healthcare with regard to:

a) local approaches and medicines that are complementary to the European standard approach;

b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.

EXPECTED IMPACT

Online consultation rating ★★★

- Social responsibility at a local level to reach a global community taking care of all individuals and their needs at different ages
- Providing knowledge on effectiveness of a holistic approach
- More humanity-based approaches and less "business as usual"
- Minimize the negative economic impact of bad health
- Better links between the European and local level
- Value added to the local healthcare approaches

3. Work life balance & Wellbeing

Technology as a means of well-being

GRAND CHALLENGES :

🟥 C1. Health, demographic change and wellbeing

🟥 C7. Secure societies – protecting freedom and security of Europe and its citizens

CHALLENGE

1. On an individual perspective: wellbeing (emotional, mental, spiritual, physical) can be understood as freedom to choose / self-determination/ autonomy. The challenging question is: what does a "good life" mean and in which way will technology be used in personal and professional lives?

2. On a public perspective:

- Guarantee the access to technology with equivalent opportunities, in order to ensure to each person a self-determined "good life" and a "balanced and ethical use of technology"
- Creation of frame conditions in order to avoid abuses both from the employees and employers point of view. Today, people are not completely aware of the possibility to create "boundaries" between them and technology. The challenge is to avoid that employers take advantage of technology to abuse employees.
- Encouraging engagement from citizens

We should keep in mind: technology is a means, not a goal. The objective is to reach a good life (self-determined).

3. On an organisational (business) level there's the need to integrate the perspective of the individuals into the workplace/ working environment, with an "integrated system design" process: start with social need and develop new technology later; not the other way around. A challenge exists between consumer technology and technologies in the workplace. So far the employees have to go through the technologies the business imposes on them. Technology development in business should learn from the consumer technology development in order to start from the final user need (employees).

SCOPE

Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric.

The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.

EXPECTED IMPACT

Online consultation rating ★

- Better understand the relation between virtual and real
- Better deal with privacy issues
- Dialogical development of our claim to technology, society and self
- Promote critical thinking as a basic requirement for all that follows
- Promoting risk assessment research (generate data & evaluate data)
- Avoid being overwhelmed by the constant pressure to make far-reaching decisions with regard to fast-paced technological developments which are outside the reach
- Holistic focus
- Measuring wellbeing
- High ethical standards of societies and constant dialog

Balanced work-life model

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing
C4. Smart, green and integrated transport
C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Work-life unbalance can be felt at many levels: time wasted in commuting between home and work, long working hours preventing from social interactions, work stability, lack of time for personal development and family and children care, restricted work flexibility, unhealthy lifestyles. In the future, it will be important to distribute work flexibly throughout life and also flexibly shift between employed (paid) and unemployed (volunteer) work.

This is needed and proved by research from two perspectives:

- From the organisational perspective: a more balanced model would make employees more productive and efficient.
- From a societal perspective: a more balanced model would make people more fulfilled and by consequence healthier.

Thereby people will be able to take care of their loved ones when needed, pursue personal fulfilment and/or follow multiple careers and slowly shift into retirement. Nowadays workers experience a tension between too much flexibility and too strict boundaries and vice versa. If from one side there is a need of more flexibility on the workplace, on the other side there is a concern that too much flexibility would destroy boundaries between personal and professional life. This can negatively affect well-being. There is a need for making the negotiation between employees and employers more balanced and fair.

SCOPE

Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.

EXPECTED IMPACT

Online consultation rating ★★★

- Assessed impact on family and social relations of more balanced work-life models
- Workers would be more satisfied overall and even more productive during working time
- This will allow people to more freely choose their lifestyles and reduce social judgments and prejudices
- Greater understanding and recognition of the impact on the society in short and long term of extra-work activities/personal activities

Good quality food for all

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing
C2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy
C5. Climate action, environment, resource efficiency and raw materials

CHALLENGE

Accessibility to good and healthy food is not equally available to all. Socio-economic factors, pricing, education, culture, location are critical factors that may limit access to healthy quality food and related dietary habits. Unequal access to food has a strong local and global impact in both urban and rural areas. This is expected to become even worse in a changing climate. This inequality is challenging public health as well as social and economic cohesion. Food poverty and food wastage are also pressing challenges in the EU. Consumers are, at times, receiving conflicting and contradictory information about healthy diets and nutritional value and this causes confusion.

SCOPE

Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally.

Research should focus on the following aspects:

- Map the food access in rural and urban areas
- Calculate and assess food poverty in the EU
- Look at supply regulation and issues connected to distribution and prices (transnational level)
- Investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level)
- Analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level)

In addition, concrete approaches to addressing the issues could be explored such as:

- Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education
- The universal basic income as a way to provide equal access to quality food

Transnational, national and local level

EXPECTED IMPACT

Online consultation rating ★★★

- Reduced inequalities of access to sustainable healthy food
- Reduced food poverty in the EU
- More sustainable urban and rural food systems
- Effective strategies to neutralize actors /institutions contributing to food injustice/ inequalities and food waste around the world
- Effective strategies to fix the flaws/instances of injustice of the transnational food commerce
- Fostering better quality nutrition to prevent long-term health problems, diseases and infections, food disorders (obesity and malnutrition) and antibiotic resistance

4. Sustainable food

Evolving food culture in growing cities

GRAND CHALLENGES :

C2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy

C5. Climate action, environment, resource efficiency and raw materials

CHALLENGE

Many people in cities come from diverse cultures. For a long time, people who migrated were expected to adapt to the local food culture. Things have changed and today migrants feel the need to maintain their traditional culture and gastronomy. In ever growing cities, this raises challenges in terms of sustainability due to the need of providing a huge diversity of food cultures, in terms of social-economics impact and in terms of social inclusion and cohesion. Challenges may arise e.g. when a city hosts Mediterranean, African or Asian food cultures which rely on food products which require to be imported from distant regions. Specific challenges include issues related to personalized food diets, food provision, social cohesion, diversity in communities, and impact on environment.

SCOPE

Research should investigate the following aspects:

- Comparative study of food supply chains and their social, ecological and economic impact
- Studies on the role of food as an enabler for social inclusion and cohesion in cities
- Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions
- Historical research of nutrition flows during periods of migration
- All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery

Research should help developing and demonstrating practical solutions such as:

- Policy tools for management of mixed food cultures in cities
- Sustainable non-indigenous local growing techniques
- Intervention options into diverse and multicultural food consumption practices
- Non-prescriptive tools to define the footprint (co2, water, land use) of food
- Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling)
- Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption

EXPECTED IMPACT

Online consultation rating ★

- More sustainable cultural mix
- Improved social inclusion and cohesion through food diversity in cities
- Personalized sustainable and healthy food diets taking into consideration the food culture mix and diversity
- More integration of citizens in the food system research, innovation and development
- Efficient food value supply chains tailored for culturally diverse sustainable and resilient food systems
- Functioning interventions for the implementation of change and the promotion of new and sustainable ways to consume food
- A sound, well communicated knowledge basis for consumers’ food decisions

Smart energy governance

GRAND CHALLENGES :

C3. Secure, clean and efficient energy

C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Smart energy systems are characterised by the increasing importance of new actors and a new diversified and sustainable energy mix in the energy systems, facilitated by ICT technologies. Decentralised and individualised energy production (prosumers) and highly regulated energy consumption will be made possible through price signals and the availability of cheap renewable energy technologies, leading to distributed investments in the energy system, higher energy efficiency, lower transmission losses, better resilience and energy security, and generally supporting the development towards a low-carbon European energy system, a defining feature of a European Energy Union. Smart energy systems are at the pilot phase and it seems urgent to begin to focus on the implementation paradigms. However, smart energy systems potentially include serious tensions inhibitory to their implementation. They are dependent upon local management and backup by consumers in their households, but at the same time they may develop to become top-down regimes creating resistance among users. They will be dependent upon investments by consumers, but the rules, including prices (sell and buy), may be set by the big operators in the system. Taxation systems may counteract the intentions on getting the smart systems out into all corners of society, because higher efficiency may result in higher taxes in order for the states to gain constant revenue. Self-sufficient prosumers may be hindered by legislation, because of the needs for them to contribute to the collective systems. Renewable energy production, prosuming and higher efficiency may result in considerably lower costs of energy in the future, which creates a risk for 'hyper-rebound' effects, creating a down-spiraling development towards much higher energy consumption. To be smart the energy systems of the future must live up to a wide range of quality criteria, including making use of ICT and "ubiquitous computing", but also having the right energy mix, being based on sustainable renewables, making clever use of storage options, and making use of existing infrastructures. Adding to this, the smart energy system needs to be attractive to consumers and prosumers, not requiring too high energy system knowledge for them to participate, being socially and economically just and fair, counteracting energy poverty, and involving ownership structures which motivates citizen to contribute and to accept the energy system transition.

These requirements do not necessarily fit well with national energy systems as they are now, many being largely monopolistic and governed by single strong central public agencies.

SCOPE

In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests.

Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership.

Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policy discourse and implementation.

EXPECTED IMPACT

Online consultation rating ★

- Reconstruction of the notion of smart energy systems to be inclusive, encompassing new governance structures
- Creation of multi-actor dialogues and re-orientation among actors regarding the policy implications of smart energy systems
- Contribute to a cross-European common understanding of the need for smart energy systems, based on a more participatory governance paradigm

Sustainable transport solutions that enable us to live where we choose

GRAND CHALLENGES :

🟥 C1. Health, demographic change and wellbeing
🟩 C4. Smart, green and integrated transport
🟧 C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Definition of sustainable transport: Sustainable transport is not polluting, not detrimental to health, CO2 neutral, affordable, accessible, available (there when you need/want it), durable and resists to climate variations.

Life is nowadays mostly concentrated and centralised in big cities, due to better job opportunities, education, services etc. In reality, people do not have the free choice to live where they wish. Therefore, we need to rethink society's organisation into more distributed communities that (might) produce and consume locally, find themselves supported by more flexible, innovative and sustainable transport solutions, considering the future context of a reduced need to move people and things into bigger cities. Another challenge is to find out (using a holistic approach), what are the new infrastructures, the virtual tools and possible innovative business models in the area of transport, that can make local communities more attractive for living. Quality of people's lives should be improved by allowing distributed living aiming at a sustainable life style. The overarching challenge is to determine the best balance between connectivity and self-sustainability of local communities, taking into account the requirements for sustainability of transport.

SCOPE

Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people).
One of the crucial questions is "What remains as transport needs - in and between - the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?).
Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody.
Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes.
The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.

EXPECTED IMPACT

Online consultation rating ★

- Provide an overview of needs of the local citizens
- Increase the attractiveness of non-urban life
- Provide tools and models that can show the socio-economic benefits of distributed living
- Reduce number of cars in cities and in places where nowadays the use of cars seems to be inevitable
- Reduce time spent in commuting
- More effective choices for transport solutions
- More attractive public/collective transport solutions
- Reduced CO2 emissions
- Employment and work opportunities, services and goods are available locally
- Increased opportunities for rural inhabitants (job access, care access, public services, etc.)
- A changed mind set of policy makers
- Provide policy solutions to support sustainable development of local communities

At one with nature

GRAND CHALLENGES :

- C1. Health, demographic change and wellbeing
- C5. Climate action, environment, resource efficiency and raw materials
- C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Humans are part of nature, and ecology has an enormous influence of our lives In light of growing urbanisation, it becomes increasingly important for research to be directed towards understanding how the carrying capacity of our environmental resource base interacts with our social and economic systems. It is important to change behaviour and attitudes in order to live in harmony with nature. The challenge is to counteract the current trends in development practices that distance humans from a relationship with nature that promotes psychological and physical well-being and health. An approach of stewardship is vital to guarantee a liveable environment for future generations. As citizens expressed, "we do not inherit the world from our ancestors, we only borrowed the world from our descendants".
In Europe consumerism is now part of culture, identity, values, and considered part of economic and national progress. We also live in a "post-fact" society where faith in scientific methods and results is dwindling. In order to change perspectives towards ecological futures, sustainability must become easily understandable, desirable and accessible.

SCOPE

Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be:

- Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment
- Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change
- Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities
- Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle

EXPECTED IMPACT

Online consultation rating ★★★

- Positive ecological prospects for future generations and integration with the UN Sustainable Development Goals
- Reconciling urbanisation processes with sustainable development actions
- Steps towards a regulative or legal framework for "the rights for nature", working towards reduced pollution, restoration of biodiversity, and legal recognition of natural entities
- Better physical and mental health ; better quality of life and happiness

7. Sustainable consumption

Consume smarter, increase well-being

GRAND CHALLENGES :

🟦 C5. Climate action, environment, resource efficiency and raw materials
🟧 C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Today conspicuous consumption is the norm and goods are used and thrown away with a very short life cycle. There are good examples of responsible consumerism but only limited adoption on a larger scale. We want to support citizens to become more responsible consumers by making information about the product and services lifecycles more transparent and available than it is today. Behavioural economics shows that consumers do not always act rationally and increased information does not always mean more responsible decisions. Therefore the insights of behavioural economics and psychology (ie consumer behaviour patterns) should be used to inform market policies and regulations for both consumers and producers. Innovative methods and actions are needed to enable policy makers, regulators, corporations and citizens to create a market place in which more responsible decisions are made easily. We expect these to (positively) affect work-life balance and personal well-being.

SCOPE

To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns.

To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery.

To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).

EXPECTED IMPACT

Online consultation rating ★★★

- Smarter consumption patterns and lifestyle changes impacting the use of resources (including time resources)
- The first step in co-creation of policy initiatives with the inclusion of citizens and public interest groups
- Input into new standards and regulations concerning sustainable products and services with responsibility of all the stakeholders to be accountable - companies and policies – and proper contract terms, legal framework & consumer protection
- Generation of new sustainable business models, products and services
- The development of robust legal and governance frameworks that support co-responsibility for the promotion of sustainable consumption patterns
- Greater movement towards a circular economy, with the preservation of resources and materials and higher quality of life
- Increased well-being, in terms of physical and psychological health, including new strategies for personal life management

Urban-rural symbiosis

GRAND CHALLENGES :

🟥 C1. Health, demographic change and wellbeing
🟩 C2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy
🟦 C3. Secure, clean and efficient energy
🟩 C4. Smart, green and integrated transport
🟦 C5. Climate action, environment, resource efficiency and raw materials
🟧 C6. Europe in a Changing World – inclusive, innovative and reflective societies
🟥 C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

A better-balanced urban rural integration - considering the diversity of rural areas (i.e. suburb, outer periphery, deep rural) - is seen as vital for the quality of life for both urban and rural citizens. There is widespread concern in different countries about a declining quality of life in rural areas and migration from the countryside to urban areas. They point to the need for integration of spatial planning of cities and rural areas to improve social, ecological and economic sustainability while preserving the distinctiveness of each space. Participatory governance is currently largely missing. As a basis for solutions, a deeper understanding of the diversity of situations is needed. Also we need more differentiated notions than the simple rural/urban dichotomy - city and countryside do not really stop at the border, the mayor's responsibility stops there, but we should consider the functional urban area.

SCOPE

Research should investigate one or several of the following aspects:

- Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe
- Ways to establish cultural and physical linkages across diverse types of spaces
- Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them
- Ways to improve the quality of life and attractiveness of countryside in deprived rural areas,
- Integrating urban rural planning approaches
- Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored
- Exploring the drivers of migration both from rural to urban and urban to rural areas
- Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts of the world

EXPECTED IMPACT

Online consultation rating ★

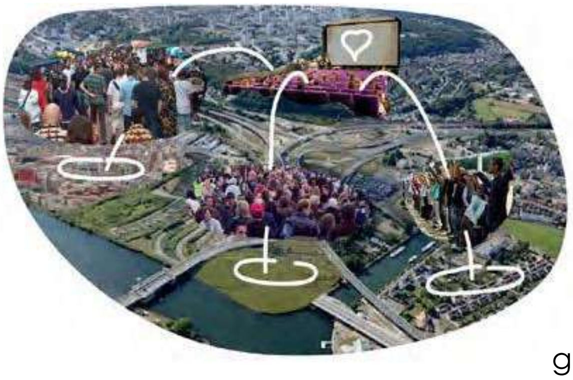
- The tendency to focus on the differences between the city and the countryside has been minimized and there is a mutual understanding between the two
- Ways to develop rural areas to preserve their identities, and to retain their human and social capital
- Solutions developed for rural areas to attract more inhabitants
- A differentiated view on diverse conditions in different areas
- More locally integrated value chains, reduced environmental footprint
- Increased resilience of cities

Making dense and growing urban areas more sustainable and liveable

GRAND CHALLENGES :

🟩 C4. Smart, green and integrated transport

🟦 C5. Climate action, environment, resource efficiency and raw materials



CHALLENGE

Highly dense and growing big cities, which have more cultural services, better health care, more education possibilities, should become more liveable for everybody. This can happen through different actions, implemented not only within the city but also across the whole Functional Urban Area (FUA). Actions include: making big parks from urban neglected areas; architecturally integrate more green in buildings and interstitial public/private shared spaces; reactivating public spaces and inventing new use of urban infrastructures; renovating public/private housing and encouraging environmentally positive externalities; creating traffic limited zones and cycling mobility. The city should not really stop at the border - the mayor's responsibility stops there, but we know otherwise the city does not stop there - so, think in the functional urban area.

SCOPE

Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area:

- The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs
- Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles)
- Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up
- The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…)
- The creation of an integrated system of public (macro) and private (micro) transportation

EXPECTED IMPACT

Online consultation rating ★

- Land and people flows analysed and mapped
- A strategy to identify places and services to integrate with view to governance solutions for the FUA, including citizen participation
- Increased sustainability, e.g., by reducing the need for cars. This will foster vibrant cities both in terms of economic and cultural activities
- Links with local SMEs and the development of potential business plans (that can be picked up and adopted once projects finish)
- Citizens' increased understanding of science/policy interface as well as science.
- More empowered citizens

Empowering diversity in communities

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Equality in diversity: in principle, all people are equal. Still, it is important to find ways to make equality real in the daily life. Our societies undergo socio-cultural changes connected to migration, globalization, democracy crisis, that we can either study and act upon or neglect and remain unprepared. Diversity should be seen as a potential rather than a drawback. Moreover, there is potential to improve the implementation of existing policies that tackle these changes on national and European level. There is a need to develop new models and innovative approaches for social inclusion.

SCOPE

Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.

EXPECTED IMPACT

Online
consultation
rating ★

- Improvement of communities and diversities integration, better communication and awareness
- Better understanding of barriers and enablers for social inclusion
- More tolerant and vibrant communities
- Stronger social cohesion
- Greater equality of rights for all groups of society
- Behavioural change in attitudes from tolerance to acceptance
- Behavioural change in mindset from stereotyped to complex
- Create communities of practice

9. Community building

Evidence-based community building

GRAND CHALLENGES :

C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

Evidence based policy making often involves tapping into knowledge and evidence across various sources. Yet, there is a lot to do for overcoming the challenge of clientelism in society (that is at the basis of arbitrary and self-interested decision-making). Also, there is a need for finding the relation between the citizen contribution (problem detection) and the expert contribution (application of the solution). Moreover, the current educational system does not foster critical and analytical thinking, so citizens have a hard time understanding evidence for the purpose of policy making. There is also the challenge of strengthening the citizens' trust in science, institutions and the policies that are meant to serve the community. In building communities, we need to empower citizens to access and consult data and evidence while accepting space for their own value based judgement.

SCOPE

Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including:

- Introducing steps for change of mind-sets in the society, involving citizens in decision-making
- Empowering citizens through accessible informational campaigns and digital tools
- Grounding decisions in research and data
- Specifying the relation between citizens' and experts' contributions

EXPECTED IMPACT

Online consultation rating ★

- Ability to justify public policies, their sustainability and possibilities for implementation
- Empowered society capable of vision development
- Involvement of stakeholders in the analysis and policy decision-making based on substantial data using methods and tools for policy impact evaluation
- Reduced power of politicians to make decisions for the entire community on their own
- Reduced bias that is generated by disinformation
- Useful and meaningful data for citizens and communities that can be used in real life

10. Participatory governence

Empowered Citizens

GRAND CHALLENGES :

🟧 C6. Europe in a changing world - inclusive, innovative and reflective societies
🟥 C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

Disenfranchised communities, citizens, and NGOs lack awareness of and access to essential services. Moreover, digital tools cannot be applied as a slave on gaping social wounds. The lack of clear channels for meaningful citizen participation furthers the feelings of disempowerment and the distrust of governing bodies. Hampered by asymmetrical knowledge, and seemingly opaque governing process, the dream of achieving an inclusive and reflective European society seems further away than ever.

SCOPE

Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.

EXPECTED IMPACT

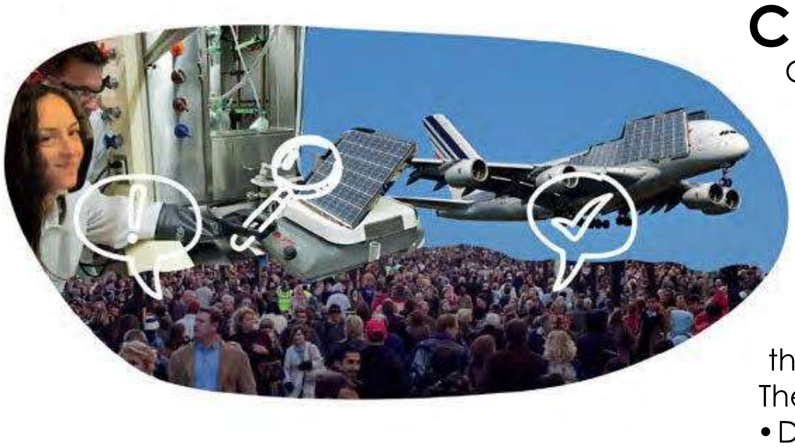
Online consultation rating ★★

- Increasing collective responsibility and awareness; for citizens to start to understand their individual responsibility and opportunity for impact
- Finding ways, tools, and techniques to systematize the public participation and transparency of decision making. Citizens will learn about institutions, the decision making process, and the scales of decisions (learning by doing). There is reciprocity in these processes. Everyone involved (institutions, stakeholders, scientists…)will learn from each other
- Promoting new modes of citizen engagement to reduce corruption, increase transparency, and further good governance
- Respecting and treating all types of knowledge and know-how equally
- Engaging citizens in participatory processes in all stages of their lives
- Creating forums for citizen and policy maker dialogues to foster social cohesion and trust in governing institutions. Developing a simple and effective platform to collect and safely communicate data, train involved actors, and target community initiatives

Meaningful research for community

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies



CHALLENGE

Currently there is no direct relation on how publicly funded research and innovation "gives back" to community. Academic research can be far away from everyday reality. There is a need for framework conditions for linking research, innovation and development projects closer to the potential benefit of the community.

The challenge requires:

- Democratisation of research funding (i.e. larger participation and better research assessment)
- A more transparent research process (evaluation, feedback, use of money, spin offs, and impact)
- Increasing research legitimacy (e.g. considering long term cost-benefit analysis and contributing to community's social and intellectual capacity-building)
- The general public should receive accessible information about the research process and impacts of research results

SCOPE

Research should explore:

- Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community
- Better understanding of publicly vs. privately funded research for securing broad perspectives in research
- Ways of building on open access and open science

EXPECTED IMPACT

Online consultation rating ★

- Higher relevance of research through better contact with the grassroots
- Better returns for tax payers
- A deeper sense of engagement in research among citizens
- Results of important research would be put into use faster and more efficiently without private or economic interests
- There are also concerns that important research might struggle to prove its relevance in early stages of maturity and be rejected and that basic research would be very difficult to finance

11. Social Economy

Debating alternative economic models

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies

C8. New economic models

CHALLENGE

The “for profit” economy does not answer to societal needs. There are concerns about the increasing poverty and income gap, social exclusion, and degradation of social values in the member states. (New) alternative economic models are existing and/or emerging around the world. They are based upon diverse social values instead of monetary values, and include different kinds of drivers (gift, exchange, rent, sharing...). Those new models may have potential to help sustain the current European social welfare standards and ensure social cohesion. Multiactors in the member states and on European level do not have the complete overview of content, advantages / disadvantages and potentials of these models. To make a robust policy strategy development it is important to have an overview and a common knowledge base.

SCOPE

There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide.
Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of:

- Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base
- Dissemination to and engagement of all relevant stakeholders in co-creation activities
- Integrating and adapting models for regional / local context
- Developing strategies for policy implementation

EXPECTED IMPACT

Online consultation rating ★★

- Relevant actors have a common overview of available and emerging alternative economic models
- Policy makers and other relevant actors are able to implement strategies to implement the alternative models in their specific situation
- More diversity of alternative economic models in Europe. This might lead to an increased societal resilience
- Formation of new networks, systems, connections and cooperation that can address the societal needs
- A new challenge is added on Horizon 2020 – Challenge 8 – new economic models

Fostering equal opportunities in the digital era

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

The on-going digitalization of every-day life is predominated by big players/platforms, and a new generation of Internet provide great opportunities, but also threats to equal conditions for all. We must ensure that new digital technologies do not oppress individuals and create inequality. For this, it is important to ensure equal access to infrastructure cheap or even free devices and services, information (such as online learning resources), and tools (including the AI-based systems). Digital consumers can be empowered and become digital producers themselves.

SCOPE

Research should explore ways to implement a fully distributed information and communication system model. The next generation Internet should be a digital architecture for an information and communication system that covers everybody in an equal way. Every node of the net has similar possibilities and opportunities. Better understand inequalities and access in the next digital era (driven by Internet of Things, virtual reality, use of natural language in men-machine interaction etc), define them in terms of human rights and minimum skills required for ensuring equal opportunities. Finding ways of avoiding the monopolisation of the key capabilities of the new digital era, including of the data on various human behaviour used for training artificial intelligence.

EXPECTED IMPACT

Online consultation rating ★

- Access to digital technologies will be equal and universal for all EU citizens (“basic right of being connected” – including the right to disconnect freely)
- Digital empowerment becomes an important driver for bridging economic, social and generational gaps
- A change in culture of digital education (related to the way data is collected and used)
- Citizens have access to open learning resources, courses

13. Education (for sustainability)

Educational ecosystem as a driver of social innovation and local development

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Generally, the educational system lacks leadership models and well prepared teachers, technical support as well as motivated pupils. The critical and creative thinking in children is not stimulated and there is not a close enough connection to the surrounding societies. The system needs to adopt personalized approaches to empower people, to be adapted to the social needs and to ensure access to different educational levels in different geographical regions. Stakeholders should be more involved since schools play an active role in the local communities. There is a need for a culture of continuous learning (re-learning, adaptation, etc.) and therefore the educational system should work as "hubs" to reconnect educational agents.

SCOPE

Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.

EXPECTED IMPACT

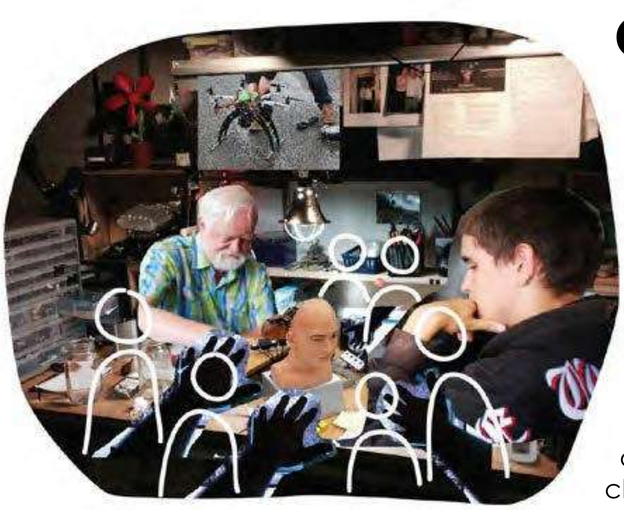
Online consultation rating ★★★

- Reduced school drop-outs
- Improved personalised education
- Much more engaging education for young people
- No shortage of specialists in certain fields
- Schools and kindergartens equipped with modern technology
- Teachers are motivated, well-prepared for their work, adequately paid and everyone respects them
- Well-educated people with critical and creative thinking build free and peaceful societies
- All education institutions form a single network
- Classes are held also in other organizations, not only in schools
- Teachers actively involve field professionals in classes and use innovative programmes/teaching applications
- Contribution to implementation of Global sustainable development goals (particularly SDG 4 and 7), taking into consideration all three aspects of sustainability (economic, societal and environmental)
- Proposals/solutions on how to develop and implement multi-thematic hubs and how to connect different forms of education (formal, non-formal, informal)
- Proposals on how to develop evidence based educational programmes fitted to national needs
- Innovative programmes for teacher's education

Design thinking & doing and life skills for all

GRAND CHALLENGES :

C7. Europe in a changing world - inclusive, innovative and reflective societies



CHALLENGE

There is not enough design thinking & doing and creative co-creation approaches in schools. How do we design learning activities, settings and processes to foster the acquisition of design thinking & doing and life skills? How to integrate these settings and processes in the curricula and, simultaneously, rethink limitations of existing curricula? A lack of focus on how to support self-directed and informal learning can be observed. How do we foster educating creators of ‘content’ and not only consumers of ‘content’. There is a need to focus on the design process instead of focusing on end-results. Only one teacher per class is not enough to achieve differentiated teaching and answer the needs of all children in class. The rigid silos of academic fields and funneled [non-bridgeable] educational tracks, leaving no room for flexibility. Current curricula are conservative and linear: not “à la carte”. The tension between historically fundamental subjects and an updated common curricular core at European level which reflects societal needs is challenging.

SCOPE

The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners’ abilities to think “out of the box” (set and solve the so called wicked or “ill-defined” problems). By adopting a system’s approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities’ organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students’ talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations.
Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.

EXPECTED IMPACT

Online consultation rating ★★

- Design thinking & doing-based education is seen as a key issue in tackling Grand Challenges and Sustainable Development Goals.
- Creative citizens (from kindergarten kids to senior citizens) who are open, courageous, full of self-esteem, free from inhibitions, ready to take action and responsibility.
- Capacity for collective action and solution finding at community level.
- Improved innovation action of the European social, environmental and economic spheres.
- The wellbeing of society is improved by the innovative approached to sustainable development.
- Job creation raises because people realise what they are good at, new professions and research centres emerge
- The society is happy because people are fulfilled at work, mentally healthy, and less frustrated.

13. Education (for sustainability)

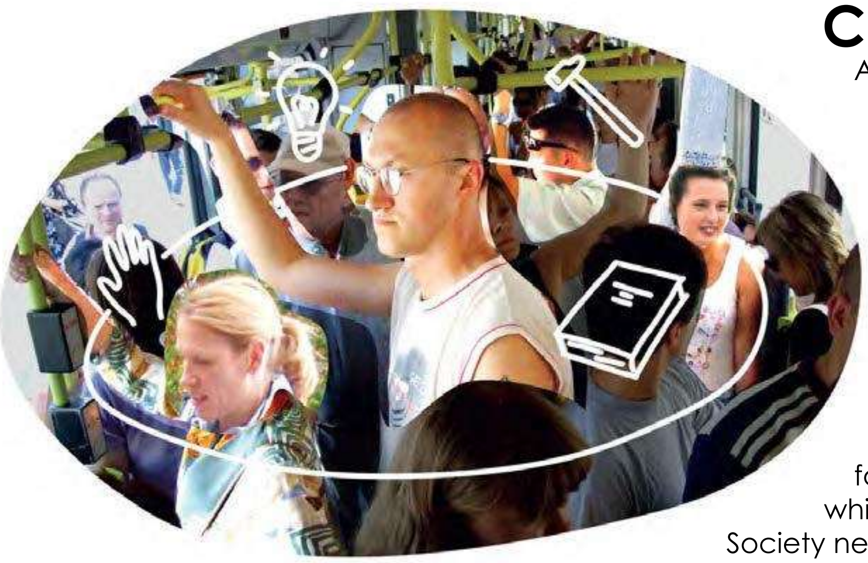
Learning for society

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

C6. Europe in a Changing World – inclusive, innovative and reflective societies

C7. Secure societies - protecting freedom and security of Europe and its citizens



CHALLENGE

A more sustainable economy and ways of living, that promotes well-being, require a more balanced position between the common good and the individual good. For this shift to occur, citizens need to be educated in a life-long process, on the balance between personal fulfilment and the benefits of collective goals. Society needs to move from "I" to "we", building motivation and trust for change. We are too individualist, which exacerbates social problems. Society needs to re-think the community's political integration (participation in the collective framework and in the global dialogue), reflecting upon the social and economic cohesion in diversity. Freedom needs to be redefined. There is a need to look for interests, responsibilities and habits of people and define their fundamental needs.

SCOPE

Research should explore the following aspects:

- Educational leverages to the sense of community and common good/progress
- Promoting collective intelligence (working together, consultation and co-creation)
- Facilitate the transformation of "education into action" and development of a new civic sense
- Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities
- Ways to acknowledge the community's problems and understanding the community/ies culture/s
- Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development

EXPECTED IMPACT

Online consultation rating ★

- Developing a sense of community and understanding of mutual dependencies and the effects of one's choices to others' lives
- Social cohesion: respect for human rights in order to be able to protect one's own and not hurt those of others, especially the rights of minority groups
- More collective thinking, citizen participation, and achieving common goals
- Promote innovative needs that allow to take risk and fail
- Contribution to SDG`s (Global Sustainable development goals) and in particular in SDG4 and SDG7

The 25 citizen-based research topics that were not refined at the CIMULACT Pan-European Conference

\# 11. Social economy

Social economy

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies

C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

The “for profit” economy does not answer the new emerging social needs. Mainstream economy has problems coping with current challenges (ageing, poverty, youth unemployment). There is an increasing need for change of the current social model that led to a degradation of social values. Commercial rivalry leads to poverty and social exclusion, raises public insecurity (wars, terrorist attacks, and civil disturbance). New economic models are emerging and include different kinds of economies. Governments/institutions could catalyze the energy and strength coming from different stakeholders (citizens, enterprises, associations NGO) and promote a new way of networking and of recognizing the social values in order to find proper economical answers.

SCOPE

Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.

EXPECTED IMPACT

Online consultation rating ★★

- Cooperation: several new agents of different sectors working in a network, enhancing the spirit of social economy. In 5/10 years, the redistribution of tasks among people to bring added value to the community (economically and in terms of time
- Sociocracy: in 2050 people becoming the decision centre and – based on more sup portive actions – reaching a level of greater cohesion and satisfaction
- Creation of a participatory platform: identification of good practices and implementation of new projects for identifying the communities’ needs and the needs of other agents

Basic universal income so nobody is left behind

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

The uneven distribution of wealth and the decreasing value of labour in all sectors, call for sustainable wealth distribution systems outside of current capitalism. The introduction of the Basic Universal Income (BUI) can contribute many benefits in unequal societies and ensure a decent human life to everybody. It can contribute to solving the problem of poverty, improving people's self-esteem, and reduce the basal existential stress and diseases. In addition, it can provide the new forms of distribution of value required for dealing with digital labour, robotization and peer-to-peer production models. BUI can be an up-to-date, evidence-based, reformulation of the welfare state, today in crisis.

SCOPE

Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects.

EXPECTED IMPACT

Online consultation rating ★

- Contrasting the cycle of poverty and helping the poor
- Increasing quality of life for all and wealth creation for all
- Improving self-esteem and reducing disease
- Allowing free choice of job and so increasing productivity
- Increasing of the value of quality work.
- Getting paid for activities frequently unpaid
- Making people financially independent from the labour market and less vulnerable against employers
- Reducing the total cost of the administration dealing with welfare

9. Community building

Community building development

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

C6. Europe in a changing world - inclusive, innovative and reflective societies

C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

Many community building initiatives are emerging. Examples are time banking, social streets, sharing economy initiatives, community gardens, etc. Related research is under way on social innovation, governance, social networks and social capital. Digitalisation is enabling the growth of social movements. In an increasingly complex society, communities and processes of community forming are more important than ever.

How to ensure the permanence of these communities is today the question. There are many issues to tackle in order to foster community development such as: decentralization, social activism, community spaces, digital empowermen, migration, status gap

SCOPE

Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard:

Decentralization: Developing local communities, their infrastructure, to keep the inhabitants and provide needed services
Social activism: Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making
Community spaces: Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills.
Digital empowerment: Building and evaluating digital tools for collaboration, collective intelligence and collective action.

EXPECTED IMPACT

Online consultation rating ★

- People have control over their own life. This will substantially change economic and state activities
- Securing public participation in co-creation of community life and decision-making
- Diversity and inclusion will free creative and innovative potential of the communities
- Self-sufficiency, interdependence, responsibility, cooperation, sense of belonging and self-esteem of the residents of the settlement
- The community can palliate the State deficiencies

11. Social economy

Alternative economic model

GRAND CHALLENGES :

C1. Health, demographic and well - being
C6. Europe in a changing world - inclusive, innovative and reflective societies
C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

In the current situation, the competitive culture resulting from our growth-based economic system hinders the inclusion of the most vulnerable members of our society. The current model is inadequate because of several reasons:

- Money is the measure of wealth. People are judged on the amount they earn.
- There is an uneven distribution of wealth. The rich get richer and the poor get poorer:
- It does not respect the (ecological) limits of planet Earth
- Short period economic interests dominate decision making.
- The two main objectives of the EU 2020 Strategy – competitiveness and employment – are in contrast to each other.

This has to change. Alternative, holistic, economic models and approaches that focus on happiness and cooperation are needed to support new forms of communities that can provide room and respect for all.

SCOPE

Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.

EXPECTED IMPACT

Online consultation rating ★★

- Increase of visibility of companies that do not adhere to the constraints of growth
- Introduction of alternative economic indicators instead of / besides GDP
- Sharing economy, open access to the results and good practices of research and development
- A cooperating (win-win type) economy instead of the "competitive"/competing one
- Spreading of the economy of kindness: timeshare, payment without money
- A society which focus on wealth creation for all through education and opportunity

Data for All – Share the Power of Data

GRAND CHALLENGES :

C3. Secure, clean and efficient energy

C4. Smart, green and integrated transport

CHALLENGE

Today's data-driven economy and society can exclude people from knowledge and decision-making. Limited citizen access to data, the lack of simple, open data analysis instruments, and curtailed public participation in the generation and utilization of data for decision-making are all critical challenges this research topic seeks to overcome. Concurrently, there are challenges to overcome in making digital- and data-literacy a widespread knowledge base, and in facilitating citizenled, data-driven policy craft.

SCOPE

Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions.

Two sets of challenges need to be addressed by research on:
- People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and
- Data-centered challenges: quality of data, openness of data, standardization of data.

EXPECTED IMPACT

Online consultation rating ★

- Increasing citizen participation in decision-making processes
- Urban Management Improvement (Traffic, Infrastructure, Resources, etc.)
- Fostering knowledge-based decision-making by citizens and communities
- Increasing transparency, Limit corruption
- Improved access to quality, standardized, resilient data setsAccessible interfaces for data analysis and visualizations
- Improved digital and data literacy
- Demonstrating successful use cases for public access and utilization of data for governance issues

10. Participatory governance

Snakes and Ladders – Connecting Scales of Issues and Actors

GRAND CHALLENGES :

🟦 C3. Secure, clean and efficient energy
🟦 C5. Climate action, environment, resource efficiency and raw materials
🟧 C6. Europe in a changing world - inclusive, innovative and reflective societies
🟥 C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

The growing disconnection between local citizens and global actors creates conditions for mistrust and abuses of power. Both sides remain convinced of the 'correctness' of their actions, and no platform for deliberation and sharing perspectives exists. These issues are compounded by the widening perception gap in understanding the consequences of local actions and behaviors as they are related to global activities and challenges, and vice versa. Even as global issues continue to impact localized ways of living, fueled as they are by local behaviors, it exists few common forums to help build understanding across these scales.

SCOPE

Research should explore possibilities for exchanging knowledge and for tak-ing joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar is-sues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.

EXPECTED IMPACT

Online consultation rating ★

- Establishing trust between citizens and decision makers
- Organizing inter-level meetings across power base
- Establishing transparency policies and ethical participatory processes
- Restoring a collective consciousness among citizens
- Giving citizens a critical comprehension of social issues in order to under-stand why/how decisions are made
- Recognizing situations to engage citizens in order to find a balance
- Changing cooperation modalities and build bridges between sectors to better attain sustainable approaches
- Shifting some decision-making power to lower governance levels
- Providing avenues for greater involvement of citizens

10. Participatory governance

The Transparency Toolbox

GRAND CHALLENGES :

🟦 C5. Climate action, environment, resource efficiency and raw materials
🟧 C6. Europe in a changing world - inclusive, innovative and reflective societies
🟥 C7. Secure societies - protecting freedom and security of Europe and its citizens

CHALLENGE

Governance processes remain opaque and inaccessible to the general pub-lic, leading to advanced forms of distrust in the institutions and organiza-tions charged with steering societies. Decision-making, priority-setting, and policy-crafting remain shrouded by layers of bureaucracy, inefficient public communications, and limited channels for citizen input. Rarely employed participatory approaches to social governance fail to accommodate citizen sentiment and opinion, and contemporary methods ignore the utility of the powerful technologies at our disposal.

SCOPE

Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.

EXPECTED IMPACT

Online consultation rating ★★

- Developing "citizen-friendly" decision-making processes
- Finding ways, tools, techniques to systematize the transparency of deci-sion making
- Examining the citizen role of voting: awareness of the importance of the elective act
- Setting up the citizen of tomorrow [future generations] in the decision process
- Developing platforms for politicians to give arguments about the "why" of public policies and decisions
- Creating systems to help citizens navigate in this multitude of data and identify actionable levers
- Setting up the citizen of tomorrow [future generations] in the decision process.

3. Work life balance & Wellbeing

Finding a balance in a fast-paced life

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

CHALLENGE

A number of today's pressing challenges are associated with fast paced life:

- Rise of diseases such as high blood pressure, heart issues, damaged immune system, depression due to lack of activity/exercise, stress, lack of leisure time, isolation
- Limited time for personal, social and family life – rise of electronic relationships
- Some companies offer employee benefits but demand long working hours
- Pressure for continuous and increased productivity together with desire/ambition of people to earn money and status
- Too little knowledge on stress factors of mental/emotional work (e.g. care)
- Anxiety is a driver (people fear change because they do not know what might come), this anxiety hampers them to act so that they remain in the current patterns of behaviour.Imbalance between genders, age categories and regions with respect to information and opportunities on the labor market.

SCOPE

Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be:

- reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals
- better transport options including alternative ways to travel such as teleportation and space travel for saving time
- ensuring more accessible environments
- digitalisation of many of the "analog" activities
- overcoming the notion that time is money

EXPECTED IMPACT

Online consultation rating ★★★

- Happier and more efficient employees, who will be happier in their personal lives as well. This will have a positive impact on the health sector and society in general
- New adjusting of activity and work (welfare economy) + unconditional basic income
- The quality of life of European citizens will rise
- Decreased competition for resources to ensure financial security for the individual and the family
- This would define an axis of prevention and thus reduce costs associated with taking in curative care
- This will make us a more resilient society to further future change

3. Work life balance & Wellbeing

Promoting well-being through relating environments

GRAND CHALLENGES :

🟥 C1. Health, demographic change and wellbeing

🟧 C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

Currently environments promoting well-being are rare, even though:

a) problems at work impact productivity and performance

b) many people are vulnerable in terms of mental balance, physical health, confidence

c) human relationships affect mental and physical wellbeing

d) impact on natural environment is evident.

Additionally, there is a strong divide between a short term/individualistic approach versus a long term/ inclusive approach, which can be summarized in a a dissonance between the willingness to act towards one's wellbeing and the ability to do so, a sense of instant gratification instead of planning in the long-term, a "self-centred" approach to wellbeing, shrugging off responsibility for issues happening away from our shores.

SCOPE

Research should be developed at different levels:

the working environment: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere.

the community level: group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills.

the individual level: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning.

the governmental levels: transparency, accountability.

EXPECTED IMPACT

Online consultation rating ★★

- Citizens appreciating their way of life and surroundings in a holistic manner (mental and physical), with greater responsibility towards future generations
- Less discrimination / division by social groups/ stereotypes
- Technologies that are harmless to society, no tech addiction
- Aesthetic and acceptable environment
- Developed, accessible and modern infrastructure
- Safe, free, non-offensive internet, positive without censorship
- Comfort – comfortable premises and environment

4. Sustainable food

Good food research

GRAND CHALLENGES :

C2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy

C5. Climate action, environment, resource efficiency and raw materials

CHALLENGE

Food is the most basic need for human beings. Therefore it is impacting both mental and physical health in the most direct way. We have to continuously research and explore nutrition quality of the food we eat and – if required – change the way we deal with food. Knowledge on nutrition is evolving continuously. Consumers encounter conflicting nutritional information from various sources ranging from the private sector, academics, governments or media. Information must be more accessible, transparent and user-friendly and tailored to users' needs in order to allow consumers to make more informed food choices for both individual health and society.

SCOPE

Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.

EXPECTED IMPACT

Online consultation rating ★★★

- Minimising the negative impacts of agri-food production and food-related consumer behaviour on land and environment
- Identification and description of possible risks related to the application of new technologies in the food production and processing
- Ensuring the neutrality and objectivity of research, choice of research topics and full presentation of the outcomes
- Providing optimal distribution of water in drought periods
- Assess and describe the influence of nutrition on human health (the role of individual factors and their combination) and disseminate the clear information on optimal eating habits
- New plans for area utilisation, policies and regulations related to the new food-generation techniques

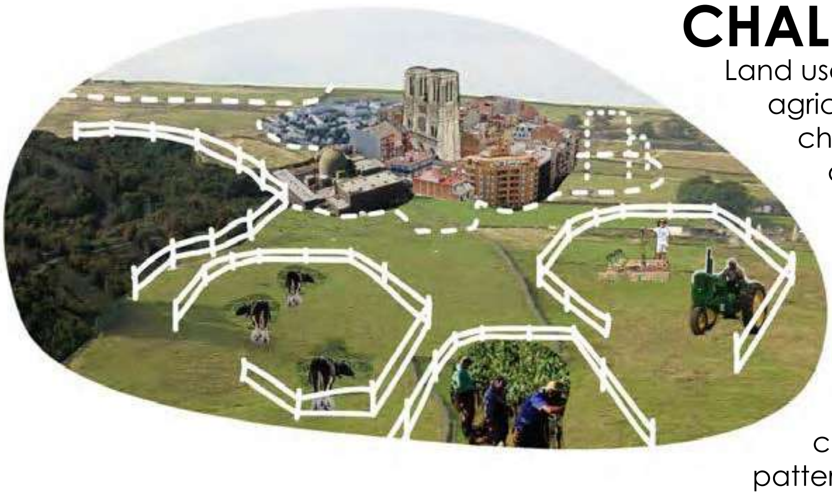
4. Sustainable food

Responsible use of land

GRAND CHALLENGES :

🟩 C2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the Bioeconomy

🟦 C5. Climate action, environment, resource efficiency and raw materials



CHALLENGE

Land use faces a series of challenges: Intensive agriculture with the adverse effects of chemical substance use and soil erosion and its consequences on water as one side of the problem. Moreover high pressures on arable land derive from an increasing sealing for housing and infrastructure for an increasing (world) population and growing distances between production/ distribution/consumption. Also climate change has a huge impact on land use patterns and production processes.

SCOPE

We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production.
Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.

EXPECTED IMPACT

Online consultation rating ★★★

- Land, water, (and sufficient) food without residues (e.g. synthetic pesticides…)
- Stopping the land degradation (possibly improving its fertility)
- Balance between food security and energy use
- Balance between growth, quality, and production
- Reduction of the ecological footprint, within an economy of low carbon use, namely regarding public transportation, commuting, livestock production and tourism
- Strengthen the local economy

2. Holistic health

Health empowerment through “Everyone’s science”

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

In the past, the family doctor was the only trustworthy source for health information. Today “Dr. Google” delivers an excess of information. At the same time citizens experience a delay and lack of communication of publishing scientific findings. Scientists on the other hand are trained to produce scientific outcomes, not to talk and engage public. Nevertheless, there are some positive examples of communication of science but little assessment of their effectiveness has been done. All this raises the need to reflect on ways to ensure easy access to reliable information including and ways for a direct transmission of research results from scientists to the people. Also the possibility to provide open access to information is to be investigated.

SCOPE

An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves.
On the side of the recipient: target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted).
On the side of the sender: the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of “classical topics” in favour of courses on how to efficiently communicate with the patients.

EXPECTED IMPACT

Online consultation rating ★★

- Longer life expectancy
- Happiness increases with the globalization of medicines
- Those with little or no financial resources would gain access to prescription drugs
- Intermediaries and media would transmit accurate information
- Healthier people, better work performance and more profits
- Discovery of non-pharmaceutical alternative medicines
- A society that is well informed and aware
- Mutual basis of trust
- Reinforcement and training of communication skills in health sciences

2. Holistic health

Deconstruction of age

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

The way society deals with aging is important because it affects its fabric on multiple levels: demographics; the development of talents, immigration / emigration; the differences in income for different age groups; the choice of the "duty to work"; Quality of life; healthy lifestyle; availability of health care; ensuring mental health.

Also notions of aging (including prejudices) play a key role in perceptions on life's worth such as: 'free time is to achieve things and working time is a burden', 'Young are dynamic, old are slow and ineffective', 'We live one life waiting for "the other part". We are slow to get aware of the importance of living the present moment'.

A more comprehensive understanding of these mechanisms will allow us to overcome the limitations induced by ageing process in learning and health, while keeping the advantages earned through experience.

SCOPE

Research should strive to understand the following aspects:

- neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis
- fundamental biological and psychological processes involved in the ageing process
- the conditions promoting intergenerational relationships
- the societal and economical impact of the melting of sociocultural borders between different ages
- the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change

EXPECTED IMPACT

Online consultation rating ★★★

- Societies better prepared for the huge challenge of demographic change ahead of us
- Improved quality of life and better interaction between young people and seniors

12. Technologies at the service of humanity

Here, there and everywhere

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing
C6. Europe in a changing world - inclusive, innovative and reflective societies

CHALLENGE

Today, most research is on physical mobility, which is getting affordable for money, but is still time and resources consuming. But almost no research is being done on the effects of virtual mobility and reality. Very powerful realities are being opened and there is very little knowledge of how they will affect several important aspects such as self-identity, personal freedom space, physical health/addiction, personal data protection, national identity. Moreover, connectivity and participation need to be increased in order to overcome the isolationism of some countries due to political and economic difficulties. This implies facing cultural challenges and overcoming economic disparities, because owning digital devices is expensive and virtual connection is still limited.

SCOPE

Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools.
There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.

EXPECTED IMPACT

Online consultation rating ★

- More tolerant societies, more acceptance and respect, and less discrimination (religion, sex, race, sexual orientation, age…)
- Virtual communication everywhere in the world and access to Internet and knowledge for everyone
- Blurring of borders (easier to come in and out)
- Social aspect: interaction - increase in socialization, decrease in loneliness
- Economic growth and optimization of the division of labour. Progress in different fields as a result of cooperation and exchange of experience and team efforts
- Personal enrichment through exchange of experiences and ideas with the others
- Taking more appropriate decisions for personal development
- School for digital nomads

1. Personal development

Rethinking (the new) job market needs

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies

SCOPE

- Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability
- Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being

CHALLENGE

- There is a lack of cooperation between businesses and educational institutions. During education the necessary knowledge that would be useful in the professional life is not acquired. There is no separation between the theoretical and practical knowledge. There is a volatile operational framework which needs are increasing and on the other hand the educational system is static and inflexible. Furthermore, there is no institutionalized practice and no incentives are given to companies to provide internships to students. On the other hand, schools do not cultivate the institution of practice which is nevertheless essential to discover one's talents and skills
- How to structure a compelling dialog between education and companies in order to guide students towards effective choices?
- Lack of multi-disciplinary and trans-disciplinary approaches
- Lack of integration of local initiatives.
- Lack of team work and open-minded attitude for networking
- Lack of vision in promoting the need for a new breed of reflective practitioners and socially-responsible entrepreneurs
- Lack of ethical and social accountability in business (new relation between businesses and agencies)
- There is no qualification framework [no recognized criteria of excellence, measures of success, trophies or prizes, or "academic" rewards] for practical knowledge, and informal education
- Practical jobs are disappearing while ever more jobs will require technical skills as well as new forms of "STREET SMARTS" (also referred to as soft skills)

EXPECTED IMPACT

Online consultation rating ★★★

- An important step is the cultivation of an education system that promotes experiential training and lifelong learning
- To make people happier, more satisfied, therefore – more productive
- Increase of job satisfaction (life quality, health, etc.)
- Reach a better level of correlation between the education system and the needs of the job market and sociopolitical needs
- From the perspective of business groups, when employees have jobs close enough to their skills and interests, the working mechanism works better and innovative ideas and products are generated
- Society satisfied with life/work (right choice of workplace). Economic development
- Creativity – ideas and solutions are always available to help the companies
- More productive learning process (teachers and professors develop)
- Understand strengths and responsibilities
- Fighting and minimizing unemployment
- Trust of the employers concerning the quality of education: titles and diplomas versus competence (skills)

#13. Education (for sustainability)

SWOT (Strengths, Weaknesses, Opportunities, Threats) Technological empowerment

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

There is a lack of awareness of the potential of technology for didactics and learning. Today's challenge is uncovering "Strengths Weaknesses Opportunities and Threats (SWOT)" of new technologies in empowering people in self and life-long learning and making them equally accessible to all.

On a more general note, we need to better understand how to direct new technologies towards the well-being of the society and the individual and possible relationships between "smart" tech and human intelligence.

SCOPE

Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education.

The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.

EXPECTED IMPACT

Online consultation rating ★★

- Improve the educational ecosystem into a viable, attractive, sustainable, human-centred setting
- The development of new / creative ways / learning methods
- Enable choice between learning methods
- Metrics to ensure 100% access
- Bring isolated places into the modern world
- Fears of technology are reduced
- Societal awareness of the threats of technology misuse
- Better combinations of "smart tech" and human critical thinking

13. Education (for sustainability)

Ecological future education

GRAND CHALLENGES :

C5. Climate action, environment, resource efficiency and raw materials
C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

There is a gulf between academic knowledge relevant to ecological futures and citizens' knowledge. There is a lack of robust evidence and longitudinal research on the long term effects of current provision and practices in learning for ecological futures. Effective training and knowledge transfer systems need to be designed, piloted, implemented, and evaluated together with stakeholders. Our knowledge and thinking of the conditions of human life is fragmented, and this fragmentation can be traced in the education and vocational training systems too. There is a challenge of "learning" rather than teaching, a need to better motivate the added value of the ecological perspective for the individual making ecology relevant and useful for all.

SCOPE

Research should assess the relative importance of two different approaches to create systems thinking:

1) 'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services.
2) 'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.

EXPECTED IMPACT

Online consultation rating ★★★

- Better educated teachers
- Shifting of the paradigm to broaden the concept of ecology to include culture, technology and social aspects
- Different and new ways to raise public awareness
- Be more creative in involving individuals and communities in ecological learning/ connecting with nature
- Making an "informal" type of education "normal"
- Bring forward new knowledge on how long-term perspectives have been attempted brought into decision-making processes today
- Create, test and implement new effective education and information systems

Transforming technologies for planet and people

GRAND CHALLENGES :

C5. Climate action, environment, resource efficiency and raw materials
C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Currently, technological development is being driven by short term industrial decision-making, without considering ecological and social impacts and long term effects. Yet, a re-assessment of new technologies in the light of new knowledge about interconnected earth system and global societies is needed towards a more responsible and conscious use of technology for the benefit of the planet and its people. This requires a democratic approach to technical innovation that includes citizens and established organizations. Therefore the challenge is about:

1. Training, raising awareness
2. Integrating ethics, accountability and participation into technology development
3. Using technology for more responsible interventions
4. Assessing impact of technologies

SCOPE

In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects:

- Develop practices of participatory development of sustainable technologies
- Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources
- Establishing a legal framework for responsible technology development and monitoring the promoted practices
- Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly
- Reducing bureaucracy, speeding up the research and implementation of new initiatives

EXPECTED IMPACT

Online consultation rating ★★

- Reduction in waste and better recycling of resources
- More responsible consumption
- Use of public transports that are powered by "clean" energies
- More active [environment friendly] intervention in society and in decision making
- Make necessary changes to the research and innovation structure itself
- Creation of eco-villages
- Improve public education
- The science landscape is changed by the core competency of citizens' new power structures, new disciplines, and new fields emerge

Personal and organizational choice management

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing
C6. Europe in a changing world – protecting freedom and security of Europe and its citizens

CHALLENGE

Uncertainty is rising due to a rapidly changing living and working environment. To meet this challenge, citizens need evolving social and technical skills. They need to be able to make individual choices and to manage career opportunities because in the 21st century the ability to make choices and the direction these take are determined both by personal skills and by the capacities and capabilities of your communities.

SCOPE

Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations."
Citizens have defined objectives and solutions on different topics:

- Daring to be different
- The education system
- Re-definition of welfare
- Re-definition of values
- The level of well-being

EXPECTED IMPACT

Online consultation rating ★★

- Develop pedagogies that empower individuals to manage life choices in a changing world
- Study ways to enable continuous learning for individuals, organizations, and communities
- This enables individuals to be adaptable by continuously evolving their skills
- All types of organizations would benefit from more adaptable members
- This shifts risks and responsibilities from the state and employer to (vulnerable) individuals

(Business)Models for balancing time

GRAND CHALLENGES :

C1. Health, demographic change and wellbeing

CHALLENGE

- Fostering work-life balance by shorter working hours and opportunities to work from home occasionally
- More flexible working hours and payment models: focused not on the hours put in, but on the task or the outcome
- Allow for people to choose different areas of life which make people feel safe, comfortable and happy
- To reduce waste of time for commuting between work and home (in large urban areas) and for empty chit-chat at offices
- Reducing segregation [by more flexible working conditions]

SCOPE

Experimenting with or setting up work-life balance pilot programmes e.g.

- integration of 'free time' in the work place
- new ways of employment where employees are more like volunteers / freelancers
- [ways to] increase the use of technologies in companies to enable more flexible employment relations

Assessing

- the impact of work-life balance policies,
- the impact of different business models on workers' time autonomy and quality of life
- the psychological acceptance of new forms of work, both individually and by society

EXPECTED IMPACT

Online consultation rating ★★

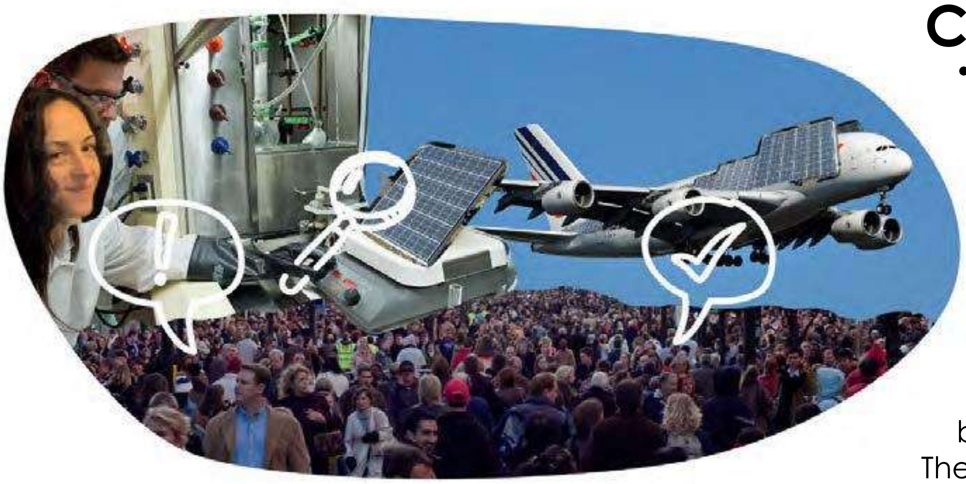
- More options to balance work, family and community life
- Increase efficiency by avoiding empty and unnecessary work
- Shifting focus from work hours to work results will lead to more time autonomy, thus increasing creativity and the quality of life
- In the long run this will contribute to underpin individual lifestyles
- More effective use work and leisure time reducing the overload and stress
- The emphasis on giving feedback to employees and awareness of their beneficial effect on the enterprise will increase their motivation and higher work efficiency
- Under certain conditions this can reduce our ecological footprint
- There are also concerns that shifting focus from work hours to work results can lead to less time autonomy and exploitation of workers, and that work-time flexibility will promote free-riding

10. Participatory governance

Meaningful research for community

GRAND CHALLENGES :

C6. Europe in a Changing World – inclusive, innovative and reflective societies



SCOPE

Research should explore:

- Ways for research to be selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community
- Explore direct research as a mean for an increased research relevance
- Better understanding of public vs. market driven research for securing broad perspectives in research
- Ways of building on open access and open science.

CHALLENGE

- Currently there is no direct relation on how publicly funded research and innovation “gives back” to community. There is a need for framework conditions for linking research, innovation and development projects closer to the potential benefit to the community.

The challenge requires:

- Democratisation of research funding (i.e. larger participation and better research assessment)
- Popular scientific integration (i.e. clarification and integration of science as a distinct but integrated sector of activity)
- Increasing research legitimacy (e.g. based on long term cost-benefit analysis)

EXPECTED IMPACT

Online consultation rating ★

- Higher relevance of research through better contact with the grassroots
- Better returns for tax payers
- A deeper sense of engagement in research among citizens
- Results of important research would be put into use faster and more efficiently without private or economic interests
- There are also concerns that important research might struggle to prove its relevance in early stages of maturity and be rejected and that basic research would be very difficult to finance

6. Transport

Freedom to choose where to live

GRAND CHALLENGES :

🟪 C1. Health, demographic change and wellbeing
🟩 C4. Smart, green and integrated transport
🟧 C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Current practices of transportation (commuting alone in private cars, etc.) are unsustainable (land use, CO2 pollution, social inequality of transport choices, etc.). There is a need for promoting a better balance of non-urban and urban areas by establishing a good connectivity between both spaces that allows boundaries of cities to spread, reduces the imbalance of transportation choices, helps to decrease the isolation of people in distant rural areas, helps to increase the number of working places in non-urban areas, facilitates more equal access to services and increases the quality of life.

SCOPE

In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/less polluting) transport options that are adapted to the requirements of rural areas (low cost/impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).

EXPECTED IMPACT

Online consultation rating ★

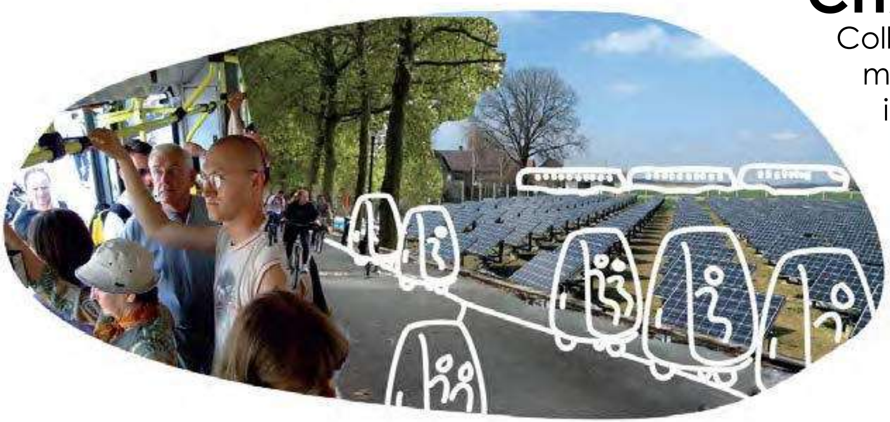
- Reduced number of cars in cities
- Reduced time spent in commuting
- Increased general quality of life (physical and psychological)
- Better choices for transport solutions
- Rebalanced opportunities for urban and rural inhabitants (job access, care access, public services, etc.)
- More attractive public/collective transport solutions
- Reduced CO2 emissions

Moving together (more collective transport options)

GRAND CHALLENGES :

🟩 C4. Smart, green and integrated transport

🟦 C5. Climate action, environment, resource efficiency and raw materials



CHALLENGE

Collective transport should become more affordable, attractive and interesting in cities as well in the countryside. Moreover, transport is a problem of public service: it is necessary to decide whether collective transport should be a public service or profitable activity. We envisage new collective transport concepts and respective technologies that reduce transport related pollution and energy demand and, at the same time, bring people together. There is today an urgency of experimenting both green personalized solutions and collective public transport, in order to test an environmental perspective to the problem and bringing to a substantial reduction of individual private transport means.

SCOPE

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).

EXPECTED IMPACT

Online consultation rating ★★

- Citizens more aware about the sustainability issue of transportation
- Incentives to use the public transportation
- Change in citizens’ behaviour: citizens will prefer collective transport, their mobility habits will change
- Higher quality and attractiveness of collective transport: it should serve in big cities as well as in rural or remote areas
- Cheaper and available collective transport

Production awareness

GRAND CHALLENGES :

C5. Climate action, environment, resource efficiency and raw materials

CHALLENGE

With limited resources, it is important that business becomes more environmentally aware of implication of the product lifecycle. Ultimately, more sustainable production technologies and models lead to promotion of goods production within the scope of limited resources. An example could be the Cradle-to-Cradle Model, whereby production uses resources within a cycle in order to minimize or erase waste (e.g. a pullover produced from bamboo fiber). The production, thus, is highly aware of sustainability in all steps of the value chain.

SCOPE

Current models of production are unsustainable in respect to resource use.
Innovation is required on two fronts:
1) To discourage the use of technologies, which are not environmentally friendly, and
2) To support the adoption of clean technologies, as well as their development.
Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed.
Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.

EXPECTED IMPACT

Online consultation rating ★★★

- A different, more sustainable, mind-set on mobile phones
- A different, more sustainable, need from consumers
- A different, more sustainable, production of mobile phones & less waste of mobile phones and its components & increase of re-use and recycling of mobile phones and their components
- Better design leads to longer life spans of consumer products and a reduction of waste

11. Social economy

From Wall Street to Main Street

GRAND CHALLENGES :

- C1. Health, demographic change and wellbeing
- C5. Climate action, environment, resource efficiency and raw materials
- C6. Europe in a Changing World – inclusive, innovative and reflective societies

CHALLENGE

Citizens request that in the future investors will make their allocation decisions aiming not just for profit generation, but also for the (positive) social and environmental impact of (real) businesses. Thus, corporations and SMEs will incorporate social and environmental targets in their strategies. In this context, we need new economic models for promoting green transformation.

SCOPE

The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the “Sustainable and Responsible Investment (SRI)” approach more adopted.

To develop a green system for an effective interaction between the lender and borrowers.

EXPECTED IMPACT

Online consultation rating ★★

- Enabling consumers to make more informed decisions
- A positive effect on work-life balance and personal well-being
- A step towards a sustainable economic system
- Increasing life satisfaction, decreasing consumption
- It will awake consumerism as a lever of political power of citizens
- Positive consequences on workers’ quality of personal and professional life
- The creation of new domains of expertise, new skills and new jobs
- Transparency with regard to the origin and production process of goods

ANNEX

2

Figure 1: Coverage

	Representation score: 0 = no; 1 =yes (regardless of alignment)																	**Overall Representation of Topic within expert studies**	**Percentage**
	(CIMUALCT topic represented in expert study? = column 2 comp reading)																		
		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16		
	yellow = cases need revisiting																		
GC	CIMULACT topics																		
GRAND CHALLENGE 1 – Health, demographic change and well-being	I am empowered to lead my changes	1	0	1	0	1	1	0	0	1	1	0	0	1	1	1	1	**0,63**	63%
	Rethinking (the new) job market needs	1	1	1	0	1	1	1	1	0	1	1	0	1	1	0	1	**0,75**	75%
	Personal and organizational choice management	0	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	**0,75**	75%
	Dissemination and continuous exploitation of research and innovation in the healthcare system	1	1	1	0	1	1	1	0	1	1	1	0	1	1	1	1	**0,81**	81%
	Evidence-based personalized healthcare	1	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	**0,75**	75%
	Access to equal and holistic health services and resources for all citizens	0	1	1	0	1	0	0	0	1	1	0	1	1	1	0	1	**0,56**	56%
	Health empowerment through “Everyone’s science”	1	1	1	0	1	1	0	1	1	0	1	0	1	1	0	1	**0,69**	69%
	Deconstruction of age	1	1	1	0	1	0	0	0	1	1	0	1	1	1	1	1	**0,69**	69%
	Technology as a means of wellbeing	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	1	**0,56**	56%
	Balanced work-life model	0	1	1	0	0	0	1	0	1	0	1	0	1	1	1	0	**0,50**	50%
	Finding a balance in a fast-paced life	0	1	1	0	0	0	0	0	0	0	0	0	1	1	1	0	**0,31**	31%
	Promoting well-being through relating environments	0	1	0	0	0	0	0	0	1	0	1	0	1	1	1	0	**0,38**	38%
	(Business)Models for balancing time	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**0,06**	6%
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland	Good quality food for all	1	1	1	1	1	1	0	1	1	1	0	0	1	1	1	1	**0,81**	81%
	Evolving food culture in growing cities	0	1	1	0	1	1	1	0	0	0	0	0	1	1	0	1	**0,50**	50%
	Good food research	1	1	1	1	1	1	1	0	0	0	0	0	1	1	1	1	**0,69**	69%
	Responsible use of land	1	1	1	0	1	1	1	0	1	1	0	1	1	0	0	1	**0,69**	69%
GRAND CHALLENGE 3 – Energy	Smart energy governance	1	1	1	0	1	1	1	0	1	1	1	1	1	0	1	1	**0,81**	81%
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	Sustainable transport solutions that enable us to live where we choose	0	1	1	0	1	1	1	0	1	1	0	1	1	1	0	0	**0,63**	63%
	Freedom to choose where to live	1	1	0	0	1	0	0	0	1	1	1	1	1	1	1	0	**0,63**	63%
	Moving together (more collective transport options)	0	1	1	0	1	0	1	1	1	1	0	0	1	0	0	0	**0,50**	50%
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	At one with nature	0	0	1	0	1	0	0	1	1	0	1	1	1	1	1	1	**0,63**	63%
	Consume smarter, in-crease wellbeing	1	0	1	0	1	1	0	1	1	1	1	0	1	0	1	1	**0,69**	69%
	Production awareness	1	1	1	0	1	1	0	1	1	0	1	0	1	1	1	1	**0,75**	75%
	Urban-rural Symbiosis	0	0	0	0	1	1	0	1	1	0	1	1	1	0	1	1	**0,56**	56%
	Making dense and growing urban areas more sustainable and liveable	1	1	1	0	1	0	1	1	1	0	1	1	1	0	1	1	**0,75**	75%
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Empowering diversity in community	1	1	1	0	1	0	0	0	1	1	0	1	1	1	0	1	**0,63**	63%
	Evidence- based community building	1	1	0	0	1	0	0	0	1	1	0	1	1	1	0	1	**0,56**	56%
	Community building development	1	1	0	0	1	1	0	0	1	1	1	1	1	1	1	1	**0,75**	75%
	Empowered citizens	1	1	0	0	1	1	0	0	1	1	1	0	1	1	0	1	**0,63**	63%
	Meaningful research for community	1	1	1	1	1	1	0	0	1	1	0	1	0	1	1	1	**0,75**	75%
	Snakes and ladders- Connecting scales of issues and actors	1	1	0	1	1	1	0	0	1	1	0	0	1	0	1	1	**0,63**	63%
	The transparancy toolbox	0	1	0	1	1	1	0	0	1	1	0	0	1	1	0	1	**0,56**	56%
	Debating alternative economic models	1	0	0	0	1	1	0	1	1	0	0	0	0	1	1	1	**0,50**	50%
	Social economy	1	1	1	0	0	1	0	0	1	0	0	0	1	1	1	1	**0,56**	56%
	Basic universal income so nobody is left behind	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	**0,13**	13%
	Alternative economic model	1	1	1	0	1	1	1	0	0	0	0	0	1	1	0	1	**0,56**	56%
	From wall street to main street	0	1	1	0	1	1	0	1	1	1	0	0	0	0	0	1	**0,50**	50%
	Educational ecosystem as a driver of social innovation and local development	0	1	0	0	1	1	0	0	1	1	0	0	1	0	0	1	**0,44**	44%
	Design thinking and doing and life skills for all	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1	**0,19**	19%
	Learning for society	1	0	1	0	1	1	0	0	1	1	0	0	1	1	0	1	**0,56**	56%
	SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	0	1	1	0	1	1	1	0	1	0	1	0	1	1	0	1	**0,63**	63%
	Ecological future education	0	1	1	0	1	1	0	1	1	0	1	0	0	0	0	1	**0,50**	50%
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of	Data for all- Share the power of Data	1	1	1	0	1	1	1	1	1	1	0	0	1	1	1	1	**0,81**	81%
	Here, there and everywhere	1	1	1	0	1	0	0	0	1	1	0	0	1	0	1	1	**0,56**	56%
	Transforming technologies for planet and people	1	1	1	0	1	1	1	0	1	1	1	1	1	1	1	1	**0,88**	88%
	Overall representation of expert report within CIMULACT	**0,59**	**0,78**	**0,74**	**0,11**	**0,85**	**0,65**	**0,35**	**0,35**	**0,83**	**0,59**	**0,43**	**0,3**	**0,83**	**0,72**	**0,57**	**0,85**		
	Overall representation of expert report within CIMULACT (percentage)	**59%**	**78%**	**74%**	**11%**	**85%**	**65%**	**35%**	**35%**	**83%**	**59%**	**43%**	**30%**	**83%**	**72%**	**57%**	**85%**		

Figure 2: Alignment average

Alignment Score : 0 = no alignment, 1 = low, 2= medium, 3= high ;

(If topic is represented, how well do directions, intentions etc. of CIMULACT topic and expert topic study align. For justification see qualitative analysis)

	Expert Study	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16	**Overall Alignment of Topic with expert studies (0-3)**	Overall Alignment of Topic with expert studies (approx. percentage)
	CIMULACT topics																		
GRAND CHALLENGE 1 – Health, demographic change and well-being	I am empowered to lead my changes	2	0	1,5	0	1,5	2	0	0	1	3	0	0	2	3	1	2	**1,19**	40%
	Rethinking (the new) job market needs	1	1	1,5	0	1	1,5	1	1	0	2,5	1,5	0	1,5	1	0	1,5	**1,00**	33%
	Personal and organizational choice management	0	0	1	0	1,5	1,5	1	1,5	1	2,5	1	0	1	1,5	2,5	2	**1,13**	38%
	Dissemination and continuous exploitation of research and innovation in the healthcare system	1	1,5	2	0	1	1	1	0	1,5	1,5	1	0	1,5	1	1,5	1	**1,03**	34%
	Evidence-based personalized healthcare	1,5	2	2	0	2,5	1	0	1,5	2,5	1	0,5	0	3	1,5	1,5	1	**1,34**	45%
	Access to equal and holistic health services and resources for all citizens	0	1	1,5	0	1,5	0	0	0	1	1,5	0,5	1,5	1,5	1,5	0	1	**0,78**	26%
	Health empowerment through “Everyone’s science”	1	1	1	0	2,5	1	0	2	1	0	0,5	0	2,5	1	0	1,5	**0,94**	31%
	Deconstruction of age	1	1	1	0	1,5	0	0	0	1	1	0,5	1	1	1	1	1	**0,75**	25%
	Technology as a means of wellbeing	0	0,5	1	0	0	0	1	2	0	1,5	1,5	0	0	2	2,5	1	**0,81**	27%
	Balanced work-life model	0	1,5	1	0	0	0	1	0	1	0	0,5	0	1,5	1	1,5	0	**0,56**	19%
	Finding a balance in a fast-paced life	0	2	1	0	0	0	0	0	0	0	0,5	0,5	1	1,5	2	0	**0,53**	18%
	Promoting well-being through relating environments	0	1	0	0	0	0	0	0	2	0	0,5	0	1	1	1,5	0	**0,44**	15%
	(Business)Models for balancing time	0	0,5	0	0	0	0	0	0	0	0	0	0,5	1	1	0	0	**0,19**	6%
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	Good quality food for all	1	1	1	1	2,5	1	0	1	1	0	0	0	1	1	1	2	**0,91**	30%
	Evolving food culture in growing cities	0	1	1	0	1	1	1	0	0	1	0	0	1	1	0	1	**0,56**	19%
	Good food research	1	1	1	1	3	2	1	0	2	0	0	0	1	1	1,5	1,5	**1,06**	35%
	Responsible use of land	1	2	1	0	1,5	1	2	0,5	2	0	0	2,5	2	0	0,5	1,5	**1,09**	36%
GRAND CHALLENGE 3 – Energy	Smart energy governance	1	2	1,5	0	1,5	0,5	1	0,5	2,5	1	1	2,5	2,5	0,5	2,5	1	**1,34**	45%
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	Sustainable transport solutions that enable us to live where we choose	0	2	1	0	2	1	2	0,5	1	0	0	2,5	2,5	1	0	0	**0,97**	32%
	Freedom to choose where to live	1	2	0	0	1,5	0	0	0	1	2,5	1	2,5	2	1,5	2	0	**1,06**	35%
	Moving together (more collective transport options)	0	1	1	0	2,5	0	1	1,5	1	0	0	0	1	0	0	0	**0,56**	19%
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	At one with nature	0	0,5	1	0	3	0	0	1	2	1,5	1	2	1	1	1	1	**1,00**	33%
	Consume smarter, in-crease wellbeing	1,5	0,5	1	0	2	0,5	0	1	2,5	1,5	1	0	2	0	2,5	1	**1,06**	35%
	Production awareness	2	1	1	0	1	1,5	0	1,5	2,5	1	1	0	2	1	3	1	**1,22**	41%
	Urban-rural Symbiosis	0	0,5	0,5	0	1	1,5	0	1,5	1	0	1	3	3	0	1,5	1	**0,97**	32%
	Making dense and growing urban areas more sustainable and liveable	1	2	1,5	0	2	0	2,5	1,5	2	0	1	3	3	0	2,5	2	**1,50**	50%
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Empowering diversity in community	1	1,5	1,5	0	3	0	0	0	2,5	1,5	0	1,5	3	2	0	2,5	**1,25**	42%
	Evidence- based community building	1	1,5	0	0	3	0	0	0	2	0	0	1,5	1	2	0	1	**0,81**	27%
	Community building development	1	1	0	0	2,5	1	0	0	1	0	1	1,5	2,5	2,5	1	1	**1,00**	33%
	Empowered citizens	0,5	2,5	0,5	0	1,5	2	0	0	2	0	1	0	1,5	2	0	2	**0,97**	32%
	Meaningful research for community	1,5	1,5	3	2,5	1,5	1,5	0	0	0,5	0	0	1,5	0	2,5	1	1	**1,13**	38%
	Snakes and ladders- Connecting scales of issues and actors	1,5	2,5	0	1,5	2	1	0	0	2	2,5	0	0	2	0	2,5	2	**1,22**	41%
	The transparancy toolbox	0	3	0	2,5	0,5	1	0	0	1	1	0	0	1,5	3	0	1,5	**0,94**	31%
	Debating alternative economic models	1	0	2	0	1	1,5	0	1	1	2	0	0	0,5	1,5	1	1	**0,84**	28%
	Social economy	1,5	1,5	1	0	0	1	0	0	1	3	0	0	1	1	1,5	1	**0,84**	28%
	Basic universal income so nobody is left behind	0	0,5	1	0	0	0	0	0	0	2,5	0	0	0	0	0	1	**0,31**	10%
	Alternative economic model	1,5	1	1	0	1	2,5	1	0	0	2,5	0	0	2	2	0	1	**0,97**	32%
	From wall street to main street	0	1	1	0	1	1	0	1,5	1	2,5	0	0	0	0	0	1,5	**0,66**	22%
	Educational ecosystem as a driver of social innovation and local development	0	3	0,5	0,5	2,5	2,5	0	0	1,5	0	0	0	1	0	0	1	**0,78**	26%
	Design thinking and doing and life skills for all	0	0	0,5	0	0,5	0	0	0	1	0	0	0	0	0	0	1	**0,19**	6%
	Learning for society	1	0	2	0	1	2,5	0	0,5	1	0	0	0	1	1	0	2	**0,75**	25%
	SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	0	2,5	1,5	0	1	1,5	0,5	0,5	2,5	0	1	0	1,5	1	0	1	**0,91**	30%
	Ecological future education	0	3	1	0	1,5	1	0	1,5	1,5	2,5	1	0	0	0	0	1	**0,88**	29%
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	Data for all- Share the power of Data	1	3	2,5	1	1,5	2	1	1,5	2	3	0	0	2	2,5	2,5	1,5	**1,69**	56%
	Here, there and everywhere	1	3	1	0	1,5	0	0	0	1	0	0	0	2	0	1,5	1,5	**0,78**	26%
	Transforming technologies for planet and people	1	3	1,5	0	2	2	1,5	0	2	1	1	1	2	2,5	2,5	2	**1,56**	52%
	Overall alignment of expert report with CIMULACT topics (0-3)	**0,68**	**1,40**	**1,05**	**0,22**	**1,43**	**0,91**	**0,42**	**0,54**	**1,28**	**1,02**	**0,45**	**0,62**	**1,46**	**1,12**	**1,01**	**1,14**		
	Overall alignment of expert report with CIMULACT topics (approx. percentage)	23%	47%	35%	7%	48%	30%	14%	18%	43%	34%	15%	21%	49%	37%	34%	38%		

Figure 3: Alignment qualitative analysis reader 1

Alignment Score : 0 = no alignment, 1 = low, 2= medium, 3= high ;																
(If topic is represented, how well do directions, intentions etc. of CIMULACT topic and expert topic study align. For justification see qualitative analysis)																
Expert Study	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16
yellow = cases need revisiting																
CIMULACT topics																
GRAND CHALLENGE 1 – Health, demographic change and well-being																
I am empowered to lead my changes	2	0	1	0	2	2	0	0	1	3	0	0	2	3	1	2
Rethinking (the new) job market needs	1	1	1	0	1	1	1	1	0	2	2	0	1	1	0	1
Personal and organizational choice management	0	0	1	0	1	2	1	2	1	2	1	0	1	1	3	2
Dissemination and continuous exploitation of research and innovation in the healthcare system	1	2	2	0	1	1	1	0	1	2	1	0	1	1	2	1
Evidence-based personalized healthcare	1	2	2	0	3	1	0	2	2	1	1	0	3	2	2	1
Access to equal and holistic health services and resources for all citizens	0	1	2	0	2	0	0	0	1	2	0	2	1	1	0	1
Health empowerment through "Everyone's science"	1	1	1	0	3	1	0	2	1	0	1	0	2	1	0	1
Deconstruction of age	1	1	1	0	2	0	0	0	1	1	0	1	1	1	1	1
Technology as a means of wellbeing	0	1	1	0	0	0	1	3	0	2	2	0	0	2	3	1
Balanced work-life model	0	2	1	0	0	0	1	0	1	0	1	0	1	1	2	0
Finding a balance in a fast-paced life	0	2	1	0	0	0	0	0	0	0	0	0	1	2	2	0
Promoting well-being through relating environments	0	1	0	0	0	0	0	0	2	0	1	0	1	1	2	0
(Business)Models for balancing time	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy																
Good quality food for all	1	1	1	1	3	1	0	1	1	1	0	0	1	1	1	2
Evolving food culture in growing cities	0	1	1	0	1	1	1	0	0	0	0	0	1	1	0	1
Good food research	1	1	1	1	3	2	1	0	2	0	0	0	1	1	1	2
Responsible use of land	1	2	1	0	1	1	2	0	2	1	0	3	2	0	0	2
GRAND CHALLENGE 3 – Energy																
Smart energy governance	1	2	2	0	2	1	1	0	3	3	1	2	2	0	2	1
GAND CHALLENGE 4 – Smart, Green and Integrated Transport																
Sustainable transport solutions that enable us to live where we choose	0	2	1	0	1	1	2	0	1	2	0	3	3	1	0	0
Freedom to choose where to live	1	2	0	0	1	0	0	0	1	2	1	3	2	1	2	0
Moving together (more collective transport options)	0	1	1	0	3	0	1	2	1	1	0	0	1	0	0	0
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials																
At one with nature	0	0	1	0	3	0	0	1	2	0	1	2	1	1	1	1
Consume smarter, in-crease wellbeing	1	0	1	0	2	1	0	1	3	1	1	0	2	0	2	1
Production awareness	2	1	1	0	1	2	0	2	3	0	1	0	2	1	3	1
Urban-rural Symbiosis	0	0	0	0	1	1	0	2	1	0	1	3	3	0	2	1
Making dense and growing urban areas more sustainable and liveable	1	2	2	0	2	0	3	2	2	0	1	3	3	0	3	2
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies																
Empowering diversity in community	1	2	1	0	3	0	0	0	3	3	0	1	3	2	0	2
Evidence- based community building	1	1	0	0	3	0	0	0	2	1	0	1	1	2	0	1
Community building development	1	1	0	0	3	1	0	0	1	2	1	1	2	3	1	1
Empowered citizens	1	3	0	0	2	2	0	0	2	3	1	0	2	2	0	2
Meaningful research for community	2	1	3	2	2	2	0	0	1	2	0	1	0	3	1	1
Snakes and ladders- Connecting scales of issues and actors	2	3	0	2	2	1	0	0	2	3	0	0	2	0	3	2
The transparancy toolbox	0	3	0	2	1	1	0	0	1	3	0	0	2	3	0	2
Debating alternative economic models	1	0	2	0	1	2	0	1	1	0	0	0	0	1	1	1
Social economy	2	2	1	0	0	1	0	0	1	0	0	0	1	1	1	1
Basic universal income so nobody is left behind	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Alternative economic model	1	1	1	0	1	3	1	0	0	0	0	0	2	2	0	1
From wall street to main street	0	1	1	0	1	1	0	2	1	3	0	0	0	0	0	1
Educational ecosystem as a driver of social innovation and local development	0	3	0	0	2	3	0	0	2	3	0	0	1	0	0	1
Design thinking and doing and life skills for all	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	1
Learning for society	1	0	2	0	1	3	0	0	1	1	0	0	1	1	0	2
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	0	3	1	0	1	2	1	0	2	0	1	0	2	1	0	1
Ecological future education	0	3	1	0	1	1	0	2	1	0	1	0	0	0	0	1
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens																
Data for all- Share the power of Data	1	3	3	1	2	2	1	2	2	2	0	0	2	3	3	1
Here, there and everywhere	1	3	1	0	2	0	0	0	1	2	0	0	2	0	2	2
Transforming technologies for planet and people	1	3	2	0	2	2	1	0	2	2	1	1	2	3	3	2

Figure 4: Alignment qualitative analysis reader 2

Alignment Score : 0 = no alignment, 1 = low, 2= medium, 3= high ;																
(If topic is represented, how well do directions, intentions etc. of CIMULACT topic and expert topic study align. For justification see qualitative analysis)																
Expert Study	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12	#13	#14	#15	#16
yellow = cases need revisiting																
CIMULACT topics																
GRAND CHALLENGE 1 – Health, demographic change and well-being																
I am empowered to lead my changes	2	0	2	0	1	2	0	0	1	3	0	0	2	3	1	2
Rethinking (the new) job market needs	1	1	2	0	1	2	1	1	0	3	1	0	2	1	0	2
Personal and organizational choice management	0	0	1	0	2	1	1	1	1	3	1	0	1	2	2	2
Dissemination and continuous exploitation of research and innovation in the healthcare system	1	1	2	0	1	1	1	0	2	1	1	0	2	1	1	1
Evidence-based personalized healthcare	2	2	2	0	2	1	0	1	3	1	0	0	3	1	1	1
Access to equal and holistic health services and resources for all citizens	0	1	1	0	1	0	0	0	1	1	1	1	2	2	0	1
Health empowerment through "Everyone's science"	1	1	1	0	2	1	0	2	1	0	0	0	3	1	0	2
Deconstruction of age	1	1	1	0	1	0	0	0	1	1	1	1	1	1	1	1
Technology as a means of wellbeing	0	0	1	0	0	0	1	1	0	1	1	0	0	2	2	1
Balanced work-life model	0	1	1	0	0	0	1	0	1	0	0	0	2	1	1	0
Finding a balance in a fast-paced life	0	2	1	0	0	0	0	0	0	0	1	1	1	1	2	0
Promoting well-being through relating environments	0	1	0	0	0	0	0	0	2	0	0	0	1	1	1	0
(Business)Models for balancing time	0	1	0	0	0	0	0	0	0	0	0	1	2	1	0	0
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy																
Good quality food for all	1	1	1	1	2	1	0	1	1	1	0	0	1	1	1	2
Evolving food culture in growing cities	0	1	1	0	1	1	1	0	0	0	0	0	1	1	0	1
Good food research	1	1	1	1	3	2	1	0	2	0	0	0	1	1	2	1
Responsible use of land	1	2	1	0	2	1	2	1	2	1	0	2	2	0	1	1
GRAND CHALLENGE 3 – Energy																
Smart energy governance	1	2	1	0	1	0	1	1	2	2	1	3	3	1	3	1
GAND CHALLENGE 4 – Smart, Green and Integrated Transport																
Sustainable transport solutions that enable us to live where we choose	0	2	1	0	3	1	2	1	1	1	0	2	2	1	0	0
Freedom to choose where to live	1	2	0	0	2	0	0	0	1	1	1	2	2	2	2	0
Moving together (more collective transport options)	0	1	1	0	2	0	1	1	1	1	0	0	1	0	0	0
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials																
At one with nature	0	1	1	0	3	0	0	1	2	0	1	2	1	1	1	1
Consume smarter, in-crease wellbeing	2	1	1	0	2	0	0	1	2	2	1	0	2	0	3	1
Production awareness	2	1	1	0	1	1	0	1	2	0	1	0	2	1	3	1
Urban-rural Symbiosis	0	1	1	0	1	2	0	1	1	0	1	3	3	0	1	1
Making dense and growing urban areas more sustainable and liveable	1	2	1	0	2	0	2	1	2	0	1	3	3	0	2	2
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies																
Empowering diversity in community	1	1	2	0	3	0	0	0	2	2	0	2	3	2	0	3
Evidence- based community building	1	2	0	0	3	0	0	0	2	1	0	2	1	2	0	1
Community building development	1	1	0	0	2	1	0	0	1	2	1	2	3	2	1	1
Empowered citizens	0	2	1	0	1	2	0	0	2	3	1	0	1	2	0	2
Meaningful research for community	1	2	3	3	1	1	0	0	0	3	0	2	0	2	1	1
Snakes and ladders- Connecting scales of issues and actors	1	2	0	1	2	1	0	0	2	2	0	0	2	0	2	2
The transparancy toolbox	0	3	0	3	0	1	0	0	1	2	0	0	1	3	0	1
Debating alternative economic models	1	0	2	0	1	1	0	1	1	0	0	0	1	2	1	1
Social economy	1	1	1	0	0	1	0	0	1	0	0	0	1	1	2	1
Basic universal income so nobody is left behind	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Alternative economic model	2	1	1	0	1	2	1	0	0	0	0	0	2	2	0	1
From wall street to main street	0	1	1	0	1	1	0	1	1	2	0	0	0	0	0	2
Educational ecosystem as a driver of social innovation and local development	0	3	1	1	3	2	0	0	1	3	0	0	1	0	0	1
Design thinking and doing and life skills for all	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	1
Learning for society	1	0	2	0	1	2	0	1	1	1	0	0	1	1	0	2
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	0	2	2	0	1	1	0	1	3	0	1	0	1	1	0	1
Ecological future education	0	3	1	0	2	1	0	1	2	0	1	0	0	0	0	1
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens																
Data for all- Share the power of Data	1	3	2	1	1	2	1	1	2	3	0	0	2	2	2	2
Here, there and everywhere	1	3	1	0	1	0	0	0	1	1	0	0	2	0	1	1
Transforming technologies for planet and people	1	3	1	0	2	2	2	0	2	2	1	1	2	2	2	2

Figure 5: Revisited cases with scoring difference >1 point

Expert Study	#1	#1	#2	#2	#3	#3	#4	#4	#5	#5	#6	#6	#7	#7	#8	#8	#9	#9	#10	#10	#11	#11	#12	#12	#13	#13	#14	#14	#15	#15	#16	#16
yellow = cases revisited	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2	QA1	QA2
CIMULACT topics																																
GRAND CHALLENGE 1 – Health, demographic change and well-being																																
I am empowered to lead my changes	2	2	0	0	1	2	0	0	2	1	2	2	0	0	0	0	1	1	3	3	0	0	0	0	2	2	3	3	1	1	2	2
Rethinking (the new) job market needs	1	1	1	1	1	2	0	0	1	1	1	2	1	1	1	1	0	0	2	3	2	1	0	0	1	2	1	1	0	0	1	2
Personal and organizational choice management	0	0	0	0	1	1	0	0	1	2	2	1	1	1	2	1	1	1	2	3	1	1	0	0	1	1	1	2	3	2	2	2
Dissemination and continuous exploitation of research and innovation in the healthcare system	1	1	2	1	2	2	0	0	1	1	1	1	1	1	0	0	1	2	2	1	1	1	0	0	1	2	1	1	2	1	1	1
Evidence-based personalized healthcare	1	2	2	2	2	2	0	0	3	2	1	1	0	0	2	1	2	3	1	1	1	0	0	0	3	3	2	1	2	1	1	1
Access to equal and holistic health services and resources for all citizens	0	0	1	1	2	1	0	0	2	1	0	0	0	0	0	0	1	1	2	1	0	1	2	1	1	2	1	2	0	0	1	1
Health empowerment through “Everyone’s science”	1	1	1	1	1	1	0	0	3	2	1	1	0	0	2	2	1	1	0	0	1	0	0	0	2	3	1	1	0	0	1	2
Deconstruction of age	1	1	1	1	1	1	0	0	2	1	0	0	0	0	0	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1
Technology as a means of wellbeing	0	0	1	0	1	1	0	0	0	0	0	0	1	1	3	1	0	0	2	1	2	1	0	0	0	0	2	2	3	2	1	1
Balanced work-life model	0	0	2	1	1	1	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	0	0	0	1	2	1	1	2	1	0	0
Finding a balance in a fast-paced life	0	0	2	2	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	2	1	2	2	0	0
Promoting well-being through relating environments	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	1	0	0	0	1	1	1	1	2	1	0	0
(Business)Models for balancing time	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	2	1	1	0	0	0	0
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy																																
Good quality food for all	1	1	1	1	1	1	1	1	3	2	1	1	0	0	1	1	1	1	1	1	0	0	0	0	1	1	1	1	1	1	2	2
Evolving food culture in growing cities	0	0	1	1	1	1	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0	1	1
Good food research	1	1	1	1	1	1	1	1	3	3	2	2	1	1	0	0	2	2	0	0	0	0	0	0	1	1	1	1	1	2	2	1
Responsible use of land	1	1	2	2	1	1	0	0	1	2	1	1	2	2	0	1	2	2	1	1	0	0	3	2	2	2	0	0	0	1	2	1
GRAND CHALLENGE 3 – Energy																																
Smart energy governance	1	1	2	2	2	1	0	0	2	1	1	0	1	1	0	1	3	2	3	2	1	1	2	3	2	3	0	1	2	3	1	1
GAND CHALLENGE 4 – Smart, Green and Integrated Transport																																
Sustainable transport solutions that enable us to live where we choose	0	0	2	2	1	1	0	0	1	3	1	1	2	2	0	1	1	1	2	1	0	0	3	2	3	2	1	1	0	0	0	0
Freedom to choose where to live	1	1	2	2	0	0	0	0	1	2	0	0	0	0	0	0	1	1	2	1	1	1	3	2	2	2	1	2	2	2	0	0
Moving together (more collective transport options)	0	0	1	1	1	1	0	0	3	2	0	0	1	1	2	1	1	1	1	1	0	0	0	0	1	1	0	0	0	0	0	0
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials																																
At one with nature	0	0	0	1	1	1	0	0	3	3	0	0	0	0	1	1	2	2	0	0	1	1	2	2	1	1	1	1	1	1	1	1
Consume smarter, in-crease wellbeing	1	2	0	1	1	1	0	0	2	2	1	0	0	0	1	1	3	2	1	2	1	1	0	0	2	2	0	0	2	3	1	1
Production awareness	2	2	1	1	1	1	0	0	1	1	2	1	0	0	2	1	3	2	0	0	1	1	0	0	2	2	1	1	3	3	1	1
Urban-rural Symbiosis	0	0	0	1	0	1	0	0	1	1	1	2	0	0	2	1	1	1	0	0	1	1	3	3	3	3	0	0	2	1	1	1
Making dense and growing urban areas more sustainable and liveable	1	1	2	2	2	1	0	0	2	2	0	0	3	2	2	1	2	2	0	0	1	1	3	3	3	3	0	0	3	2	2	2
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies																																
Empowering diversity in community	1	1	2	1	1	2	0	0	3	3	0	0	0	0	0	0	3	2	3	2	0	0	1	2	3	3	2	2	0	0	2	3
Evidence- based community building	1	1	1	2	0	0	0	0	3	3	0	0	0	0	0	0	2	2	1	1	0	0	1	2	1	1	2	2	0	0	1	1
Community building development	1	1	1	1	0	0	0	0	3	2	1	1	0	0	0	0	1	1	2	2	1	1	1	2	2	3	3	2	1	1	1	1
Empowered citizens	1	0	3	2	0	1	0	0	2	1	2	2	0	0	0	0	2	2	3	3	1	1	0	0	2	1	2	2	0	0	2	2
Meaningful research for community	2	1	1	2	3	3	2	3	2	1	2	1	0	0	0	0	1	0	2	3	0	0	1	2	0	0	3	2	1	1	1	1
Snakes and ladders- Connecting scales of issues and actors	2	1	3	2	0	0	2	1	2	2	1	1	0	0	0	0	2	2	3	2	0	0	0	0	2	2	0	0	3	2	2	2
The transparancy toolbox	0	0	3	3	0	0	2	3	1	0	1	1	0	0	0	0	1	1	3	2	0	0	0	0	2	1	3	3	0	0	2	1
Debating alternative economic models	1	1	0	0	2	2	0	0	1	1	2	1	0	0	1	1	1	1	0	0	0	0	0	0	0	1	1	2	1	1	1	1
Social economy	2	1	2	1	2	1	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0	0	0	0	1	1	1	1	1	2	1	1
Basic universal income so nobody is left behind	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Alternative economic model	1	2	1	1	1	1	0	0	1	1	3	2	1	1	0	0	0	0	0	0	0	0	0	0	2	2	2	2	0	0	1	1
From wall street to main street	0	0	1	1	1	1	0	0	1	1	1	1	0	0	2	1	1	1	3	2	0	0	0	0	0	0	0	0	0	0	1	2
Educational ecosystem as a driver of social innovation and local development	0	0	3	3	0	1	0	1	2	3	3	2	0	0	0	0	2	1	3	3	0	0	0	0	1	1	0	0	0	0	1	1
Design thinking and doing and life skills for all	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1
Learning for society	1	1	0	0	2	2	0	0	1	1	3	2	0	0	0	1	1	1	1	1	0	0	0	0	1	1	1	1	0	0	2	2
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	0	0	3	2	1	2	0	0	1	1	2	1	1	0	0	1	2	2	0	0	1	1	0	0	2	1	1	1	0	0	1	1
Ecological future education	0	0	3	3	1	1	0	0	1	3	1	1	0	0	2	1	1	1	0	0	1	1	0	0	0	0	0	0	0	0	1	1
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens																																
Data for all- Share the power of Data	1	1	3	3	3	2	1	1	2	1	2	2	1	1	2	1	2	2	2	3	0	0	0	0	2	2	3	2	3	2	1	2
Here, there and everywhere	1	1	3	3	1	1	0	0	2	1	0	0	0	0	0	0	1	1	2	1	0	0	0	0	2	2	0	0	2	1	2	1
Transforming technologies for planet and people	1	1	3	3	2	1	0	0	2	2	2	2	1	2	0	0	2	2	2	2	1	1	1	1	2	2	3	2	3	2	2	2

ANNEX

3

Using foresight to support the next strategic programming period of Horizon 2020 (2016-2018), Ed. European Commission 2014

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.	The increasing capacity of individuals to do things and express themselves goes hand in hand with growing expectations for individual empowerment. Overall, re-defining the sense of self, which encompasses dimensions such as personal ambition, one's preferred lifestyle and work / career trajectory, is becoming an important priority for many, especially in the younger generations (11) Education is undergoing significant transformations, enabling increasingly personalized and tailored learning experiences.(13) Values drive the personal conduct of individuals and, in aggregate, that of economic actors. A polarisation in values would trigger contradictory behaviours and create tensions...On the other hand, the natural evolution of values and beliefs enables the development of new value systems in an on-going dynamic process. (23-4) The acceleration of technological convergence provides an increasing ability to deliver transversal service platforms cutting across established sectoral boundaries combining infrastructures and technology, which enable the delivery of individualized services to users through higher system responsiveness and intelligent user-interfaces. This is a powerful enabler which is reinforced by "personal aspirations and empowerment". (31)	Alignment = med The elements that compose this research area and make it a citizen priority are mentioned in various parts of the expert report, wherein they are viewed as trends that influence change across various sectors. They are not explicitly hilighted as research areas in the expert report, but are implied to be present in various research efforts across technologies an policies.	Alignment = med
Rethinking (the new) job market needs	Developing and operating transversal platforms requires new mixes of competencies, capabilities and modes of	Alignment = low Expert report hilights technology as main	Alignment = low

• Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability • Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	thinking, as production organization and supply chains can be potentially restructured in major ways.(31)	driver of new workforce skills in demand. The CIMULACT suggestions also add ethics, social accountabilitiy, and sustainabilitiy as key elements of job market research.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being		Alignment = none While the expert group does mention that organizational choice management will change due to technological adoption, etc, They do not place the same value on socilal defined values, welfare, nor do they have the same social focus on coping with change.	Alignment = none
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	The convergence of technology and medicine, aided by the intense collaboration already at play across national boundaries, will trigger innovation, such as nano-robots, remote surgery and personalised drugs & diets. (10) The combination of various scientific fields is bringing new applications which are adopted widely across society and hold promise for radical improvements in a wide array of domains, such as manufacturing, health, agriculture and service industries. (13)	Alignment = low Expert view tends to mention tech innovation as independent from social context, patient input, or critical local or regional differences. CIMULACT emphasizes 'engage people,' the importance of local-level practice, and grassroots entities.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally	The convergence of technology and medicine, aided by the intense collaboration already at play across national boundaries, will trigger innovation, such as nano-robots, remote surgery and personalised drugs & diets. (10) An important direction of change in the context of technological convergence which is facilitated by IT, concerns	Alignment = low Expert view is that technology (alone?) will enable high level of individualization in care, and seems more focused on cures than prevention. CIMULACT cites need for	Alignment = med

friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: - For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. - For the citizens to be trained on health and digital literacy.	the increasing ability to deliver transversal service platforms, combining infrastructures and technology and cutting across established sectorial boundaries, to deliver increasingly individualized services to users. (13) The acceleration of technological convergence provides an increasing ability to deliver transversal service platforms cutting across established sectoral boundaries combining infrastructures and technology, which enable the delivery of individualized services to users through higher system responsiveness and intelligent user-interfaces. This is a powerful enabler which is reinforced by "personal aspirations and empowerment" (p.31)	training for patients and doctors. collaborative learning and social psychology.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care.		Alignment = none	Alignment = none

2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.			
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	In science, shifts in the processes of generation of new knowledge are included in the phenomenon termed "Science 2.0" (including phenomena such as "big data" and citizen science). (15)	Alignment = low 'Science 2.0' implies new ways of conducting research and the process of innovation. CIMULACT provides details of what cititzens think such collaboration includes.	Alignment = low
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis	The main challenge posed in Europe by this driver is the gradual ageing of the population. This is usually seen as a threat, although the health expert panel gathered as part of the project workshop did point out that older citizens can, and do, contribute to the economic and social well being of Europe. This contribution is an area which, currently, is not well understood or quantified. (p.29)	Alignment = low Expert report speaks directly to the transversal challenges of an ageing population and how they might be addressed through STI and social interventions. CIMULACT adds re-	Alignment = low

• fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	Horizon 2020 can focus investment in technology areas which directly intervene in mitigating the effect of this ageing trend on European citizens (i.e. assistive technologies based on robotics; development of treatments for age-related diseases) (p.30) An additional strategic response should be in supporting social interventions that have an indirect effect on this trend, by combating the sense of isolation and personal loneliness experienced by older people. Supporting e-health and tele-medicine solutions, for example, can improve the ease of access to social services of increasing value to older generations, and strengthen personal confidence. (p.30)	search and fostering of 'socialcultural intergenerational relsationships.'	
Topics mentioned only in the expert based study			
Emerging Epidemics	At the same time the risk of catastrophic emerging epidemics is not eliminated, as poverty and environmental degradation increase the risks of new health threats. Efforts must therefore be targeted at exploiting the opportunities created by the conjunction of health, ageing, the environment and social conditions. (29-30)	Alignment = none Epidemics were not evident in citizen visisons. This could indicate that citizens priortize addressing current healthcare issues over potential threats.	Alignment =

1.3 Work-life balance and wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignment = none	Alignment = none
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied		Alignment = none	Alignment = none

(and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money		Alignment = none	Alignment = none
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and		Alignment = none	Alignment = none

strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	Increasing poverty in Europe, fed by on-going economic recession and austerity policies could result in food crisis, survival struggle and social unrest with increasing hostility towards the European integration project. (25)	Alignment = low The citizen vision was focused on creating a picture of ongoing food poverty and addressing that through holistic solutions. The Expert report is more crisis-oriented, though also takes a comprehehsnive view of drivers of poverty writ large.	Alignment = low
Evolving food culture in growing cities		Alignment = none	Alignment = none

Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.			

Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	The development of fully synthetic food products, for instance, is seen as a remedy to population growth (outside of Europe) and resource scarcity. (34)	Alignment = low Experts cite food technology (genetic engineering in partiulcar) as solution base. Citizens also highlight this, but add food and nutrition education initiatives, economic and environmental research as convergent domains within this area.	Alignment = low
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	The combination of various scientific fields is bringing new applications which are adopted widely across society and hold promise for radical improvements in a wide array of domains, such as manufacturing, health, agriculture and service industries. (13)	Alignment = low Experts imply that some new technologies can help land become more productive. Citizens take a multi-pronged approach to land use decisions, seeking inclusion in governance.	Alignment = low
Topics mentioned only in the expert based study			
Synthetic Foods	The development of fully synthetic food products, for instance, is seen as	Alignment = none	Alignment = none

	a remedy to population growth (outside of Europe) and resource scarcity (p.33)	Citizens do mention bio-technology as part of Good Food Research, but do not mention synthetic foods by name, nor as a solution to population growth's effect on food markets.	

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy	Adaptation strategies to develop new and economical sources of energy, for example tidal power from the oceans and seas around Europe, water and materials. (33)	Alignment = low Experts focus on the exploitation of new sources of energy. Ciitzens visions recognize these technologies importance, but prioritize governance issues, market regulations and incentives.	Alignment = low

communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
Resource Scarcity and Energy Demand	The collision of population growth, the rise of a global "middle class", and climate change creates overwhelming pressure on food, water, materials and energy reserves. A number of developed economies are at risk of experiencing power blackouts as energy demands exceed temporarily supply outputs. (16) Breakthrough strategies, such as harnessing resources exploited in space to supplement similar resources coming to an end on earth.(33)	Alignment = none	Alignment = none

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban"		Alignment = none	Alignment = none

and the idea of “self-sustainability” of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by “digitalisation”) for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	With abundant bandwidth and devices, commerce, trading as well as social and business interactions become increasingly virtual, potentially negating the need to commute, travel or meet real people. (15)	Alignment = low Expert report mentions remote working as one possible impact of improved ICT infrastucuture, and they do not mention its capacity on transportation writ large. Citizens view ICT as one part of enabling technologica infrastrucutures coupled with social organizing principles in order to achieve greater personal freedoms.	Alignment = low
Moving together (more collective transport options)		Alignment = none	Alignment = none

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).			
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.		Alignment = none	Alignment = none

Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	New attitudes rejecting ostentatious consumption are appearing in the West, perhaps more so than in other regions globally. Combined with the ability to share or lease services and products rather than owning them, a new model of consumption becomes established within a circular economy. (11) @sharing: In parallel to globalisation, there are processes of fragmentation (exemplified at an institutional level by the centrifugal trend in the creation of new countries, such as Catalonia and Scotland) and rising alternative systems and models (examples include uses of telecommunication infrastructures in Africa; humantechnology interfaces in health; the culture of sharing in the West etc.) (p.30) The process of fragmentation may increase the available technological variety with benefits for all. It can create new spaces for innovation and entrepreneurship. It also may provide opportunity for policy experimentation, for instance to address issues of “climate change” or “coupling the economy with the limits of the planet”, that require economic functions and models that are still in the sphere of visions. (p.30)	Alignment = low Expert views widely align with CIMULACT findings, but mention drivers and trends without suggesting a thorough research agenda.	Alignment = med

	Mitigation strategies to identify new technologies which lower the consumption of scarce resources, such as new lighter material used in cars and aeroplanes and more efficient combustion engines or renewable materials used in biobased industrial processes.(33)		
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	Adaptation strategies to develop new and economical sources of energy, for example tidal power from the oceans and seas around Europe, water and materials (p.33) Mitigation strategies to identify new technologies which lower the consumption of scarce resources, such as new lighter material used in cars and aeroplanes and more efficient combustion engines or renewable materials used in biobased industrial processes. (p.33) Tackling degradation at the source will involve a change in behaviours among economic actors, which Europe must encourage, in order to reduce demand for goods and services which are polluting, or generate pollution during their production. (p.33)	Alignment = med Expert Report prioritizes research that can change production methods and materials towards greater sustainability/ environmental friendliness. CIMULACT focuses more on consumer knowledge and availabilitiy of information so that they can make better choices as individuals and collectives regarding ecological mindfulness.	Alignment = med

	Horizon 2020 can also support the development of circular economy models and experimentation, especially where enabled by technology, as this will reduce demand and waste thanks to recycling and reuse (p.33)		
Topics mentioned only in the expert based study			
Environmental Degradation	Environment degradation is the reduction of the capacity of the environment to meet social and ecological objectives, and needs. It involves the destruction of natural habitats and the depletion of natural resources. (11) Given the extent of environmental degradation to date, the focus of policies and strategic programmes has to be the coupling of adaptation and mitigation strategies to rectify the trajectory of this driver.(33)	Alignment = low CIMULACT results imply that environmental degradation is a problem area, but orients its suggestions in a pro-active, solution-oriented manner. CIMULACT is aware of environmental degradation, and seeks to address it indrectly through various research agenda points.	Alignment =
Space Exploration	While space technology makes significant contributions to the improvement of the performance of technologies and services on earth, only a small fraction of the possibilities offered by space is exploited or even known. Pushed by diminishing resources and energy sources on the planet, we are seeking to explore and exploit the theoretically infinite reserves of space. (14) Breakthrough strategies, such as harnessing resources exploited in space to supplement similar resources coming to an end on earth.(33)	Alignment = none CIMULACT research makes little to no mention of space exploration and related research, though numerous scientifica nd technological advances have come from the sector.	Alignment =

Rampant Vulnerability to Natural catastrophes	Intense and repeated natural disasters of major scale could overcome our society’s capacity to deal with their consequences. Destructive climate change including rising sea levels could lead to massive destruction of infrastructure and loss of high-quality agricultural land in low-laying coastal areas and require relocation of entire populations. Vulnerability to natural disasters could develop into major humanitarian catastrophes, characterised by major threats to food security and large-scale epidemics. (26) The multiplication of extreme natural events is emerging as a strong trait of environmental and climate change. Natural catastrophes are a reality, not a possibility, for our society. Just like other continents, Europe requires better preparedness to these extreme events, to minimise their impact a priori and encourage multi-country collaboration in preparing for them. Because extreme events could multiply, it is important for Horizon 2020 to move towards a higher systemic resilience, through better forecasting models supported by High Performance Computing and connected to better contingency plans.(32)	Alignment = none CIMULACT results do not tend to prioritize natural catastrphes on the research agenda. Rather, through addressing climate change drivers through other means (improved energy, transport, food, etc) CIMULACT would attempt to curtail climate change and the vulnerabilities that result.	Alignment =

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts		Alignment = none	Alignment = none
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and	Environmental and energy-efficiency considerations favour urban lifestyles, while the dependence of urban life on infrastructure, transport and logistics can challenge food availability, induce new vulnerabilities and require new answers to enhance resilience of urbanized areas. (12)	Alignment = low Both Expert and CIMULACT groups recognize that urbanization remains a domain of both challenges and solutions. Expert research tends to prioritize technological solutions, while	Alignment = low

suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of “promising/good” practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.		CIMULACT includes citizen consultation and inclusivity as important areas for research.	
Topics mentioned only in the expert based study			
			Alignment =

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	A further aim could be to exploit opportunities emerging from multiculturalism, and from worldwide population changes. These can benefit Europe’s economy and counteract the negative economic trends at play in the region. (p.30) An additional strategic response should be in supporting social interventions that have an indirect effect on this trend, by combating the sense of isolation and personal loneliness experienced by older people. Supporting e-health and tele-medicine solutions, for example, can improve the ease of access to social services of increasing value to older generations, and strengthen personal confidence. (30) The process of fragmentation may increase the available technological variety with benefits for all. It can create new spaces for innovation and entrepreneurship. It also may provide opportunity for policy experimentation... (30)	Alignment = low Expert report situates empowered diversity within an economic paradigm - an opportunity for growth. CIMULACT focuses on the researching diversities role in building integrated communicities, enriching the social fabric, and addressing legal and policy implications for such empowerment.	Alignment = low
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence	A further aim could be to exploit opportunities emerging from multiculturalism, and from worldwide population changes. These can benefit Europe’s economy and counteract the negative economic trends at play in the region. (30)	Alignment = low Expert report situates empowered diversi-ty within an	Alignment = low

based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions		economic paradigm - an opportunity for growth. CIMULACT focuses on the researching diversities role in building integrated communicities, enrich-ing the social fabric, and addressing legal and policy implications for such empow-erment.	
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	@decentralisation: In parallel to globalisation, there are processes of fragmentation (exemplified at an institutional level by the centrifugal trend in the creation of new countries, such as Catalonia and Scotland) and rising alternative systems and models (examples include uses of telecommunication infrastructures in Africa; humantechnology interfaces in health; the culture of sharing in the West etc.) (p.30)	Alignment = low Expert report seems more inclined to uncover processes of fragmentation - diametrically opposed to the research agenda put forth by CIMULACT.	Alignment = low
Topics mentioned only in the expert based study			

Ageing Population	Ageing population is the cause of new economic and societal issues in Europe. A reducing active population has to bear the cost of a larger, older group. Social models of solidarity and fairness need to be reshaped. (9) The main challenge posed in Europe by this driver is the gradual ageing of the population. This is usually seen as a threat, although the health expert panel gathered as part of the project workshop did point out that older citizens can, and do, contribute to the economic and social well being of Europe.(29)	Alignment = low While CIMULACT suggests research into medical technologies and social organizations that can confront aging peoples, it seems less inclined to mention the more general trend of ageing populations that the experts hilighlight.	Alignment =
Trust and Reputation	Trust can be defined as the belief that people will behave predictably. Institutions are built on trust and are a means to develop trust. The more interdependent people, economic actors, and institutions are becoming the more important trust is for the effective functioning of our societies. (24)	Alignment = low Though trust is implicit in some of the community building and empowerment research suggested by CIMULACT, the expert report centralizes trust as an important component for governing entities to priritize.	Alignment =
Dissolution of European Union	Together with a regain of populism and a return to national, rather than European, responses, this could ultimately lead to	Alignment = none	Alignment =

	the dissolution of the European Union. A weakened unifying and moderating framework raises the risk of the emergence of new divisions and conflicts within Europe.(25)	This possibility was not mentioned in the CIMULACT visions, which is more focused on maintaining and strengthening the EU.	

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	Values drive the personal conduct of individuals and, in aggregate, that of economic actors. A polarisation in values would trigger contradictory behaviours and create tensions...On the other hand, the natural evolution of values and beliefs enables the development of new value systems in an on-going dynamic process. (23-4)	Alignment = low CIMULACT situates empowerment as firstly within the domain of governance, with other impacts (social, economic, technological, etc.) stemming from that conceptualization. The Expert Report views participation (as an extension of changing values, from a primarily economic point of view, though social impacts are also recognized.	Alignment = low

Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	The increase of open innovation agreements between multiple actors challenges traditional model of IP ownership. Access to knowledge, the growing role of entrepreneurship culture, changes in personal identity and identification with community interests and values all contribute to a fundamental shift in creativity. (14) First, it could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and technologies. (30)	Alignment = med The expert report is aligned with the CIMULACT suggested research agenda regarding this topic.	Alignment = low
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	First, it could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and technologies. (30)	Alignment = med Expert group suggest that technological infrastrucuture can fuel open innovation regarding global phenomena. CIMULACT asserts that additional research into governance structures, policy processes, and trandiscilplinary research is also critical.	Alignment = low

The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	First, it [Horizon 2020] could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and technologies. (p.30) Second, it could enable innovation experimentations that take advantage of emerging alternative systems, e.g. in the form of supporting SME and innovative business environments in such systems. (p.30) Horizon 2020 can also support the development of circular economy models and experimentation, especially where enabled by technology, as this will reduce demand and waste thanks to recycling and reuse. (33)	Alignment = low In this area, the expert group suggestions and CIMULACT results are aligned.	Alignment = low
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic	The process of fragmentation may increase the available technological variety with benefits for all. It can create new spaces for innovation and entrepreneurship. It also may provide opportunity for policy experimentation, for instance to address issues of "climate change" or "coupling the economy with the limits of the planet", that require	Alignment = med The research agenda set forth by CIMULACT seems to match up with the suggestions of the expert group.	Alignment = low

models should be sustainability, education, equality, respect of environment.	economic functions and models that are still in the sphere of visions. (p.30) Second, it [H2020] could enable innovation experimentations that take advantage of emerging alternative systems, e.g. in the form of supporting SME and innovative business environments in such systems. (30)		
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects In addition, it can provide the new forms of distribution of value required for dealing with digital labour, robotization, and peer-to-peer production models.		Alignment = none	Alignment = none
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard	First, it could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and	Alignment = low CIMULACT tends to prioritize research into economic models as paired with UBI. Expert group sees alternative economic models as emerging from alternative systems	Alignment = med

work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.	technologies. Second, it could enable innovation experimentations that take advantage of emerging alternative systems, e.g. in the form of supporting SME and innovative business environments in such systems. (p.30) Horizon 2020 can also support the development of circular economy models and experimentation, especially where enabled by technology, as this will reduce demand and waste thanks to recycling and reuse. (33)	(ICT) and policy incentives. Both emphasize need for experiments in policies and models to test assumptions against realities.	
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			
Globalization	Globalisation is a process of international integration covering increasingly the planet and characterised by the growing movement of goods, capital, information, people and services around the globe, itself resulting from liberalisation of trade over the last half of the last century and the establishment of an almost global information and supply chain infrastructure. Part of this	Alignment = low CIMULACT seems to recognize globalization through research items like diversified communities, urban food culture, and the need for	Alignment =

	process involves the rise of new economic powers and new distributions of economic activity. (9) IT connectivity and infrastructure create competitive environments, where European economic actors face new competitors and partners in a virtual and globalised marketplace. This is a strong opportunity for European businesses to capture new revenue streams from customers they could not reach economically until now. (32)	greater inclusion. Expert report regards this as a primary driver of changes across domains.	
Trust and Reputation	Apart from social unrest, such a mistrust of the political governance of our society would almost immediately generate a high degree of uncertainty and impact much of commerce and the financial system...Even if public order could be maintained, widespread disruptions to supply chain and public services would follow and make everyday life unbearable. (24)	Alignment = low Though trust is implicit in some of the community building and empowerment research suggested by CIMULACT, the expert report centralizes trust as an important component for governing entities to pritiritize.	Alignment =
Crisis Prone Global Economy	Given the anaemic recovery experienced in the last two years, successive economic shocks may create a downward spiral of economic depression, protectionism, social unrest and political extremism. Starting with unmanageable inflation (or deflation), a major systemic financial failure could occur. This could set off an unsolvable market labour imbalance, with rising unemployment, and severe income disparities.(25)	Alignment = low Expert group prioritizes economic crises of the past and future as essential drivers of change. This could be underlying reason for CIMULACT's interest in alternative economic models, but it is not explicit..	Alignment =
Advanced Automation	Advanced automation is likely to challenge our notions of work in a major way, raising very important political, economic and policy issues. (31)	Alignment = none CIMULACT does not prioritize Automation in its re-	Alignment =

		search agenda, unless implictly through improved production processes (as long as they increase sustainabilitiy, not just productivity).	

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = none	Alignment = none
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of		Alignment = none	Alignment = none

students’ talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of “education into action” and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	Education is a fundamental factor in development and societal progress, enabling literacy and facilitating the integration of individuals in society in general and in employment in particular. (12)	Alignment = low Expert group see education as preparing individuals for entrance into society. CIMULACT suggests community as source of learning models and knowledge.	Alignment = low
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and “out of the box” thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education.		Alignment = none	Alignment = none

The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.			
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			
Gender Equality	Education is a fundamental factor in development and societal progress, enabling litera-cy and facilitating the integration of individuals in society in general and in employment in particular. (12)	Alignment = low Expert group does explciitly mention Gender Equlatiy in education, whereas this might only be implied within the CIMULACT report.	Alignment =

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: - People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and - Data-centered challenges: quality of data, openness of data, standardization of data.	In science, shifts in the processes of generation of new knowledge are included in the phenomenon termed “Science 2.0” (including phenomena such as “big data” and citizen science). (15) As people and machines connect through mobile devices and implanted chips, an avalanche of data is gathered, stored and analysed. This increases the risk of security and privacy breaches whilst holding the promise a safer, simpler world for individuals. (15)	Alignment = low The Expert group tends to see data from the perspective of those who have access to it (which is important). CIMULACT suggests research into policies that advance the Open Access agenda, and safeguard individuals and communities.	Alignment = low
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological	IT is now part of the ‘fabric of society’ and it is critical for Europe to encourage the universal provision of connectivity – whether through mobile or fixed technology - and of increasing bandwidth to all its citizens and economic actors. (p.32)	Alignment = low While the expert group recognizes that some technologies are embedded across society, CIMULACT calls for new modes of understanding scale across many domains through this ICT	Alignment = low

aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		infrastructure and the experiences it enables. .	
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	The combination of various scientific fields is bringing new applications which are adopted widely across society and hold promise for radical improvements in a wide array of domains, such as manufacturing, health, agriculture and service industries. (13) The convergence of different technologies and the rising investment in R&D is generating an environment of techno-optimism, driven by a strong belief that technological breakthroughs are out there to be achieved and all we have to do is develop them through brain-power and R&D investment. However, technology can also have unintended negative consequences. When combined, the level of complexity of much of technology research and the hard-to-identify ramifications of a given domain connecting to others present large-scale risks. (25) Reaping the benefits of innovation and technology in the future will depend on our ability to embed	Alignment = low The expert group harbors a technological primacy mindset - in which technologies are developed, can embetter society, but it is up to people to use them properly...CIMULACT tends toward the co-development approach to technology - that better technologies, and communities of practice, emerge when research is conducted in a participatroy and inclusive manner.	Alignment = low

	them properly in social contexts. From that perspective, public authorities have an important role to ensure that there is appropriate expertise and knowledge available to enable them to "regulate out" negative technological surprises, and that the development of technology keeps up with social and economic expectations. In view of the manifold unknown side- and secondary effects of these emerging technological opportunities, it will be essential to ensure a critical monitoring of their further deployment, and take responsible and corrective action as needed (p.31).		
Topics mentioned only in the expert based study			
Robotics and Automation	A further question is posed by the increased use of robots in the manufacturing of goods and the provision of services. The growing role of machines throughout our social, personal and economic interactions creates an uncertainty, in the medium to long term. Advanced automation is likely to challenge our notions of work in a major way, raising very important political, economic and policy issues. (p. 31)	Alignment = none CIMULACT does not make mention of robots or automation, rather emphasizing human-to-human relationships, and organizing principles.	Alignment =

Conflict and Insecurity	Wars and conflicts may well remain a constant in the coming decades, with likely more civil wars and terrorist activities and certainly a rise in cyber-crime and cyber-war. Some see the emergence of unconventional weapons (such as deadly viruses) as a possible escalation in new conflicts, driven by state or non-state actors. (25)	Alignment = none War and Conflict do not factor in heavily to the CIMULACT research agenda, while the expert group sees this as a driver of change worth monitoring.	Alignment =
Cyber Security	Nevertheless, for all the promises a fully connected world holds, IT shapes huge challenges for our social models: advanced automation and employment; national identities and digital natives; a global financial system and **cyber-crime,** amongst others. Addressing this challenge requires global collaboration with private and public actors, both in Europe and in other regions of the world. Cyber-defence may be a space where Europe could coordinate relevant efforts of its member states.(32)	Alignment = low CIMULACT research agenda prioritizes data literacy, and personal privacy, whereas expert group sees cyber security as playing an important role in infrastructure, financial, and social challenges.	Alignment =
Multi-disciplinary Convergence	Finally, by taking a multi-disciplinary approach, Horizon 2020 can make better use of the opportunities created by multiple drivers converging. In the	Alignment = low	Alignment =

	space formed by the interaction between driving factors (be they drivers or disrupters) Europe can identify ways to enhance prosperity and well-being within the planetary boundaries: thriving economies, flourishing societies, engaged communities and scope for personal fulfilment. (34)	CIMULACT does mention multi- and trans-discipline research within certain contexts, but this expert group makes such research a stand-alone priority area. Ultimatley the two reports align well on this topic, the expert are just more explicit in its mention.	

An OECD Horizon Scan of Megatrends and Technology Trends in the Context of Future Research Policy (2016), Ed. OECD , Kopenhagen: Danish Agency for Science, Technology and Innovation

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: - Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. - Better understanding the labor market and its future changes through theories, models and foresight approaches. - New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) - Exploring possible roles of communities for enabling alternative life-job-education pathways.	- governments will likely seek to reduce beneficiaries and benefits, increase workers' contributions, and extend the required number of working years (12) -Estimations of future workforce shortages should consider technological change as an important determining factor, particularly the impacts of robotics and artificial intelligence, which may reduce the demand for migrant workers' labour and skills. Technologies such as these and others (e.g. neurotechnologies) may also enhance physical and cognitive capacities, allowing people to work longer in their lives. (13) -advances in machine learning and artificial intelligence are expected to expand the capabilities of task automation. Recent research suggests that **almost half of total employment could be at high risk (with a probability of more than 70%) of becoming automated over the next two decades** (Frey and Osborne, 2013) (37) → If these predictions prove correct, then a large portion of the workforce will need to be re-trained…Greater work-sharing and a reduced working week could help distribute work more evenly, but would need to guarantee a living wage (Skidelsky, 2013). (37) -All economic sectors will be affected by AI developments, some more than others. Ab I and advanced robots will become increasingly central to manufacturing. Sectors that are likely to experience a new production revolution and full transformation include	Alignment = low Expert report focuses on technological trends and possibilities that would seriously impact individual opportunities in the workplace and capacities for self-care. In effect, the expert report highlights future oriented issues that will work against citizen recommendations.	Alignment = med

	agriculture, chemicals, oil and coal, rubber and plastics, shoe and textile, transport, construction, defence, and surveillance and security (54) -Humans will most likely be substituted by AI-enabled robots in "dirty, dangerous, and demanding" jobs, as well as in those that are repetitive and labour-intensive. But advances in smart systems will also enable automation of some knowledge work. For the first time, automation will no longer depend on a differentiation between manual and intellectual tasks but on some routine features of the jobs. Middle income classes may be under particular pressure, as an increasing number of administrative, cognitive and analytical jobs may be performed by data- and AI-empowered applications (55)		
Rethinking (the new) job market needs - Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability - Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	- governments will likely seek to reduce beneficiaries and benefits, increase workers' contributions, and extend the required number of working years (12) -advances in machine learning and artificial intelligence are expected to expand the capabilities of task automation. Recent research suggests that **almost half of total employment could be at high risk (with a probability of more than 70%) of becoming automated over the next two decades** (Frey and Osborne, 2013) (37) -As smart machines replace human workers in jobs, reproducible goods and services could be produced at lower marginal cost and become almost free. Productivity gains and economic growth could thus be disconnected from job creation and well-being. However, a no-job growth jeopardises public budgets and social safety net systems. A drop in employment would be echoed by a proportional drop in the tax base and government revenues. Social contributions and personal tax income accounted for an average	Alignment = low The expert report implies the need for retraining and education reform, but focuses more attention on automation technology as a job eliminator. Expert report sees waning demand for workers, regardless of training - a scenario that could negate citizen visions.	Alignment = med

	18% of OECD GDP in 2013 (OECD, 2015j). Likewise, employment-based pension systems are threatened. As workers may be left without salary, income redistribution policies will become more central to future social cohesion. The challenge could be of an unprecedented scale to avoid growing inequality. (55)		
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	-As smart machines replace human workers in jobs, reproducible goods and services could be produced at lower marginal cost and become almost free. Productivity gains and economic growth could thus be disconnected from job creation and well-being. However, a no-job growth jeopardises public budgets and social safety net systems. A drop in employment would be echoed by a proportional drop in the tax base and government revenues. Social contributions and personal tax income accounted for an average 18% of OECD GDP in 2013 (OECD, 2015j). Likewise, employment-based pension systems are threatened. As workers may be left without salary, income redistribution policies will become more central to future social cohesion. The challenge could be of an unprecedented scale to avoid growing inequality. (55)	Alignment = low Expert report focuses on trends and conditions that would vastly erode personal and organizational choice, while discussing items in the citizen vision. Expert report says welfare and values may be redefined as worker displacment becomes more widespread.	Alignment = low
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	- the prevalence of non-communicable diseases and increased disability among the elderly will place considerable burdens on healthcare and other services, where a more-than-proportional increase in demand can be expected. (12) -The global health challenges for the next decades are immense. But the very scale of those challenges across the developing world and the advanced economies offers vast opportunities for established and novel medical procedures, specialised treatments, new medicines and technological solutions, as well as for the development and implementation of innovative systems of health provision and care co-ordination and management. (47) -Big data analytics may enable a massive brewing of personal data that become accessible to a large number of actors (everyone?) in a way that is unpredictable and could become uncontrollable, as the volume, velocity and variety of data increase. For instance, patients sharing sensitive health data may support medical research and benefit from preferential medical treatment. Yet medical data made accessible to business interests (e.g. insurance companies and employers) raises a major issue of privacy and equity. Privacy is also endangered if these data are not well protected and if hacking or misuse could result from breaches in security. (53) - Broad data on exposures, outcomes and healthcare utilisation could be put together with deep clinical and biological data, opening new avenues to advance common knowledge, for instance on ageing-related diseases, or to support interdisciplinary research, for instance on combined effects of cure and care (53)	Alignment = med The expert report emphasizes the importance of healthcare trends, technologies as shapers of long term futures. It focuses on technologies (big data, robots, brain interfaces, dental applications, etc.) and does not mention the importance of localized care solutions that are important to citizen visions.	Alignment = med

	-In the health sector, for instance, surgery robots are already in use and further automation of health-related tasks are highly probable (López Pelaez and Kyriakou, 2008). Diagnostics could also evolve with AI-enabled analysis of medical databases. (55) -Neurotechnologies could provide effective treatments for many serious neurological and mental health disorders. For example, they could be used to retard disease progression and potentially cure those suffering from Parkinson's disease; and they could improve the quality of life for people suffering from depression, migraines and other psychiatric conditions (57) - Deep brain stimulation is an invasive procedure requiring brain surgery to place electrodes in a specific region deep within the brain. Its therapeutic uses include treating movement disorders (such as those associated with Parkinson's disease) and neuropathic pain. There is also considerable research activity exploring its use to treat a wide range of psychiatric disorders such as epilepsy, dystonia, Tourette's syndrome, depression, obsessive-compulsive disorder and cluster headaches (57) - Brain-computer interfaces (BCIs) may or may not be invasive and work by acquiring brain signals, analysing them, and translating them into commands that are relayed to output devices (e.g. computers and robotics) that carry out desired actions (Shih et al, 2012). Such applications can be further enhanced by incorporating artificial sensory systems that provide environmental feedback to the brain. BCIs have vast implications for those who have neurological disabilities. For example, they can be used to replace or restore useful function to people disabled by neuromuscular disorders, to improve cognitive functions, and to communicate thoughts and intentions when normal capabilities are impaired (58) - One of the most promising application areas for nanomaterials is in medicine, which currently accounts for the		

	highest share of applied nanoproducts (Vance et al., 2015). Nanomaterials are expected to enhance diagnostics in several ways, e.g. increases in sensitivity of diagnostics chips (lab-on-a-chip) will enable earlier diagnosis of cancer; robust fluorescent markers using nanomaterials are likely to increase reliability of in-vitro diagnostics (VDI Technologiezentrum GmbH, 2015); and tagged gold nanoparticles will boost the development of molecular imaging and can also be used for rapid screening of cancer drugs that require less special equipment than traditional methods (University of Massachusetts Amherst, 2014). Nanomaterials are also expected to enhance medical treatment, e.g. biocompatible nano-cellulose could be applied in treating burns. (61) - Dental applications represent the largest share in the medical field to benefit from 3D printing technologies. Printed dental prostheses, hip implants and prosthetic hands (bioprinting or bioengineering), as well as prototypes of exoskeletons are already in use. DNA printers and printing of body parts and organs from the patient's own cells are in the process of development. Bioprinted biological systems not only resemble humans genetically, but they also respond to external stress as if they are living organs (Kuusi and Vasamo, 2014). Bioengineering experts estimate that animal testing could be replaced by 3D printed human cells by 2018 (63) - Gene editing uses the natural immune defences of bacteria to create “molecular scissors” that cut out and replace strands of DNA with great precision (Sample, 2015). This technique is helping scientists further understand the roles of genes in health and how several diseases could be treated by modifying tissues and organs. Patients' immune cells could be reprogrammed to make them attack cancer cells; immune cells could be made resistant to the HIV virus; and genetic disorders could be stopped from being passed on to offspring. (68)		
Evidence-based personalized healthcare	-The IoT provides opportunities to improve people's health and provide better healthcare by connecting inner	Alignment = med	Alignment = med

Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. • For the citizens to be trained on health and digital literacy.	and outer bodily sensors to both personal health monitoring devices and professional health care systems. An Internet of bio-nano things monitoring and managing internal and external health hazards may be emerging (Akyldiz et al., 2015). The treatment of chronically ill patients in particular is expected to become more efficient (MGI, 2013). (50) -Big data analytics may enable a massive brewing of personal data that become accessible to a large number of actors (everyone?) in a way that is unpredictable and could become uncontrollable, as the volume, velocity and variety of data increase. For instance, patients sharing sensitive health data may support medical research and benefit from preferential medical treatment. Yet medical data made accessible to business interests (e.g. insurance companies and employers) raises a major issue of privacy and equity. Privacy is also endangered if these data are not well protected and if hacking or misuse could result from breaches in security. (53) -electronic health record systems, for example, can increase efficient access to healthcare and provide novel insights into innovative health products and services (OECD 2013e). Diagnosis, treatment and monitoring of patients may become a joint venture of analytical software and physicians. Clinical care may even become preventive in nature as big data analytics help discover pathologies before symptoms occur (53)	The expert group often mentions the technological capacities to collect and analyze vast amounts of personalized data in regards to individual health and life-style. The expert group fails to mention social skills training for healthcare specialists, digital literacy for both patients and doctors, and other fators that would humanize a big data healthcare system.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply:	-Unfortunately, at the present time the resources devoted to preventing, mitigating and curing disease, as well as to people's access to those resources, are also unevenly distributed. Evidence to date indicates that access to good health care correlates quite strongly with income level, educational level and access to knowledge. Thus, as incomes and educational levels rise across much of	Alignment = med Expert report hilights same concern as CIMLUACT - unevenly distributed access to healthcare.	Alignment = low

1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	the globe, even in poorer countries, and the middle classes in emerging and developing economies gain ground, the prospects for sustainable **health markets** in those parts of the world are expected to brighten considerably. (47)	Experts report concludes that with growth of global middle classes, access to quality healthcare will also continuously improve. Experts do not address how relatively welathy regions (like th EU), with lower growth prospectts, will address equal access to healthcare.	
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	- Do-it-yourself (DIY) biology or bio-hacking refers to a growing community of individuals and small organisations that study and practise biology and life science outside of professional settings. Lower costs of equipment, instruments and computing coupled with the rise of open source development practices have fuelled this movement, democratising science and giving people access to their own biological data. Cost-effectiveness has also improved for gene synthesis as well (at a much slower pace), yet price declines in both synthesis and sequencing have recently stagnated (Carlson, 2014). DIY biology represents a potential engine of innovation similar to Silicon Valley, with a large number of individuals discovering and finding applications for bio-bricks. In the future, innovation in this field could be further democratised, allowing users to tinker and improve products and services from large firms, as has already occurred in manufacturing sectors (68)	Alignment = low Expert report highlights some aspects of citizen science (lower cost of equipment, computing), but emphasizes citizen participation through innovation and experimentation. CIMULACT looks to increase science-soceity dialogue, emphasizing need for conversational parity between healthcare professionals and citizens, particularly in regards to data collection, recommendations, and holistic health choices.	Alignment = low

Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	-the prevalence of non-communicable diseases and increased disability among the elderly will place considerable burdens on healthcare and other services, where a more-than-proportional increase in demand can be expected. (12) -While the annual number of deaths due to infectious disease is projected to decline, the total annual number of deaths from non-communicable diseases (NCDs) is projected to increase from 38 million in 2012 to 52 million by 2030. This **epidemic of NCDs is being driven by powerful forces such as demographic ageing,...** (46) -Cases of **neurological disease**, spurred in particular by rising longevity and the anticipated rapid ageing of societies in the coming decades, are expected to multiply (Figure 27). Alzheimer's Disease International (ADI), for example, estimates that 46.8 million people worldwide are living with dementia in 2015, and that the number will almost double every 20 years, reaching 74.7 million in 2030 and 131.5 million in 2050. (47)	Alignment = low Expert report higlights issues that concern ageing populations, and conditions that arise in the elderly (neurological diseases, etc.). Expert report does not discussintergenerational care and communities, encouraging neuroplasticity through environments and lifestyles, or lifelong learning.	Alignment = low
Topics mentioned only in the expert based study			
Reacting to new health threats	-**trends are at work in society that suggest that future progress in countering infectious diseases may become harder to achieve.** Urbanisation is continuing to gather pace in the developing world; climate change is influencing geographic patterns of human and animal infections (e.g. malaria); international tourism is growing; global migration levels are unlikely to abate; and excessive current use of antibiotics is set to reduce the future effectiveness of drugs against some communicable diseases (e.g. TB). (46)	Alignment = none	Alignment =

	-While the annual number of deaths due to infectious disease is projected to decline, the total annual number of deaths from non-communicable diseases (NCDs) is projected to increase from 38 million in 2012 to 52 million by 2030. This **epidemic of NCDs is being driven by powerful forces such as demographic ageing, rapid unplanned urbanisation, and the globalisation of unhealthy lifestyles.** While many chronic conditions develop only slowly, changes in lifestyles and behaviours are occurring rapidly and pervasively. The leading causes of NCD deaths in 2012 were cardiovascular diseases, cancers, respiratory diseases and diabetes. These four major NCDs were responsible for 82% of NCD deaths. Going forward, annual cardiovascular disease mortality is projected to increase from 17.5 million in 2012 to 22.2 million in 2030, and annual cancer deaths from 8.2 million to 12.6 million (WHO, 2014b). The prevalence of diabetes has been increasing globally in recent decades, and WHO projects that it will be the seventh-leading cause of death in 2030 (46) -Cases of **neurological disease**, spurred in particular by rising longevity and the anticipated rapid ageing of societies in the coming decades, are expected to multiply (Figure 27). Alzheimer’s Disease International (ADI), for example, estimates that 46.8 million people worldwide are living with dementia in 2015, and that the number will almost double every 20 years, reaching 74.7 million in 2030 and 131.5 million in 2050. (47) -Finally, as noted earlier, use of antibacterial drugs has become widespread over several decades (although equitable access to antibacterial drugs is far from being available worldwide). These drugs have been extensively misused in both humans and food-producing animals in ways that favour the selection and spread of resistant bacteria. Consequently, **antibacterial drugs have become less effectiv**e or even ineffective, resulting in an accelerating global health security emergency that is rapidly outpacing available treatment options (48)		

1.3 Work-life balance and wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	Greater work-sharing and a reduced working week could help distribute work more evenly, but would need to guarantee a living wage (Skidelsky, 2013).(37)	Alignment = low Expert report discusses possibility of redistributing work more effectivley (better work-life balance), but highlights shortage of work as reason for redistribution and implies life quality could degrade without aditionla policy changes.	Alignment = low
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible	Work may also become more fragmented, with an increasing number of workers doing lots of different part-time jobs – the rise of the so-called **"gig economy"**. The growth of online platforms that link a vast pool of freelancers, who are physically based in different parts of the world, with companies inviting them to bid to work on a wide variety of tasks, is enabling this trend. While such	Alignment = low Expert report emphasizes the changing nature of the job-market, the trend in temporary,	Alignment = low

work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.	platforms offer flexibility to workers and companies, they raise some difficult questions about workplace protections and what a good job will look like in the future (Sundararajan, 2015). (37-8)	non-contract, work, and the potential repercussions to quality of life and social welfare. CIMULACT seeks recognition of work outside traditional workplaces, and calls for negotiations concerning flexible, productive forms of work, and increasing social well-being.	
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments	Big data analytics offers opportunities to boost productivity, foster a more inclusive growth, and contribute to citizens' well-being (OECD, 2015i).(52)	Alignment= low Expert group mentions citizen well-being as a minor topic, primarily in relation to the deployment of big data analytics. This does not directly address CIMULACT vision	Alignment = low

- digitalisation of many of the “analog” activities overcoming the notion that time is money		of reduced stress, daily-life management, the value of social realtionships, and increased accessibility.	
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.		Alignment= none	Alignment = none
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. - integration of ‘free time’ in the work place - new ways of employment where employees are more like volunteers / freelancers		Alignment= none	Alignment = none

- [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** - the impact of work-life balance policies, - the impact of different business models on workers' time autonomy and quality of life - the psychological acceptance of new forms of work, both individually and by society			
Topics mentioned only in the expert based study			
			Alignment =

2 GRAND CHALLENGE 2 – Agriculture

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: - Map the food access in rural and urban areas, - Calculate and assess food poverty in the EU, - look at supply regulation and issues connected to distribution and prices (transnational level), - investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), - analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: - Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, - The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	-food and nutritional insecurity will persist in many, predominantly poor, regions (18) -**Soil degradation** will affect the amount of land available for productive agriculture: around half of the world's agricultural land is already affected by moderate to severe degradation and around 12 million hectares of productive land become barren annually due to desertification and drought (18)	Alignment= low Expert group focuses on food insecurity as being a persistent problem, and environmental trends that will continue to drive food production and distribution problems. Expert report does not offer specific research agenda items or topics.	Alignment = low

Evolving food culture in growing cities Research should investigate the following aspects: - Comparative study of food supply chains and their social, ecological and economic impact - Studies on the role of food as an enabler for social inclusion and cohesion in cities - Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. - Historical research of nutrition flows during periods of migration - All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: - Policy tools for management of mixed food cultures in cities, - Sustainable non-indigenous local growing techniques, - Intervention options into diverse and multicultural food consumption practices, - Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). - Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.	Groundwater is being exploited faster than it can be replenished across many parts of the world – the depletion rate more than doubled between 1960 and 2000 – and is also becoming increasingly polluted. By 2050, **groundwater depletion may become the greatest threat to agriculture and urban water supplies in several regions. (18)** **Soil degradation** will affect the amount of land available for productive agriculture: around half of the world's agricultural land is already affected by moderate to severe degradation and around 12 million hectares of productive land become barren annually due to desertification and drought. (18)	Alignment= low Expert report only mentions some genral environmental issues that will impact urban environments, and does not recognize the diverse food cultures (and their resource needs) that exist in urban populations. CIMULACT also sees urban food culture as an opportunity for community building and the strengthening of social bonds.	Alignment = low

Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	-changing diets, driven by a growing middle class, will lead to additional demand for more resource-intensive types of food, such as meat. (18) Synthetic biology may also help meet bio-economy objectives, i.e. reduction of greenhouse gas emissions and attaining food and energy security. As global population continues to grow and threats to water and soil quality increase, synthetic biology offers far-reaching agricultural applications that promise to increase productivity and efficiency. Examples include not only crops that are resistant to drought and diseases and increase yields, but also plants that produce their own fertilisers. (67)	Alignment= low Expert report highlights trends that might spur food research (growing middle class appetites) and some lines of research (synthetic biology). CIMULACT acknowledges technological possibilities, but emphasizes research aimed at understanding their secondary and tertiary impacts. CIMULACT further highlights sustainability and education as important components of defining good research.	Alignment = low
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population.	-**Soil degradation** will affect the amount of land available for productive agriculture: around half of the world's agricultural land is already affected by moderate to severe degradation and around 12 million hectares of productive land become barren annually due to desertification and drought (18) -changing diets, driven by a growing middle class, will lead to additional demand for more resource-intensive types of food, such as meat. (18)	Alignment = low Expert report highlights one aspect of the need for responsible land use policy (soil degradation) and details issues that are expected to raise demand for	Alignment = low

Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.		further agricultural land development. It does not address CIMULACT concerns for comprehensively sustainable land use practice, multi-level governane, or the integration of production process innovation into land use systems.	
Topics mentioned only in the expert based study			
Food security	-It is estimated that **60% more food will be required to feed the world population by 2050** (18) -food and nutritional insecurity will persist in many, predominantly poor, regions (18) -**Soil degradation** will affect the amount of land available for productive agriculture: around half of the world's agricultural land is already affected by moderate to severe degradation and around 12 million hectares of productive land become barren annually due to desertification and drought (18) -biofuels may provide up to 27% of the world's transportation fuel by 2050, up from the current level of 2% (IEA, 2011), though with uncertain consequences for food security. (19)	Alignment = none While CIMULACT does mention the need to calculate and assess food poverty in the EU, the expert report takes a more comprehensive	Alignment = none

	-**Extreme and variable rainfall** will have major impacts on water availability and supply, food security, and agricultural incomes, and will lead to shifts in the production areas of food and non-food crops around the world (IPCC, 2014). The impacts of climate change on yields of the major crops (wheat, rice and maize) will be negative for most countries and commodities, though are likely to affect the poorest populations the most (Ignaciuk and Mason-D'Croz, 2014). They will likely reduce renewable surface water and groundwater resources in most dry subtropical regions, intensifying competition for water among different sectors (22) - Synthetic biology may also help meet bio-economy objectives, i.e. reduction of greenhouse gas emissions and attaining food and energy security. As global population continues to grow and threats to water and soil quality increase, synthetic biology offers far-reaching agricultural applications that promise to increase productivity and efficiency. Examples include not only crops that are resistant to drought and diseases and increase yields, but also plants that produce their own fertilisers. (67)	view of Food Security as a global issue.	
Water Stress	Water demand outpaced population growth by a factor of more than two during the twentieth century. Based on continuing socio-economic trends and no new policies to improve water management (a baseline scenario), **water demand is projected to increase by 55% globally between 2000 and 2050.** Agriculture will remain the largest consumer of water, (15) By 2050, **groundwater depletion may become the greatest threat to agriculture and urban water supplies in several regions.** The quality of surface water in many OECD non-member economies is also expected to deteriorate, through nutrient flows from agri-	Alignment = none Again, 'sustainable water management' is mentioned briefly in CIMULACT, but the expert report takes a more comprehesive and global view of fresh water demand increases, and threats to supply.	Alignment = none

	culture and poor wastewater treatment. The consequences will be increased eutrophication, biodiversity loss and disease (OECD, 2012b).(18)		

3 GRAND CHALLENGE 3 – Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need	**-The third largest consumer of energy in 2040 will be commercial and residential buildings.** Worldwide, households will increasingly shift towards cleaner fuels and will rely more on electricity than primary fuels as domestic appliances and electronics become more widely available (19) -Without more stringent climate change mitigation policies, **fossil fuels will continue to dominate the fuel mix** (20) -Support for a portfolio of low-carbon technologies across all energy sectors (Figure 12) will provide the greatest potential to ensure uptake of immediately available solutions that keep climate goals achievable while also stimulating the initial development of more complex solutions needed for long-term deep decarbonisation (22) -In the power sector, while onshore wind and solar PV are ready to be mainstreamed in many energy systems, very high levels of deployment will require further innovation in enabling technologies – for example, in energy storage and smart grid infrastructure – to manage their variability and increase the flexibility of power systems (22) -While rapid economic development holds significant potential to deploy the latest low-carbon technologies across all energy sectors, this will depend on international co-operation that supports technology and knowledge transfer (23) -IoT-enabled smart grids with smart energy meters allow for two-way communication between homes/organisations and the energy grid (OECD, 2015h). Consumer awareness	Alignment = med Expert report emphasizes multiple energy supply (alternative sources) and governance technologies (smart grids), and makes the case for policies and practices that can enale 'long-term, deep de-carbonization.' CIMULACT also focuses on governance models that are inclusive, and focus on the broad societal impacts of smart energy systems. CIMULACT also recommends public-private	Alignment = low

for "energy communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation	about energy consumption will rise, potentially reducing energy consumption as a result. In addition, smart grids help cut utility operating costs and reduce power outages and electricity waste by providing real-time information about the state of the grid (MGI, 2013). (50) - With an increasing share of renewable energy contributions to electrical grids, it is indispensable to invest in storage technologies that allow the adjustment of energy supply to energy demand. Those technologies are implemented on small and large scales in either centralised or decentralised ways throughout the energy system. Large-scale systems (grid energy storage), of which 97% capacity is accounted for by pumped hydro storage (IEA, 2015b), can balance power fluctuations. Battery systems are suitable for decentralised but shorter-term balancing due to limited storage capacity, long charging time and self-discharge (65) - Smart storage systems and smart grids may also encourage the production of renewable energy by local co-operative structures (ESPAS, 2014); cost-effective solar, wind and battery technologies are key building blocks for decentralised energy systems (66)	parternships to encourgae investment, and to bulld trust among various takeholder groups.	
Topics mentioned only in the expert based study			
Energy security	-The IEA (2014) projects world oil supply to rise to 104 million barrels per day in 2040 and estimates this will require some USD 900 billion per year of investment in upstream oil and gas development by the 2030s. The Middle East and the Russia/Caspian region will likely remain the largest oil exporters over the next decades, while Asia Pacific and Europe will remain the largest importers. (20) -Demand for natural gas will grow by more than half, the fastest growth rate of all fossil fuels (21)	Alignment = low CIMULACT only implicitly acknowledges energy security concerns, whereas teh expert report highlights multiple factors that threaten	Alignment = none

	-an increasingly flexible global trade in liquefied natural gas will offer some protection against the risk of supply disruptions (21) -A more stringent mitigation scenario that leads to CO2-equivalent concentrations of about 450 parts per million in 2100 would meet the 2°C targets agreed at the recent Paris climate conference. This **2°C Scenario (2DS) is characterised by 40-70% reductions in global GHG emissions by 2050 compared with 2010.** It will mean increasing the share of low-carbon electricity supply from the current share of approximately 30% to more than 80% by 2050 (22) - Synthetic biology may also help meet bio-economy objectives, i.e. reduction of greenhouse gas emissions and attaining food and energy security. (67)	energy security in both the developed and developing world.	

4 GRAND CHALLENGE 4 – Transportation

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities.	-**Transportation will be the second largest consumer of energy in 2040.** While car numbers are projected to expand with a growing global middle class, fuel efficiency improvements mean energy demand from cars will rise only slightly. Hybrid vehicles could account for nearly 50% of new-car sales by 2040, compared with just 1% in 2010 (ExxonMobil, 2015). This effect will be especially noticeable in Europe, where liquid fuels consumption is expected to decline (19) Some car manufacturers have started to sell vehicle-to-home systems, enabling customers to use vehicles to charge homes and vice versa. In the future, supercapacitors (high-capacity electrochemical capacitors) that store kinetic energy in pendulum movements and charge nearly without time delay, could also allow cars to charge during normal stops in traffic, e.g. at traffic lights (Kuusi and Vasamo, 2014). (65) Indeed, **urbanisation can be an important dynamo of economic growth:** cities generally provide easier access to modern and efficient infrastructure – for example**, public transportation**, housing, electricity, water and sanitation – for large numbers of people in an economically efficient manner (OECD, 2012b; UN, 2014). (14)	Alignment = low Expert report discusses different technoloy groups that are essential to sustainable transport, but it does not reflect the sytemic and societal views that are emphasized by the CIMULACT findings.	Alignment = low

This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).		Alignemnt = none CIMULACT view personal life-style choice as integral to developing future transportation systems.	Alignment = none
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate	Indeed, **urbanisation can be an important dynamo of economic growth:** cities generally provide easier access to modern and efficient infrastructure – for example, **public transportation**, housing, electricity, water and sanitation – for large numbers of people in an economically efficient manner (OECD, 2012b; UN, 2014). (14)	Alignment = low Expert report only mentions that cities are providers of more resource efficient systems, including transportation, due to mainly popoulation density.	Alignment = low

and disaggregate, trains of units and local capillary distribution, …).		CIMULACT promotes reearch into alternative organizational models that can be experimented with to make better use of existing infrastrucutre, and address more localized and community needs.	
Topics mentioned only in the expert based study			
Transportation Systems	Commercial transport – including airplanes, shipping, trains and trucks – will account for virtually all of the growth in energy demand from transportation. Most of this demand growth will be met by oil (ExxonMobil, 2015). (19) *Transport systems* The IoT holds great promises for the improvement of transport management and road safety. Sensors attached to vehicles and elements of the road infrastructure may become interconnected, thereby generating information on traffic flows, the technical status of vehicles and the status of the road infrastructure itself. Traffic lights and road toll systems may be adapted to the actual road usage, emergency services can be triggered automatically, and car theft protection may be enhanced (OECD, 2015h).(51) Direct product manufacturing using printing technologies can reduce the number of steps required for parts production, transportation, assembly and distribution, reducing the amount of material wasted in comparison with subtractive methods (OECD, 2015c). (64)	Alignment = low The expert report examines components of the transportation systems topic that are not mentioned (much) in the CIMULACT recommendations - specfically technological advances for logistics of goods and resrouce transport, smart traffic sensors, and distributed manufacturing which lowers commercial transport demand.	Alignment = none

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	-A growing world population and increasing economic development will enlarge global demand for water, food and energy, putting further pressures on the natural environment. Continued degradation and erosion of the natural environment is expected to occur over the coming decades, which, when taken together with climate change, raises the risk of irreversible changes that could endanger two centuries of rising living standards. These environmental challenges will need to be systemically addressed in the context of other global challenges, notably water, food and energy security (17)	Alignment = low Expert report mentions environmental challenges and the trends that are likely to fuel them over the long term (population growth, growing middle class demands, etc.) CIMULACT is more focused on creating systems and policies that encourage more sustainable behavior, particularly among those populations that might already be considered affluent and developed. CIMULACT also	Alignment = low

		mentions social innovation and legal rights for non-humans as potential policy directions.	
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy well-being are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	-While cities will make it easier to provide modern energy and water infrastructures to a growing number of people, air pollution and unmanaged waste will be major concerns for public health in many urban areas (15) -changing diets, driven by a growing middle class, will lead to additional demand for more resource-intensive types of food, such as meat. (18)	Alignment = low Expert report mentions urgency in more efficient consumption of resources and food in terms of both systems and individual behaviors. CIMULACT, more focused on individual behavior, and the legal frameworks that shape that behavior, seeks to carve out legislation that can generate co-responsibilits (corporate and citizenry) and incentivize new values and behavior.	Alignment = low
Production awareness	**By 2030, firms will be predominantly digitalised**, enabling product design, manufacturing and delivery processes to be highly integrated and efficient. (35)	**Alignment = low**	Alignment = low

Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	Additive manufacturing – also commonly known as 3D printing – encompasses different techniques that build products by adding material in layers, often using computer-aided design software (OECD, 2015c; VDI Technologiezentrum GmbH, 2015). (61) The digitisation of 3D printing technologies will allow product design, manufacturing and delivery processes to become more integrated and efficient. As 3D printing will drive digital transportation, storage, creation and replication of products, it has the potential to change work patterns and to spark a production revolution. (64) 3D printing could also offset the environmental impacts of traditional manufacturing processes and supply chains due to lower waste production. Direct product manufacturing using printing technologies can reduce the number of steps required for parts production, transportation, assembly and distribution, reducing the amount of material wasted in comparison with subtractive methods (OECD, 2015c). (64)	Expert report focuses more on technologies that could disrupt production models and systems, and create more (business) efficiency. CIMULACT emphasizes technologies, policies, design parameters, and social practices that promote resource efficiency in terms of environmental impact and sustainabaility.	
Topics mentioned only in the expert based study			
Resource Scarcity	- A growing world population and increasing economic development will enlarge global demand for water, food and energy, putting further pressures on the natural environment (17) -Based on continuing socio-economic trends and no new policies to improve water management (a baseline scenario), water demand is projected to increase by 55% globally between 2000 and 2050. Agriculture will remain the largest consumer of water, but sharp increases in demand are expected from manufacturing (+400%), electricity generation (+140%) and domestic use (+130%) (17) -Groundwater is being exploited faster than it can be replenished across many parts of the world – the depletion	Alignment = none Expert group emphasizes multiple resource categories that are likely to see dramatic supply stresses over the long term. Such urgency concerning increased	Alignment =

	rate more than doubled between 1960 and 2000 – and is also becoming increasingly polluted. By 2050, groundwater depletion may become the greatest threat to agriculture and urban water supplies in several regions (18) -An increasing number of regions will face water scarcity, and the competition for scarce water resources could lead to internal and international conflict (18)	demand and bottlenecks in supply are not the direct focus of CIMULACT.	
Environmental disasters and threats	-1.6 billion people – almost 20% of the world's population – are projected to be at **risk from floods.** The economic value of assets at risk is expected to be around USD 45 trillion by 2050, a growth of over 340% from 2010 (18) -**Soil degradation** will affect the amount of land available for productive agriculture: around half of the world's agricultural land is already affected by moderate to severe degradation and around 12 million hectares of productive land become barren annually due to desertification and drought (18) -Heat waves will likely occur more often and last longer, while extreme precipitation events will become more intense and frequent in many regions. Rainfall will most likely increase in the tropics and higher latitudes, but decrease in drier areas. The oceans will continue to warm and acidify, strongly affecting marine ecosystems. The global mean sea level will continue to rise at an even higher rate than during the last four decades. The Arctic region will continue to warm more rapidly than the global mean, leading to further glacier melt and permafrost thawing. However, while the Atlantic Meridional Overturning Circulation will most likely weaken over the 21st century, an abrupt transition or collapse is not expected (22) -Reducing and managing the risks of climate change will require a mixed strategy of mitigation and adaptation. The extent of mitigation efforts will determine levels of future GHG emissions: without additional efforts beyond those al-	Alignment = low CIMULACT tends to value and promote sustainabaility and environmental protection without specifically detailing the numerous threat vectors to ecologies as found in the expert report.	Alignment =

	ready in place today, warming by the end of the 21st century will lead to a high risk of severe, widespread and irreversible impacts globally, even with adaptation (22)		

5.2 Urban and Rural development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	-High fertility rates combined with limited job prospects in many rural areas are important drivers of urbanisation, as cities typically offer better jobs and educational opportunities. (14)	Alignment = none Expert report seems to only mention 'rural' regions as a source for people and captial that is migrating towards cities. CIMULACT calls for experimentation to create balanced relationships between urban and rural environments, such that neither is neglected while the other grows unsustainably.	Alignment = low
Making dense and growing urban areas more sustainable and liveable	-By 2050, the urban population is expected to surpass 6 billion – up from less than 1 billion in 1950. By 2100, it is likely to reach somewhere around nine billion, corresponding to close to 85% of the projected global population (14)	Alignment = med Expert group outlines long-term	Alignment = low

Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	-Indeed, urbanisation can be an important dynamo of economic growth: cities generally provide easier access to modern and efficient infrastructure – for example, public transportation, housing, electricity, water and sanitation (14) -Building on advances in sensors and their connectivity through high-performance computing – the so-called Internet of Things – urban areas in more advanced economies will increasingly become **"smart cities"**. Various utility and transport networks and systems will become progressively interconnected, thereby supporting more sustainable use and management of resources (15) -While cities will make it easier to provide modern energy and water infrastructures to a growing number of people, air pollution and unmanaged waste will be major concerns for public health in many urban areas (15) -The IoT also holds promise for other efficiency gains in the functioning of cities. Embedded sensors in waste containers and water infrastructure management enable the streamlining of garbage collection and may improve water management (MGI, 2013). Furthermore, location-based services that citizens may use on their mobile phones can give city planners new insights into the usage of the public road infrastructure (OECD, 2015h). (50)	trends that are impacting urbanization, alongside many of the benefits that urbanization might be generating (innovation, economic growth, etc.), and enabling technologies that will further support efficient use of resources and infrastructures in urban settings. CIMULACT further emphasizes social services and their provision, redefined values and human behavior, and greater citizen consultation.	
Topics mentioned only in the expert based study			
			Alignment =

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	- inflows of migrant workers will be an important factor to mitigate ageing in most OECD economies (12) -International migration, while potentially solving anticipated labour and skills shortages in receiving countries, will see the size and importance of ethnic minority communities grow. Some of these may be poorly integrated and economically disadvantaged, which may lead to tensions and instability (UK Ministry of Defence, 2014). This may make it more difficult for governments to win support for more open and forward-looking immigration policies (ESPAS, 2015). Immigration will also be challenged by inequalities: in societies with a shrinking middle class, openness is likely to be perceived as a threat to well-being and job security. Rising populism could also see governments use migrants as scapegoats for existing social problems (EUISS, 2010). (13) - Migratory movements show no sign of slacking, as the long drawn-out conflicts among other places in North and sub-Saharan Africa and the Middle East drive people to seek safe havens in Europe, and income and wealth disparities across the globe continue to attract people from poorer to more prosperous countries (27) -Also at risk are young adults, who make up an increasing share of the poor. The increase in youth poverty is to be found particularly among youngsters not in education, employment or training who run a greater than average chance of unemployment, lower wages, poorer health and therefore a	Alignment = low Expert report tend to emphasize the trends of migration, and potential challenges that those migrants might present incumbent populations. CIMULACT goes beyond these assessments and promotes a number of topics and research agendas that can help build community across diverse populations, that can strengthen legal normas	Alignment = med

	greater risk of long-term “scarring”. In many countries, migrant families and their children are also at risk. Within Europe, this is particularly true of non-EU immigrant families and their offspring (Jokinen and Kuronen, 2011). And finally, there are those families facing persistent poverty. These are most likely to be older people, single people (especially women both with and without children) and jobless households. (42)	and expectations for both groups (migrant and incumbent), and empowering political and social activity of diverse populations.	
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens’ and experts’ contributions		Alignment = none	Alignment = none
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard:		Alignment = none	Alignment = none

Decentralization: Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action			
Topics mentioned only in the expert based study			
			Alignment =

6.2 Participatory governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.		Alignment = none	Alignment = none
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	-Increasing access to public science has the potential to make the entire research system more effective and productive by reducing duplication and the costs of creating, transferring, and re-using data; by allowing the same data to generate more research, including in the business sector; and by multiplying opportunities for domestic and global participation in the research process (OECD, 2014b). The rise of open data and open access policies and infrastructures is already making isolated scientific datasets and results part of big data. The number of stakeholders involved in research practices and policy design will continue to increase, making science a citizen endeavour, reinforcing a more entrepreneurial approach to research and encouraging more responsible research policies. (52)		Alignment = high

	-There is a threat that citizen- and challenge-driven scientific agendas may focus on more immediate and applied outcomes to the detriment of longer-term blue-skies research. Fundamental research is by its nature unpredictable and a too-risky endeavour for market interests. To ensure future opportunities are not to be missed, fundamental research that is disconnected from current challenges will need to be preserved. (73) -Increasing access to scientific research results has the potential to make research systems more efficient by reducing duplication and data management costs. The same data could generate more research and more opportunities for domestic and global participation in the research (OECD, 2014b). Supporting this, there is general recognition that scientific goods generated with taxpayer money are public goods and should be made public with a view to increasing social return. Open access to scientific knowledge, especially for low-income countries and especially in fields of general interest (e.g. health), may be a key driver of more inclusive growth. (73) -A growing number of policy initiatives aim to foster industry-science co-operation and speed the transfer of public research results to society, while a growing number of research system intermediaries aim to smooth and improve transfers (e.g. technology transfer offices, patent funds, intellectual property brokers). (75) -Participation in research systems has expanded beyond the traditional researcher, university, government lab and firm, to involve broader communities of students, local actors, networks and society as a whole. Society is increasingly engaged in research policy design through public consultation. Awareness campaigns, norms and scientific communication could encourage the uptake of innovation, greater acceptance of scientific discoveries and the embrace of scientific careers. Society will also be increasingly involved in research activities per se, for instance in data collection, project definition or		

	crowdsourcing. Because of higher levels of education and widespread availability of a cheap Internet and online information supports (e.g. science blogs), citizen science is emerging as an open, networked and increasingly polarised and "bottom-up" process. (76) -students and citizens will need to acquire skills for participating in the scientific endeavour, interacting with the research community and contributing actively to an open scientific culture. Some countries are currently developing data science curricula to address this issue, but more will need to be done(77) -Sharing results openly online and reusing results and data produced by others supposes a radical shift in academic culture. Recent surveys on the behaviour of scientists reveal that not all researchers are necessarily aware of the possibilities offered by open science (OECD, 2015n). As scientific information is increasingly discussed and disseminated through science forums, blogs or conference proceedings, patterns in publishing and recognition are changing. Research culture and career paths will have to change accordingly.(77)		
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.		Alignment = none	Alignment = none
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes		Alignment = none	Alignment = none

of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.			
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	- Already by 2020 emerging economies are likely to be in possession of almost 40% of global financial assets, doubling their share since 2010 (27) -While the concept of the circular economy means different things to different people, many would nonetheless agree that it **implies a systemic change**, moving to a zero- or at least low- waste, resource-efficient society and involving big changes to our methods of both production and consumption. Looking beyond the potential for materials savings and a smaller footprint on the environment that a move away from the established “take, make and dispose” model could bring, a circular economy would create huge economic opportunities as new services and business models emerge and the relationship between producer and consumer, and between a product and its user, undergoes radical transformation. Repair, re-use, re-distribution and re-manufacture would increase, as well as recycling rates; materials technology would evolve and enable a move from non-renewable materials to the production and use of high levels of renewable materials in finished products (Waste Management World, 2015). This scaling up of the shift to a circular economy promises to deliver substantial macroeconomic as well as corporate benefits. The materials savings potential alone is thought to be over a trillion dollars annually (WEF, 2014; McKinsey Centre for Business and Environment and The Ellen MacArthur Foundation, 2015). (31) -**high-frequency computer trading and a disproportionate focus on quarterly earnings will likely continue to bias capital markets towards short-termism.** A key policy challenge will therefore be to establish long-term investment incentives that offset tendencies in the financial system to measure profit margins on a short-term basis (WEF, 2011). Institutional investors with a longer-term return horizon, such	Alignment = med Expert report provides a solid overview of many of the ecnomic factors and trends that are likely to have an important long term impact, as well as mentioning at least one alternative economic model that could be developed (circular economy).	Alignment = med

	as pension funds, sovereign wealth funds, or foundations, could help counterbalance this trend, particularly if a larger proportion of their investment portfolios could be targeted at financing innovative young firms (39)		
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.	-World GDP is expected to more than triple by 2060, per capita incomes are also set to rise rapidly, and wealth accumulation is anticipated to continue apace. However, whether this will also be a better world depends very much on how incomes and wealth will be distributed across the globe and within countries. (40) -The evidence suggests that what matters most is the gap between low-income households and the rest of the population. Indeed, over the last 30 years, incomes at the low end of the scale often grew much more slowly during the prosperous years and decreased during downturns. Unsurprisingly perhaps, for the vast majority of developed countries for which data are available, poverty rates increased from the mid-1990s to the 2010s, pushing up rates for the OECD area as a whole by 1.5 percentage points.(41) -Over the last couple of decades the risk of poverty has shifted markedly away from the elderly towards families with children. Hence, large families with three or more children also tend to have higher levels of poverty risk. Moreover, **child poverty is seen to be increasing in almost all OECD and EU countries.** On average across the OECD, the child poverty rate increased from 12.2% in 2000 to 13.2% in 2010 (41) -Also at risk are young adults, who make up an increasing share of the poor. The increase in youth poverty is to be found particularly among youngsters not in education, employment or training who run a greater than average chance of unemployment, lower wages, poorer health and therefore a greater risk of long-term “scarring”. In many countries, migrant families and their children are also at risk. Within Europe, this is particularly true of non-EU immigrant families and their offspring (Jokinen and Kuronen, 2011). And finally, there are those families facing persistent poverty. These are most	Alignment = low Expert report discusses numerous economic trends, while leaving these trends social or anthropocentric impacts largely vague. Wealth distribution is emphasized as largely impactful regarding quality of life issues. CIMULACT is more braodly interested in new, comprehensive alternative economic frameworks - learning about them historically and through continued experimentation, including transitional phases between current and future systems.	Alignment = low

	likely to be older people, single people (especially women both with and without children) and jobless households. (42)		
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects	-As smart machines replace human workers in jobs, reproducible goods and services could be produced at lower marginal cost and become almost free. Productivity gains and economic growth could thus be disconnected from job creation and well-being. However, a no-job growth jeopardises public budgets and social safety net systems. A drop in employment would be echoed by a proportional drop in the tax base and government revenues. Social contributions and personal tax income accounted for an average 18% of OECD GDP in 2013 (OECD, 2015j). Likewise, employment-based pension systems are threatened. As workers may be left without salary, income redistribution policies will become more central to future social cohesion. The challenge could be of an unprecedented scale to avoid growing inequality. (55)	Alignment = low Expert grou pdoes not specifcally mention Universal Basic Income, but does reflect on a number of factors that could make such a system appealing if not necessary. CIMULACT, on the other hand, encourages widespread experimentation with UBI immediately to find out the various social, cultural, and other localized factors that can make UBI schema fail or succeed.	Alignment = low
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living.	-World GDP is expected to more than triple by 2060, per capita incomes are also set to rise rapidly, and wealth accumulation is anticipated to continue apace. However, whether this	Alignment = low Expert group does mention how a circular economy model of	Alignment = low

It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.	will also be a better world depends very much on how incomes and wealth will be distributed across the globe and within countries. (40) -**Inequalities within countries will pose major political, social and economic risks in the coming years.** Over two-thirds of emerging and poor countries, encompassing 86% of the population of the developing world, will experience growing inequalities. (40)	resource use and waste management can be helpful to addressing needs of a sustainability-oriented society. CIMULACT calls for much broader experimentation with circular economic models alongside numerous other alternative economic frameworks. They also call for UBI experiments, and research into transition practices and policies to encourage a smoother changeover between economic systems.	
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.	-Banks and other lenders represent the largest component of the financial sector and have expanded at broadly similar rates. Intermediated credit and stock market capitalisation have also increased. While these trends may hold over the next 10 to 15 years, if not intensify as financial services further develop in emerging economies, digitalisation promises to disrupt the sector considerably. For instance, banks' lending role will be increasingly challenged by digitally-enabled peer-to-peer lending platforms, while equity crowdfunding is also expected to grow (38)	Alignment = low Expert report highlights the powerful role of the financial services sector, and points to tehnologically driven disruption within the sector going forward. CIMULACT suggests research into policy based reform to incentivze financial institutions to act sustainably, and in a socially responsibe and inclsuive manner.	Alignment = low

Topics mentioned only in the expert based study			
General economic risks	- The fact that armed conflict can impact negatively on openness to trade and investment seems intuitively obvious, and yet the matter has attracted little attention from economic research until fairly recently. Work by Kamin (2015), for example, suggests that major conflicts can indeed reduce trade flows (by up to two-thirds) … For exporting nations, understanding and anticipating the risks and the nature of these economic impacts will be an important part of conducting business in an increasingly complex geopolitical future. (30)	Alignment = none	Alignment =
Reducing growing inequality	-**Inequalities within countries will pose major political, social and economic risks in the coming years.** Over two-thirds of emerging and poor countries, encompassing 86% of the population of the developing world, will experience growing inequalities. (40) -The evidence suggests that what matters most is the gap between low-income households and the rest of the population. Indeed, over the last 30 years, incomes at the low end of the scale often grew much more slowly during the prosperous years and decreased during downturns. Unsurprisingly perhaps, for the vast majority of developed countries for which data are available, poverty rates increased from the mid-1990s to the 2010s, pushing up rates for the OECD area as a whole by 1.5 percentage points.(41) -Over the last couple of decades the risk of poverty has shifted markedly away from the elderly towards families with children. Hence, large families with three or more children also tend to have higher levels of poverty risk. Moreover, **child poverty is seen to be increasing in almost all OECD and EU countries.** On average across the OECD, the child poverty rate increased from 12.2% in 2000 to 13.2% in 2010 (41) -Also at risk are young adults, who make up an increasing share of the poor. The increase in youth poverty is to be	Alignment = Low CIMULACT implies wealth distribution inequality alongside many other forms of inequality that are propagating across the EU. The expert report spends more time outlining the problem , its causes, and its impacts, than suggesting research for finding solutions.	Alignment =

	found particularly among youngsters not in education, employment or training who run a greater than average chance of unemployment, lower wages, poorer health and therefore a greater risk of long-term “scarring”. In many countries, migrant families and their children are also at risk. Within Europe, this is particularly true of non-EU immigrant families and their offspring (Jokinen and Kuronen, 2011). And finally, there are those families facing persistent poverty. These are most likely to be older people, single people (especially women both with and without children) and jobless households. (42) -Recent analysis (e.g. Piketty and Zucman, 2013; Braconier et al., 2014) suggests that the trend towards increasing inequality in incomes and wealth will very likely continue for many years to come. Indeed, based on current trends, **earnings inequality in an average OECD country could rise by more than 30% by mid-century,** bringing OECD economies as a whole to the same level of inequality experienced in the United States (43) -**inequality undermines education opportunities for the disadvantaged,** which in turn reduces social mobility, leading to a slowing of human capital accumulation. Survey results tend to support this theoretical approach. The OECD’s Adult Skills Survey (PIAAC) demonstrates that widening income disparities hamper the development of skills among those segments of the population with poorer educational background. (44) - Growing social inequalities will result not only from job destruction and employment polarisation that will inevitably come along with the structural shift in skills, but also from weaker social mobility and a persisting digital divide. Discrimination enabled by data analytics may result in greater efficiencies, but may also limit an individual’s ability to modify path-dependent trajectories and escape socio-economic lock-ins. In addition, a new digital divide is arising from growing information asymmetries and related power shifts from individuals to organisations, from traditional businesses to data-driven businesses, and from government to data-driven busi-		

	nesses (OECD, 2015i). Social cohesion and economic resilience could be undermined, especially in developing economies. (53)		

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = none	Alignment = none
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in		Alignment = none	Alignment = none

development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	*The rise of citizen science* Participation in research systems has expanded beyond the traditional researcher, university, government lab and firm, to involve broader communities of students, local actors, networks and society as a whole. Society is increasingly engaged in research policy design through public consultation. Awareness campaigns, norms and scientific communication could encourage the uptake of innovation, greater acceptance of scientific discoveries and the embrace of scientific careers... Society will also be increasingly involved in research activities per se, for instance in data collection, project definition or crowdsourcing. Because of higher levels of education and widespread availability of a cheap Internet and online information supports (e.g. science blogs), citizen science is emerging as an open, networked and increasingly polarised and "bottom-up" process. (75)	Alignment = med Expert report rightly outlines the increase in citizen participation in research across numerous sectors. Both reports emphasize the broad impacts of cititzen science across diverse communities, including the need to address polarization and foster inclusivity and social cohesion. CIMULACT calls	Alignment = med

		for tighter integration of these trends within educational systems (from curricula, to merits or credits), and for promoting social challenges (divisions across cultures, ages, and other inequalities)	
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	-As digital technologies make ever-deeper inroads into education, and in particular at university level, learning methods and strategies will change. The scope for personalisation is already expanding, as the capabilities and the willingness to use digital resources help create bespoke pathways for learning, for example by breaking the courses into modules and enabling students and instructors to re-configure the modules to suit the learning situation. Then there is analysis and use of "big data", which offers more nuanced and timely insights into all kinds of learning processes and tailoring of content to specific learning contexts. Nonetheless, far from placing the technology and the IT infrastructure in the foreground, the focus is expected to continue to shift toward conceiving it as a **digital learning environment** (45) -Today's education systems should ensure that young people are equipped with the right skills to perform in tomorrow's AI-enhanced environment. Training systems will help smooth the	Alignment = low Expert group calls for technology to have deeper connection to education system writ large. However, CIMULACT further requires that such technologies be broadly co-developed with the students	Alignment = med

	transition and ensure people can follow the unpredictable learning curve of AI. (55)	and communities into which they are deployed, and that they should emphasize creativity and critical thinking, rather than just knowledge dissemination.	
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.	Multidisciplinary sciences have drawn increasing policy attention. The convergence of key emerging technologies, encompassing information and communication technologies (ICTs), nanotechnology, biotechnology and cognitive sciences, is expected to create opportunities that may be difficult to seize in discipline-based public research systems. Many countries have already started to reform public research governance, evaluation and funding to encourage greater cross-fertilisation of ideas (OECD, 2014b). (75)	Alignment =low Expert group rightly outlines the ecological conditions or systemic thinking that is currently challenging the more traditional, siloed approach to education. However, the expert group does not tie these changes into education system reform, curriculum redesign,	Alignment = low

		or alternative pedagogies, which CIMULACT does.	
Topics mentioned only in the expert based study			
Educated Women	Growth in female enrolment at all levels of education will continue, and will have important implications for labour markets and family life. (7) Through concerted efforts by governments, civil society and the development community, **girls' enrolment at all levels of schooling in the developing world has risen significantly over the last two decades.** Most low-income countries, for example, made substantial progress during the 1990s in achieving gender parity in both primary school enrolments and literacy.(44) At the higher education level, too, gender equality is making significant inroads. In most OECD countries, women already account for at least 50% of tertiary education enrolments. That proportion could increase yet further through 2025 – to over 70% in Austria and the United Kingdom, and well over 60% in North America and parts of Scandinavia (OECD, 2008). It goes without saying that the emergence of such strongly qualified female cohorts has important implications for economic growth, labour markets, family life, patterns of childcare and elderly care. (44)	Alignment = low CIMULACT only implicitly mentions this type of disparity along more general types of inequality, whereas the expert report spends a significant amount of time detailing how this is a major issue with glboal consequences.	Alignment =

Digitized Education Paradigms	As digital technologies make ever-deeper inroads into education, and in particular at university level, learning methods and strategies will change. The scope for personalisation is already expanding, as the capabilities and the willingness to use digital resources help create bespoke pathways for learning,...(45) Nonetheless, far from placing the technology and the IT infrastructure in the foreground, the focus is expected to continue to shift toward conceiving it as a **digital learning environment** (Brown, 2015). Access to education, of course, is not necessarily access to knowledge. The future is on a course that will increasingly thrive on ubiquitous access to ever-growing volumes of information and data in contexts other than those of a structured learning/teaching environment. The keys are the growing penetration of the Internet and mobile technology. (45)	Alignment = low CIMULACT does mention technology in regards to education, but expert group specifically discusses how technologies influence over education could become increasingly invisible (data behind the scene) and highly personalized by design (not as product of co-development).	Alignment =
Inequalties and Education	[Developing] countries are typically among the poorest and already struggle to provide educational and employment opportunities for their young people. A reservoir of disaffected young people with low education and few job opportunities may lead to greater political and social instability. (10) New large economies in 2030 (measured in total GDP at purchasing power parity [PPP]) will include Mexico, Indonesia, Turkey, Nigeria and Viet Nam, their eventual success depending	Alignment = low Again, inequalities and education are both implicitly and explcitily discussed in CIMULACT, but they are rarely paired for analyses as they	Alignment =

	largely on the quality of their governance and of their economic policy, their demographic profile and the level of education they provide to their citizens (ESPAS, 2015). (24) Also at risk are young adults, who make up an increasing share of the poor. The increase in youth poverty is to be found particularly among youngsters not in education, employment or training who run a greater than average chance of unemployment, lower wages, poorer health and therefore a greater risk of long-term “scarring”.(42) The reasons, it is suggested, are to be found primarily in human capital accumulation theory: **inequality undermines education opportunities for the disadvantaged,** which in turn reduces social mobility, leading to a slowing of human capital accumulation.(44) **The average level of educational attainment is set to rise more quickly in developing countries than in advanced economies, shrinking the gap between the two.** The number of students around the globe enrolled in higher education is forecast to more than double to 262 million by 2025. Nearly all of this growth will be in the developing world, with more than half in China and India alone.(44)	are in the expert report.	

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	-The number of connected devices in and around people's homes in OECD member countries will probably increase from 1 billion today to 14 billion by 2022 (OECD, 2015h). By 2030, it is estimated that 8 billion people and maybe 25 billion active "smart" devices will be interconnected and interwoven by one single huge information network (OECD 2015i). Other estimates indicate a number of 50 to 100 billion connected devices in and outside people's homes by 2020 (Evans, 2011; MGI, 2013; Perera et al., 2015). The result is the emergence of a gigantic, powerful "superorganism", in which the Internet represents the "global digital nervous system" (50) -Security and privacy are considered the most important risks relating to the IoT. Hackers may be able to remotely take over connected objects such as the electricity grid and driverless cars or manipulate IoT-generated data. The reliability of the network is a major issue, since human lives may depend on successful, sometimes real-time transfers of data. The key issue of consent and perhaps the notion of privacy itself are also challenged by the near-continuous flow of sensitive data that the billions of ubiquitous sensors will produce (OECD, 2015h). Furthermore, artefacts in the IoT can become extensions of the human body and mind. Human autonomy and agency may be shifted or delegated to the IoT, with potential risks for users' privacy and security (IERC, 2015). (51) -Conflicts with existing regulation and regulatory uncertainty may act as bottlenecks when rolling out IoT services nationwide (OECD, 2015h). The international dimension of the IoT	Alignment = high Both the expert report and CIMULACt recognize that large-scale data collection represents both a breakthrough in our capacity to analyze the world, and provide critical insights across a wide spectrum of interactions. Additionally, both reports are keen to emphasize certain individual protections, and highlight	Alignment = med

	adds further to the complexity, since objects and artefacts could be controlled remotely from abroad while litigation is treated under national legal frameworks (51) - Legal institutions must also evolve to better promote a seamless flow of data across nations, sectors and organisations. There are growing concerns about how to define and appropriate open access rights, while maintaining publishers' and researchers' incentives to keep publishing and performing research. International co-operation will be key in that respect (53) -Big data analytics may enable a massive brewing of personal data that become accessible to a large number of actors (everyone?) in a way that is unpredictable and could become uncontrollable, as the volume, velocity and variety of data increase. For instance, patients sharing sensitive health data may support medical research and benefit from preferential medical treatment. Yet medical data made accessible to business interests (e.g. insurance companies and employers) raises a major issue of privacy and equity. Privacy is also endangered if these data are not well protected and if hacking or misuse could result from breaches in security. (53) -The Internet of Things (IoT), i.e. greater connectivity of a growing number of apps, sensors and self-tracking tools, combined with participatory sensing and self-reported data, are generating trillions of bytes of information whose storage, curation, preservation, protection and dissemination require new knowledge and capacity. (77)	that trust and access are central to the efficacy of big data.	
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools.	Looking ahead, **the number of students seeking study abroad could double to 8 million by 2025.** Average annual growth in demand for international higher education between 2005 and 2025 is expected to exceed 3% in Africa, the Middle East, Asia, Central America and South America (Goddard, 2012). (45)	Alignment = Low The majority of the expert report is focused on more macro level issues and perspectives	Alignment = low

There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.	There are as yet 4.2 billion or 57% of the world's people who still do not enjoy regular access to the Internet (ITU, 2015). For some observers, however, **the digital divide may soon be bridged, namely by mobile technology** (ITU, 2015). (45)	(everywhere), whereas CIMULACT tends to value and promote the local (here) perspectives and knowledge.	
Transforming technologies for planet and people In order to ensure that technology is being used for the well-being of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	National research policy frameworks are increasingly shaped by a more global context, as science, technology and innovation networks extend beyond national frontiers. Countries, firms, universities and researchers are increasingly organised into open and collaborative networks that connect local research and innovation hubs across frontiers (Figure 32). Ideas, assets and resources concentrate in these pockets of excellence. At stake is the capacity of research ecosystems to offer attractive environments to highly mobile talent and international investments, including robust (and expensive) research infrastructures, e.g. libraries and information archives that both will need to be renewed as they wear out or become outdated. (78)	Alignment = med The expert report emphasizes the growing impact of transnational or global context of research in shaping policy frameworks, and the growing trend of collaboration across public-private, discipleneray, and other "boundaries." Developing new understandings of research ecosystems is critical in the expert assessment. This echoes	Alignment = low

		CIMULACT suggestions, however, those are more focused on human centric research, participatory processes, and environmental sustainability.	
Topics mentioned only in the expert based study			
Reducing the risk of Technology-abuse	- Security and privacy are considered the most important risks relating to the IoT. Hackers may be able to remotely take over connected objects such as the electricity grid and driverless cars or manipulate IoT-generated data. The reliability of the network is a major issue, since human lives may depend on successful, sometimes real-time transfers of data. The key issue of consent and perhaps the notion of privacy itself are also challenged by the near-continuous flow of sensitive data that the billions of ubiquitous sensors will produce (OECD, 2015h). Furthermore, artefacts in the IoT can become extensions of the human body and mind. Human autonomy and agency may be shifted or delegated to the IoT, with potential risks for users' privacy and security (IERC, 2015). (51) - Legal institutions must also evolve to better promote a seamless flow of data across nations, sectors and organisations. There are growing concerns about how to define and appropriate open access rights, while maintaining publishers' and researchers' incentives to keep publishing and performing research. International co-operation will be key in that respect (53) - Big data analytics offers a unique possibility to combine personal data with pattern recognition programmes, enabling the	Alignment = Low There are many instances in which CIMULACT speaks to safeguarding against technological development, but the expert report explicitly outlines some of the dangers that can arise from the abuse of data, security breaches, and other forms of risk that new tehnologies introduce.	Alignment =

	generation of new information and knowledge about people (ITF, 2014). However, the same data and same programmes could serve to manipulate people, distort their perception of reality and influence their choices (Glancy, 2012; Helbing, 2015; IERC, 2015; Piniewski et al., 2011). Individual autonomy, free thinking and free will would be challenged, potentially undermining the foundations of modern democratic societies. (53)		
Nanomaterials	- Nanomaterials face several challenges if they are to find widespread commercial applications. On a technical level, signal transmission between the nanoscale and the macroscopic world remains problematic, as does controlling mechanical responses at the nanoscale (Fahlman, 2011). These technical restrictions continue to hinder development of cost-effective, large-scale commercial applications of nanomaterials. There are also questions around unintended hazards (toxic effects) to humans and the environment. While particle size alone is insufficient to account for toxicity (SCENIHR, 2009), using nanomaterials in some specific environments may need to be regulated (OECD, 2015k). For example, due to their small size, nanoparticles can permeate cell membranes (via skin absorption, ingestion, inhalation) and travel to places in the body where larger particles cannot physically reach (Suran, 2014). The same risk has to be considered for the use of nanoparticles in agriculture (Das et al, 2015). Risk assessment is still confronted with a considerable lack of data on exposure of nanomaterials to the environment, requiring further research (EC, 2014a; OECD, 2011c; Fahlman, 2011). (62)	Alignment = none CIMULACT does not mention specific technological advance sectors like nano-materials, despite their capacity to fundamentally alter many social, industrial, and resource use pratices.	Alignment =

Further topics from the study

General importance of fundamental research	The imperative to restore a more inclusive growth; the needs of ageing societies; environmental pressures; the depletion of natural resources; threats to energy, water and food security; and various health issues all require new technological breakthroughs for which the disruptive potential of research will need to be mobilised. (73) Research is likely to remain high on policy agendas, and the utilitarian view of science is poised to strengthen. The increasing attention paid to ethical and societal dimensions of research is already reflected in the framing of more “responsible research and innovation” policies. Following these recent policy developments, govergovernments will likely encourage greater involvement of civil society in research policy. (73) Still, science will not be in a position to address all sorts of issues it is presented with. Moreover, there is a threat that citizen- and challenge-driven scientific agendas may focus on more immediate and applied outcomes to the detriment of longer-term blue-skies research. Fundamental research is by its nature unpredictable and a too-risky endeavour for market interests. To ensure future opportunities are not to be missed, fundamental research that is disconnected from current challenges will need to be preserved. (73) New public-private partnerships (PPPs) have emerged and reinforced a market perspective in academic research. As public budgets remain under pressure, PPPs will remain strategic policy instruments in the near future, and the traditional industry-science dichotomy will continue to blur through further cross-sectoral funding(75) But more technology platforms and physical spaces for researchers to meet are still needed. Likewise, governments will also need to support the interoperability of scientific infrastructure, shared methodologies and tools (e.g. codes, applications), standards for digital repositories, and common access rules.(76)	Alignment = Low CIMULACT supports amny different types of research, across numerous fields, but the expert report specifically support research more genrally, making the case for expanded nationa and international research programs.	Alignment = none

	Novel research fields will develop around data mining, machine learning, privacy, database interoperability etc. with a view to enabling big data science (EC, 2014b). Big data analytics should open new research avenues and create new business models. New research fields will also emerge from the convergence of technologies (e.g. bioinformatics, biosensors).(77) National research policy frameworks are increasingly shaped by a more global context, as science, technology and innovation networks extend beyond national frontiers. Countries, firms, universities and researchers are increasingly organised into open and collaborative networks that connect local research and innovation hubs across frontiers (Figure 32). Ideas, assets and resources concentrate in these pockets of excellence. At stake is the capacity of research ecosystems to offer attractive environments to highly mobile talent and international investments, including robust (and expensive) research infrastructures, e.g. libraries and information archives that both will need to be renewed as they wear out or become outdated. (78)		

Using foresight to support the next strategic programming period of Horizon 2020 (2016-2018), Ed. European Commission 2014

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.	The increasing capacity of individuals to do things and express themselves goes hand in hand with growing expectations for individual empowerment. Overall, re-defining the sense of self, which encompasses dimensions such as personal ambition, one's preferred lifestyle and work / career trajectory, is becoming an important priority for many, especially in the younger generations (11) Education is undergoing significant transformations, enabling increasingly personalized and tailored learning experiences.(13) Values drive the personal conduct of individuals and, in aggregate, that of economic actors. A polarisation in values would trigger contradictory behaviours and create tensions...On the other hand, the natural evolution of values and beliefs enables the development of new value systems in an on-going dynamic process. (23-4) The acceleration of technological convergence provides an increasing ability to deliver transversal service platforms cutting across established sectoral boundaries combining infrastructures and technology, which enable the delivery of individualized services to users through higher system responsiveness and intelligent user-interfaces. This is a powerful enabler which is reinforced by "personal aspirations and empowerment". (31)	Alignment = med The elements that compose this research area and make it a citizen priority are mentioned in various parts of the expert report, wherein they are viewed as trends that influence change across various sectors. They are not explicitly hilighted as research areas in the expert report, but are implied to be present in various research efforts across technologies an policies.	Alignment = med
Rethinking (the new) job market needs	Developing and operating transversal platforms requires new mixes of competencies, capabilities and modes of	Alignment = low Expert report hilights technology as main	Alignment = low

- Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability - Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	thinking, as production organization and supply chains can be potentially restructured in major ways.(31)	driver of new workforce skills in demand. The CIMULACT suggestions also add ethics, social accountabilitiy, and sustainabilitiy as key elements of job market research.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: - Daring to be different - The education system - Re-definition of values - Re-definition of welfare - The level of well-being		Alignment = none While the expert group does mention that organizational choice management will change due to technological adoption, etc, They do not place the same value on socilal defined values, welfare, nor do they have the same social focus on coping with change.	Alignment = none
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	The convergence of technology and medicine, aided by the intense collaboration already at play across national boundaries, will trigger innovation, such as nano-robots, remote surgery and personalised drugs & diets. (10) The combination of various scientific fields is bringing new applications which are adopted widely across society and hold promise for radical improvements in a wide array of domains, such as manufacturing, health, agriculture and service industries. (13)	Alignment = low Expert view tends to mention tech innovation as independent from social context, patient input, or critical local or regional differences. CIMULACT emphasizes 'engage people,' the importance of local-level practice, and grassroots entities.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally	The convergence of technology and medicine, aided by the intense collaboration already at play across national boundaries, will trigger innovation, such as nano-robots, remote surgery and personalised drugs & diets. (10) An important direction of change in the context of technological convergence which is facilitated by IT, concerns	Alignment = low Expert view is that technology (alone?) will enable high level of individualization in care, and seems more focused on cures than prevention. CIMULACT cites need for	Alignment = med

friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. • For the citizens to be trained on health and digital literacy.	the increasing ability to deliver transversal service platforms, combining infrastructures and technology and cutting across established sectorial boundaries, to deliver increasingly individualized services to users. (13) The acceleration of technological convergence provides an increasing ability to deliver transversal service platforms cutting across established sectoral boundaries combining infrastructures and technology, which enable the delivery of individualized services to users through higher system responsiveness and intelligent user-interfaces. This is a powerful enabler which is reinforced by "personal aspirations and empowerment" (p.31)	training for patients and doctors. collaborative learning and social psychology.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care.		Alignment = none	Alignment = none

2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.			
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	In science, shifts in the processes of generation of new knowledge are included in the phenomenon termed "Science 2.0" (including phenomena such as "big data" and citizen science). (15)	Alignment = low 'Science 2.0' implies new ways of conducting research and the process of innovation. CIMULACT provides details of what cititzens think such collaboration includes.	Alignment = low
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis	The main challenge posed in Europe by this driver is the gradual ageing of the population. This is usually seen as a threat, although the health expert panel gathered as part of the project workshop did point out that older citizens can, and do, contribute to the economic and social well being of Europe. This contribution is an area which, currently, is not well understood or quantified. (p.29)	Alignment = low Expert report speaks directly to the transversal challenges of an ageing population and how they might be addressed through STI and social interventions. CIMULACT adds re-	Alignment = low

• fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	Horizon 2020 can focus investment in technology areas which directly intervene in mitigating the effect of this ageing trend on European citizens (i.e. assistive technologies based on robotics; development of treatments for age-related diseases) (p.30) An additional strategic response should be in supporting social interventions that have an indirect effect on this trend, by combating the sense of isolation and personal loneliness experienced by older people. Supporting e-health and tele-medicine solutions, for example, can improve the ease of access to social services of increasing value to older generations, and strengthen personal confidence. (p.30)	search and fostering of 'socialcultural intergenerational relsationships.'	
Topics mentioned only in the expert based study			
Emerging Epidemics	At the same time the risk of catastrophic emerging epidemics is not eliminated, as poverty and environmental degradation increase the risks of new health threats. Efforts must therefore be targeted at exploiting the opportunities created by the conjunction of health, ageing, the environment and social conditions. (29-30)	Alignment = none Epidemics were not evident in citizen visisons. This could indicate that citizens priortize addressing current healthcare issues over potential threats.	Alignment =

1.3 Work-life balance and wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignment = none	Alignment = none
Balanced work-life model Research should rethink the definition of “work” and develop approaches that permit to recognize and reward as “work” all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied		Alignment = none	Alignment = none

(and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money		Alignment = none	Alignment = none
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and		Alignment = none	Alignment = none

strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	Increasing poverty in Europe, fed by on-going economic recession and austerity policies could result in food crisis, survival struggle and social unrest with increasing hostility towards the European integration project. (25)	Alignment = low The citizen vision was focused on creating a picture of ongoing food poverty and addressing that through holistic solutions. The Expert report is more crisis-oriented, though also takes a comprehehsnive view of drivers of poverty writ large.	Alignment = low
Evolving food culture in growing cities		Alignment = none	Alignment = none

Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.			

Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	The development of fully synthetic food products, for instance, is seen as a remedy to population growth (outside of Europe) and resource scarcity. (34)	Alignment = low Experts cite food technology (genetic engineering in partiulcar) as solution base. Citizens also highlight this, but add food and nutrition education initiatives, economic and environmental research as convergent domains within this area.	Alignment = low
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	The combination of various scientific fields is bringing new applications which are adopted widely across society and hold promise for radical improvements in a wide array of domains, such as manufacturing, health, agriculture and service industries. (13)	Alignment = low Experts imply that some new technologies can help land become more productive. Citizens take a multi-pronged approach to land use decisions, seeking inclusion in governance.	Alignment = low
Topics mentioned only in the expert based study			
Synthetic Foods	The development of fully synthetic food products, for instance, is seen as	Alignment = none	Alignment = none

	a remedy to population growth (outside of Europe) and resource scarcity (p.33)	Citizens do mention bio-technology as part of Good Food Research, but do not mention synthetic foods by name, nor as a solution to population growth's effect on food markets.	

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for “energy	Adaptation strategies to develop new and economical sources of energy, for example tidal power from the oceans and seas around Europe, water and materials. (33)	Alignment = low Experts focus on the exploitation of new sources of energy. Ciitzens visions recognize these technologies importance, but prioritize governance issues, market regulations and incentives.	Alignment = low

communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
Resource Scarcity and Energy Demand	The collision of population growth, the rise of a global "middle class", and climate change creates overwhelming pressure on food, water, materials and energy reserves. A number of developed economies are at risk of experiencing power blackouts as energy demands exceed temporarily supply outputs. (16) Breakthrough strategies, such as harnessing resources exploited in space to supplement similar resources coming to an end on earth.(33)	Alignment = none	Alignment = none

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban"		Alignment = none	Alignment = none

and the idea of “self-sustainability” of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by “digitalisation”) for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	With abundant bandwidth and devices, commerce, trading as well as social and business interactions become increasingly virtual, potentially negating the need to commute, travel or meet real people. (15)	Alignment = low Expert report mentions remote working as one possible impact of improved ICT infrastucuture, and they do not mention its capacity on transportation writ large. Citizens view ICT as one part of enabling technologica infrastrucutures coupled with social organizing principles in order to achieve greater personal freedoms.	Alignment = low
Moving together (more collective transport options)		Alignment = none	Alignment = none

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).			
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.		Alignment = none	Alignment = none

Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	New attitudes rejecting ostentatious consumption are appearing in the West, perhaps more so than in other regions globally. Combined with the ability to share or lease services and products rather than owning them, a new model of consumption becomes established within a circular economy. (11) @sharing: In parallel to globalisation, there are processes of fragmentation (exemplified at an institutional level by the centrifugal trend in the creation of new countries, such as Catalonia and Scotland) and rising alternative systems and models (examples include uses of telecommunication infrastructures in Africa; humantechnology interfaces in health; the culture of sharing in the West etc.) (p.30) The process of fragmentation may increase the available technological variety with benefits for all. It can create new spaces for innovation and entrepreneurship. It also may provide opportunity for policy experimentation, for instance to address issues of "climate change" or "coupling the economy with the limits of the planet", that require economic functions and models that are still in the sphere of visions. (p.30)	Alignment = low Expert views widely align with CIMULACT findings, but mention drivers and trends without suggesting a thorough research agenda.	Alignment = med

	Mitigation strategies to identify new technologies which lower the consumption of scarce resources, such as new lighter material used in cars and aeroplanes and more efficient combustion engines or renewable materials used in bio-based industrial processes.(33)		
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	Adaptation strategies to develop new and economical sources of energy, for example tidal power from the oceans and seas around Europe, water and materials (p.33) Mitigation strategies to identify new technologies which lower the consumption of scarce resources, such as new lighter material used in cars and aeroplanes and more efficient combustion engines or renewable materials used in biobased industrial processes. (p.33) Tackling degradation at the source will involve a change in behaviours among economic actors, which Europe must encourage, in order to reduce demand for goods and services which are polluting, or generate pollution during their production. (p.33)	Alignment = med Expert Report prioritizes research that can change production methods and materials towards greater sustainability/ environmental friendliness. CIMULACT focuses more on consumer knowledge and availabilitiy of information so that they can make better choices as individuals and collectives regarding ecological mindfulness.	Alignment = med

	Horizon 2020 can also support the development of circular economy models and experimentation, especially where enabled by technology, as this will reduce demand and waste thanks to recycling and reuse (p.33)		
Topics mentioned only in the expert based study			
Environmental Degradation	Environment degradation is the reduction of the capacity of the environment to meet social and ecological objectives, and needs. It involves the destruction of natural habitats and the depletion of natural resources. (11) Given the extent of environmental degradation to date, the focus of policies and strategic programmes has to be the coupling of adaptation and mitigation strategies to rectify the trajectory of this driver.(33)	Alignment = low CIMULACT results imply that environmental degradation is a problem area, but orients its suggestions in a pro-active, solution-oriented manner. CIMULACT is aware of environmental degradation, and seeks to address it indrectly through various research agenda points.	Alignment =
Space Exploration	While space technology makes significant contributions to the improvement of the performance of technologies and services on earth, only a small fraction of the possibilities offered by space is exploited or even known. Pushed by diminishing resources and energy sources on the planet, we are seeking to explore and exploit the theoretically infinite reserves of space. (14) Breakthrough strategies, such as harnessing resources exploited in space to supplement similar resources coming to an end on earth.(33)	Alignment = none CIMULACT research makes little to no mention of space exploration and related research, though numerous scientifica nd technological advances have come from the sector.	Alignment =

Rampant Vulnerability to Natural catastrophes	Intense and repeated natural disasters of major scale could overcome our society's capacity to deal with their consequences. Destructive climate change including rising sea levels could lead to massive destruction of infrastructure and loss of high-quality agricultural land in low-laying coastal areas and require relocation of entire populations. Vulnerability to natural disasters could develop into major humanitarian catastrophes, characterised by major threats to food security and large-scale epidemics. (26) The multiplication of extreme natural events is emerging as a strong trait of environmental and climate change. Natural catastrophes are a reality, not a possibility, for our society. Just like other continents, Europe requires better preparedness to these extreme events, to minimise their impact a priori and encourage multi-country collaboration in preparing for them. Because extreme events could multiply, it is important for Horizon 2020 to move towards a higher systemic resilience, through better forecasting models supported by High Performance Computing and connected to better contingency plans.(32)	Alignment = none CIMULACT results do not tend to prioritize natural catastrphes on the research agenda. Rather, through addressing climate change drivers through other means (improved energy, transport, food, etc) CIMULACT would attempt to curtail climate change and the vulnerabilities that result.	Alignment =

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts		Alignment = none	Alignment = none
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and	Environmental and energy-efficiency considerations favour urban lifestyles, while the dependence of urban life on infrastructure, transport and logistics can challenge food availability, induce new vulnerabilities and require new answers to enhance resilience of urbanized areas. (12)	Alignment = low Both Expert and CIMULACT groups recognize that urbanization remains a domain of both challenges and solutions. Expert research tends to prioritize technological solutions, while	Alignment = low

suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of “promising/good” practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.		CIMULACT includes citizen consultation and inclusivity as important areas for research.	
Topics mentioned only in the expert based study			
			Alignment =

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	A further aim could be to exploit opportunities emerging from multiculturalism, and from worldwide population changes. These can benefit Europe's economy and counteract the negative economic trends at play in the region. (p.30) An additional strategic response should be in supporting social interventions that have an indirect effect on this trend, by combating the sense of isolation and personal loneliness experienced by older people. Supporting e-health and tele-medicine solutions, for example, can improve the ease of access to social services of increasing value to older generations, and strengthen personal confidence. (30) The process of fragmentation may increase the available technological variety with benefits for all. It can create new spaces for innovation and entrepreneurship. It also may provide opportunity for policy experimentation... (30)	Alignment = low Expert report situates empowered diversity within an economic paradigm - an opportunity for growth. CIMULACT focuses on the researching diversities role in building integrated communicities, enriching the social fabric, and addressing legal and policy implications for such empowerment.	Alignment = low
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence	A further aim could be to exploit opportunities emerging from multiculturalism, and from worldwide population changes. These can benefit Europe's economy and counteract the negative economic trends at play in the region. (30)	Alignment = low Expert report situates empowered diversi-ty within an	Alignment = low

based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions		economic paradigm - an opportunity for growth. CIMULACT focuses on the researching diversities role in building integrated communicities, enrich-ing the social fabric, and addressing legal and policy implications for such empow-erment.	
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	@decentralisation: In parallel to globalisation, there are processes of fragmentation (exemplified at an institutional level by the centrifugal trend in the creation of new countries, such as Catalonia and Scotland) and rising alternative systems and models (examples include uses of telecommunication infrastructures in Africa; humantechnology interfaces in health; the culture of sharing in the West etc.) (p.30)	Alignment = low Expert report seems more inclined to uncover processes of fragmentation - diametrically opposed to the research agenda put forth by CIMULACT.	Alignment = low
Topics mentioned only in the expert based study			

Ageing Population	Ageing population is the cause of new economic and societal issues in Europe. A reducing active population has to bear the cost of a larger, older group. Social models of solidarity and fairness need to be reshaped. (9) The main challenge posed in Europe by this driver is the gradual ageing of the population. This is usually seen as a threat, although the health expert panel gathered as part of the project workshop did point out that older citizens can, and do, contribute to the economic and social well being of Europe.(29)	Alignment = low While CIMULACT suggests research into medical technologies and social organizations that can confront aging peoples, it seems less inclined to mention the more general trend of ageing populations that the experts hilighlight.	Alignment =
Trust and Reputation	Trust can be defined as the belief that people will behave predictably. Institutions are built on trust and are a means to develop trust. The more interdependent people, economic actors, and institutions are becoming the more important trust is for the effective functioning of our societies. (24)	Alignment = low Though trust is implicit in some of the community building and empowerment research suggested by CIMULACT, the expert report centralizes trust as an important component for governing entities to pririitize.	Alignment =
Dissolution of European Union	Together with a regain of populism and a return to national, rather than European, responses, this could ultimately lead to	Alignment = none	Alignment =

	the dissolution of the European Union. A weakened unifying and moderating framework raises the risk of the emergence of new divisions and conflicts within Europe.(25)	This possibility was not mentioned in the CIMULACT visions, which is more focused on maintaining and strengthening the EU.	

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	Values drive the personal conduct of individuals and, in aggregate, that of economic actors. A polarisation in values would trigger contradictory behaviours and create tensions...On the other hand, the natural evolution of values and beliefs enables the development of new value systems in an on-going dynamic process. (23-4)	Alignment = low CIMULACT situates empowerment as firstly within the domain of governance, with other impacts (social, economic, technological, etc.) stemming from that conceptualization. The Expert Report views participation (as an extension of changing values, from a primarily economic point of view, though social impacts are also recognized.	Alignment = low

Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	The increase of open innovation agreements between multiple actors challenges traditional model of IP ownership. Access to knowledge, the growing role of entrepreneurship culture, changes in personal identity and identification with community interests and values all contribute to a fundamental shift in creativity. (14) First, it could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and technologies. (30)	Alignment = med The expert report is aligned with the CIMULACT suggested research agenda regarding this topic.	Alignment = low
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	First, it could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and technologies. (30)	Alignment = med Expert group suggest that technological infrastrucuture can fuel open innovation regarding global phenomena. CIMULACT asserts that additional research into governance structures, policy processes, and trandiscilplinary research is also critical.	Alignment = low

The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	First, it [Horizon 2020] could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and technologies. (p.30) Second, it could enable innovation experimentations that take advantage of emerging alternative systems, e.g. in the form of supporting SME and innovative business environments in such systems. (p.30) Horizon 2020 can also support the development of circular economy models and experimentation, especially where enabled by technology, as this will reduce demand and waste thanks to recycling and reuse. (33)	Alignment = low In this area, the expert group suggestions and CIMULACT results are aligned.	Alignment = low
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic	The process of fragmentation may increase the available technological variety with benefits for all. It can create new spaces for innovation and entrepreneurship. It also may provide opportunity for policy experimentation, for instance to address issues of "climate change" or "coupling the economy with the limits of the planet", that require	Alignment = med The research agenda set forth by CIMULACT seems to match up with the suggestions of the expert group.	Alignment = low

models should be sustainability, education, equality, respect of environment.	economic functions and models that are still in the sphere of visions. (p.30) Second, it [H2020] could enable innovation experimentations that take advantage of emerging alternative systems, e.g. in the form of supporting SME and innovative business environments in such systems. (30)		
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects In addition, it can provide the new forms of distribution of value required for dealing with digital labour, robotization, and peer-to-peer production models.		Alignment = none	Alignment = none
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard	First, it could help feeding intelligence and knowledge of worldwide phenomena (new emerging alternative systems) into R&D and innovation activities that would enable companies to correctly anticipate trends in potentially important new markets and	Alignment = low CIMULACT tends to prioritize research into economic models as paired with UBI. Expert group sees alternative economic models as emerging from alternative systems	Alignment = med

work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.	technologies. Second, it could enable innovation experimentations that take advantage of emerging alternative systems, e.g. in the form of supporting SME and innovative business environments in such systems. (p.30) Horizon 2020 can also support the development of circular economy models and experimentation, especially where enabled by technology, as this will reduce demand and waste thanks to recycling and reuse. (33)	(ICT) and policy incentives. Both emphasize need for experiments in policies and models to test assumptions against realities.	
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			
Globalization	Globalisation is a process of international integration covering increasingly the planet and characterised by the growing movement of goods, capital, information, people and services around the globe, itself resulting from liberalisation of trade over the last half of the last century and the establishment of an almost global information and supply chain infrastructure. Part of this	Alignment = low CIMULACT seems to recognize globalization through research items like diversified communities, urban food culture, and the need for	Alignment =

	process involves the rise of new economic powers and new distributions of economic activity. (9) IT connectivity and infrastructure create competitive environments, where European economic actors face new competitors and partners in a virtual and globalised marketplace. This is a strong opportunity for European businesses to capture new revenue streams from customers they could not reach economically until now. (32)	greater inclusion. Expert report regards this as a primary driver of changes across domains.	
Trust and Reputation	Apart from social unrest, such a mistrust of the political governance of our society would almost immediately generate a high degree of uncertainty and impact much of commerce and the financial system...Even if public order could be maintained, widespread disruptions to supply chain and public services would follow and make everyday life unbearable. (24)	Alignment = low Though trust is implicit in some of the community building and empowerment research suggested by CIMULACT, the expert report centralizes trust as an important component for governing entities to prioritize.	Alignment =
Crisis Prone Global Economy	Given the anaemic recovery experienced in the last two years, successive economic shocks may create a downward spiral of economic depression, protectionism, social unrest and political extremism. Starting with unmanageable inflation (or deflation), a major systemic financial failure could occur. This could set off an unsolvable market labour imbalance, with rising unemployment, and severe income disparities.(25)	Alignment = low Expert group prioritizes economic crises of the past and future as essential drivers of change. This could be underlying reason for CIMULACT's interest in alternative economic models, but it is not explicit..	Alignment =
Advanced Automation	Advanced automation is likely to challenge our notions of work in a major way, raising very important political, economic and policy issues. (31)	Alignment = none CIMULACT does not prioritize Automation in its re-	Alignment =

		search agenda, unless implictly through improved production processes (as long as they increase sustainabilitiy, not just productivity).	

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = none	Alignment = none
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of		Alignment = none	Alignment = none

students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	Education is a fundamental factor in development and societal progress, enabling literacy and facilitating the integration of individuals in society in general and in employment in particular. (12)	Alignment = low Expert group see education as preparing individuals for entrance into society. CIMULACT suggests community as source of learning models and knowledge.	Alignment = low
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education.		Alignment = none	Alignment = none

The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.			
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			
Gender Equality	Education is a fundamental factor in development and societal progress, enabling litera-cy and facilitating the integration of individuals in society in general and in employment in particular. (12)	Alignment = low Expert group does explciitly mention Gender Equlatiy in education, whereas this might only be implied within the CIMULACT report.	Alignment =

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	In science, shifts in the processes of generation of new knowledge are included in the phenomenon termed “Science 2.0” (including phenomena such as “big data” and citizen science). (15) As people and machines connect through mobile devices and implanted chips, an avalanche of data is gathered, stored and analysed. This increases the risk of security and privacy breaches whilst holding the promise a safer, simpler world for individuals. (15)	Alignment = low The Expert group tends to see data from the perspective of those who have access to it (which is important). CIMULACT suggests research into policies that advance the Open Access agenda, and safeguard individuals and communities.	Alignment = low
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological	IT is now part of the ‘fabric of society’ and it is critical for Europe to encourage the universal provision of connectivity – whether through mobile or fixed technology - and of increasing bandwidth to all its citizens and economic actors. (p.32)	Alignment = low While the expert group recognizes that some technologies are embedded across society, CIMULACT calls for new modes of understanding scale across many domains through this ICT	Alignment = low

aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		infrastructure and the experiences it enables. .	
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	The combination of various scientific fields is bringing new applications which are adopted widely across society and hold promise for radical improvements in a wide array of domains, such as manufacturing, health, agriculture and service industries. (13) The convergence of different technologies and the rising investment in R&D is generating an environment of techno-optimism, driven by a strong belief that technological breakthroughs are out there to be achieved and all we have to do is develop them through brain-power and R&D investment. However, technology can also have unintended negative consequences. When combined, the level of complexity of much of technology research and the hard-to-identify ramifications of a given domain connecting to others present large-scale risks. (25) Reaping the benefits of innovation and technology in the future will depend on our ability to embed	Alignment = low The expert group harbors a technological primacy mindset - in which technologies are developed, can embetter society, but it is up to people to use them properly...CIMULACT tends toward the co-development approach to technology - that better technologies, and communities of practice, emerge when research is conducted in a participatroy and inclusive manner.	Alignment = low

	them properly in social contexts. From that perspective, public authorities have an important role to ensure that there is appropriate expertise and knowledge available to enable them to "regulate out" negative technological surprises, and that the development of technology keeps up with social and economic expectations. In view of the manifold unknown side- and secondary effects of these emerging technological opportunities, it will be essential to ensure a critical monitoring of their further deployment, and take responsible and corrective action as needed (p.31).		
Topics mentioned only in the expert based study			
Robotics and Automation	A further question is posed by the increased use of robots in the manufacturing of goods and the provision of services. The growing role of machines throughout our social, personal and economic interactions creates an uncertainty, in the medium to long term. Advanced automation is likely to challenge our notions of work in a major way, raising very important political, economic and policy issues. (p. 31)	Alignment = none CIMULACT does not make mention of robots or automation, rather emphasizing human-to-human relationships, and organizing principles.	Alignment =

Conflict and Insecurity	Wars and conflicts may well remain a constant in the coming decades, with likely more civil wars and terrorist activities and certainly a rise in cyber-crime and cyber-war. Some see the emergence of unconventional weapons (such as deadly viruses) as a possible escalation in new conflicts, driven by state or non-state actors. (25)	Alignment = none War and Conflict do not factor in heavily to the CIMULACT research agenda, while the expert group sees this as a driver of change worth monitoring.	Alignment =
Cyber Security	Nevertheless, for all the promises a fully connected world holds, IT shapes huge challenges for our social models: advanced automation and employment; national identities and digital natives; a global financial system and **cyber-crime,** amongst others. Addressing this challenge requires global collaboration with private and public actors, both in Europe and in other regions of the world. Cyber-defence may be a space where Europe could coordinate relevant efforts of its member states.(32)	Alignment = low CIMULACT research agenda prioritizes data literacy, and personal privacy, whereas expert group sees cyber security as playing an important role in infrastructure, financial, and social challenges.	Alignment =
Multi-disciplinary Convergence	Finally, by taking a multi-disciplinary approach, Horizon 2020 can make better use of the opportunities created by multiple drivers converging. In the	Alignment = low	Alignment =

	space formed by the interaction between driving factors (be they drivers or disrupters) Europe can identify ways to enhance prosperity and well-being within the planetary boundaries: thriving economies, flourishing societies, engaged communities and scope for personal fulfilment. (34)	CIMULACT does mention multi- and trans-discipline research within certain contexts, but this expert group makes such research a stand-alone priority area. Ultimatley the two reports align well on this topic, the expert are just more explicit in its mention.	

Studie: 4. Copenhagen Research Forum II - Recommendations for the optimal implementation of Horizon 2020

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology)		Alignment = 0	Alignment = None

• Exploring possible roles of communities for enabling alternative life-job-education pathways.			
Rethinking (the new) job market needs • Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability • Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being		Alignment = 0	Alignment = None
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values		Alignment = 0	Alignment = None

• Re-definition of welfare • The level of well-being			
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.		Alignment = 0	Alignment = None
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this		Alignment = 0	Alignment = None

purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: - For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. - For the citizens to be trained on health and digital literacy.			
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.		Alignment = 0	Alignment = None

Health empowerment through “Everyone’s science” An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of “classical topics” in favour of courses on how to efficiently communicate with the patients.		Alignment = 0	Alignment = None
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy lifestyles and lifelong learning on employment, innovation and social change		Alignment = 0	Alignment = None

Topics mentioned only in the expert based study			

1.3 Work-life balance and wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignment = 0	Alignment = None
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their		Alignment = 0	Alignment = None

personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the "analog" activities overcoming the notion that time is money		Alignment = 0	Alignment = None
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere.		Alignment = 0	Alignment = None

the community level: group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society		Alignment = 0	Alignment = None
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	Cross-disciplinarity is essential for addressing the societal challenges, which is why mechanisms must be established to ensure that it is encouraged and supported for example by earmarked resources, scientific matchmaking programmes or other incentives (p.8)	Alignment = low Expert report mentions the need for cross-disciplinarity in general, but does not bring this into the context of food research	Alignment = low

Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.		Alignment = 0	Alignment = None

Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	All research can potentially be applied to solving societal challenges. To achieve this outcome, a wide range of organisations representing universities, research organisations, academies, industry, businesses and funding agencies should be heard and invited to play an active role in the development of Horizon 2020 as well as in the year-to-year implementation of the programme. (6) An elaborated plan for dissemination of research results should be included as an integral part of any project proposal; the dissemination plan should have well-defined end goals and parameters so the project's effect on civil society and other stakeholders can be monitored (p.9)	Alignment = low Expert report mentions the overall need for dissemination in every research project, which somewhat aligns to what the CIMULACT topics states with regard to food research. Link is weak.	Alignment = low
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.		Alignment = 0	Alignment = None
Topics mentioned only in the expert based study			

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an		Alignment = 0	Alignment = None

important aim for the governance models, as should the future need for "energy communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most		Alignment = 0	Alignment = None

appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).		Alignment = 0	Alignment = None
Moving together (more collective transport options)		Alignment = 0	Alignment = None

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).			
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.		Alignment = 0	Alignment = None
Consume smarter, increase wellbeing		Alignment = 0	Alignment = None

To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).			
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed.		Alignment = 0	Alignment = None

Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.			
Topics mentioned only in the expert based study			

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts		Alignment = 0	Alignment = None
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area:		Alignment = 0	Alignment = None

The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of “promising/good” practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.			
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.		Alignment = 0	Alignment = None
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking		Alignment = 0	Alignment = None

Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions			
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action		Alignment = 0	Alignment = None
Topics mentioned only in the expert based study			

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.		Alignment = 0	Alignment = None
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	All research can potentially be applied to solving societal challenges. To achieve this outcome, a wide range of organisations representing universities, research organisations, academies, industry, businesses and funding agencies should be heard and invited to play an active role in the development of Horizon 2020 as well as in the year-to-year implementation of the programme. (6) A framework needs to be laid down to secure open access data for all European citizens and the competitiveness of European industry (p.13)	Alignment = med to high Expert report mentions participatory agenda setting for Horizon 2020, and demands an obligation for research to	Alignment = high

	Researchers should be obliged to engage in explaining how their research helps to solve the societal challenges (13)	solve grand challenges. Hoewever the CIMULACT topic goes further in demanding that research proposals should be evaluated with regard to sustainable development.	
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	All research can potentially be applied to solving societal challenges. To achieve this outcome, a wide range of organisations representing universities, research organisations, academies, indus-try, businesses and funding agencies should be heard and invited to play an active role in the development of Horizon 2020 as well as in the year-to-year implementation of the programme. (6)	Alignment = med Expert report aligns with CIMULACT on the matter of participatory agenda setting for research, but does not mention the issue of transdisciplinary development of actual research projects.	Alignment = low

The transparency toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	**Transparency and inclusion:** - Make the process from idea to call transparent and include a wide range of stakeholders in the year-to-year unfolding of the research programme - The deliberations of the challenge-specific programme committees should be made available to the public. - Make use of open virtual hearing systems, including expression of interest calls where relevant - Support and organise large stakeholder meetings but keep the number of meetings to a minimum following the concept of "fewer and better" (7)	Alignment = med While the CIMULACT topic sets out to investigate how transparency can benefit generally in governance and diverse social contexts, the expert report focusses only on fostering transparency in research programming.	**Alignment = high**
Topics mentioned only in the expert based study			

Flexible roadmapping	- Long-term planning should be implemented through use of flexible, openended multiannual roadmaps for each challenge - Short-term planning should be carried out by challenge-specific programme with clear reference to the respective roadmap - Challenge-specific research should focus on mid-term needs (5-15 years) - Short-term needs should be dealt with through continued, effective communication between researchers and end-users, with at least 10% of the resources being spent on a supported project/programme/partnership/network - The longer-term perspectives should be addressed by the European Research Council (ERC) and the National Research Councils with reference to institutional priorities in research infrastructure and recruitment (7)	Alignment = 0	Alignment = None
Structuring Inclusion	**Suggestion: Less criteria equals more inclusion** - Consortium forming should be left open as much as possible to industry and academia; additional criteria	Alignment = 0	**Alignment = low**

	for participating companies (e.g. size, geographical position) should only be imposed when these criteria are needed to deliver the expected impact of the project - Make plans for further elaboration of synergistic activities between European universities together with other public research institutions and European publicprivate partnership initiatives - Include topics aimed at commercialisation and encourage SME involvement through increments in the dissemination score - Allow for formal participation of stakeholders with low or non-financial contribution e.g. end-users - An elaborated plan for dissemination of research results should be included as an integral part of any project proposal; the dissemination plan should have well-defined end goals and parameters so the project’s effect on civil society and other stakeholders can be monitored (9)		

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation		Alignment = 0	Alignment = None
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.		Alignment = 0	Alignment = None

Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects		Alignment = 0	Alignment = None
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of “lessons learned”; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.		Alignment = 0	Alignment = None
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily		Alignment = 0	Alignment = None

reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.			
Topics mentioned only in the expert based study			
		Alignment = 0	

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	Furthermore, the CRF panel holds the view that it is not publications, patents or technologies alone but interacting networks of people with new knowledge that make innovation happen. Promoting stronger links between research and higher education is vital to increasing human flow in research and to stimulating innovation processes. (12)	Alignment = 0	Alignment = low
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of		Alignment = 0	Alignment = None

students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development		Alignment = 0	Alignment = None
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education.		Alignment = 0	Alignment = None

The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.			
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		Alignment = 0	Alignment = None
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	A framework needs to be laid down to secure open access data for all European citizens and the competitiveness of European industry (13) Ethical issues in research should be dealt with continuously throughout Horizon 2020 through institutionalised meetings and seminars encompassing all types of Stakeholders (p. 13)	Alignment = low	Alignment = low
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		Alignment = 0	**Alignment = None**

<table>
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<td>Transforming technologies for planet and people
In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects:
Develop practices of participatory development of sustainable technologies
Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources
Establishing a legal framework for responsible technology development and monitoring the promoted practices
Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly
Reducing bureaucracy, speeding up the research and implementation of new initiatives</td>
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<td colspan="4">Topics mentioned only in the expert based study</td>
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Studie: Højgaard, Liselotte/ Deborah Smith/ Tine Willum Hansen (2012): Visions for Horizon 2020. Kopenhagen: Copenhagen Research Forum II

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, Demographic Change and Well-Being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.	A vision of a better Europe includes all citizens having command over the resources necessary to develop their lives according to their interests and values.(79)	Alignemnt = med Expert report calls for a broad and general address of the topic that the CIMULACT report details to a greater degree.	Alignment = low
Rethinking (the new) job market needs • Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability • Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	Europe should improve its attractiveness by taking proactive decisions and promoting the training of students in experimental approaches and in data-based decision making very early at school as well as by leading a strong effort to propose attractive careers, research positions, and create career paths for young researchers.(83)	Alignemnt = low Expert report calls for training expeimentation within a narrow scope (data literacy) and opening up career paths for a specfic type of professional (young researchers). CIMULACT ap-	Alignment = low

		proaches both educational reform and job-market readiness under more universal terms.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	Within the area of food and health, life-long learning approaches should be developed for key professionals (e.g. doctors/physicians, teachers), on the most recent scientific developments and status,(38) Climate actions must be implemented, monitored, and subsequently evaluated in order to improve practice....Stakeholders must be heavily involved in the learning process based on the successes and failures from such conducted experiments.(70) RESEARCH ON THE UNEXPECTED …. However, there is increasing evidence that dramatic, nonlinear events can and do occur in all types of systems. Understanding and predicting such possible developments and installing early warning systems based on this understanding are essential, provided that society is equipped to deal with such abrupt changes. Preparing society for such events also requires research.(70)	Alignemnt = low Expert report suggests topics within the CIMULACT research vision, but does not address it comprehensively. Expert report emphasizes life-long learning in regard to specific field (health and diet), and participatory climate discourse and action (but not with respect to individual growth or mobility), and research on the unexpected which address complexity and uncertainty, thogh not decision making with resepct to them.	Alignment = med
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	The evidence is overwhelming that investment in biomedical research yields economic returns both through improved health gains, e.g. a healthy workforce and healthy aging, and through commercial exploitation of research outputs. Investment in medical research has been shown to continually yield an annual nancial return of 39%.(23) Research excellence needs excellent research infrastructures that not only underpin research but also lead its development and create an attractive climate for world-class researchers.(24) Research of host defence mechanisms in disease – the innate and adaptive immune systems – are of importance, as well as immunotherapy. Stem cell research is a related issue. Research in infection diseases and vaccines are central due to the changes in climate and society structure. Research to improve the prevention, diagnosis and management of reproductive health disorders, including infertility in areas of long standing low fertility rates below replacement level.(26) In the research area the most important focus is to implement in clinical practice, we must however be careful when pushing for implementation and demand evidence and usefulness. (27) There is a need to improve the transfer of knowledge from research and science communities to commercial stakeholders and the general public. (83)	Alignemnt = low Expert report does emphasize the importance of medical and helathare research as engine for economic growth, and as areas critical for research funding. However, the expert report does not recognizethe same potential for localized knowledge or pracitce as promoted by CIMULACT, nor the need to engage people in co-development.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of	An important solution for the health challenges Europe faces involves rethinking conventional biomedical practices and converting to personalised medicine. (24)	Alignemnt = high	Alignment = med

data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. • For the citizens to be trained on health and digital literacy.	Europe should lead the establishment of a fundamental reinterpretation of how to approach healthcare by pursuing personalised medicine.(25) In the research area the most important focus is to implement in clinical practice, we must however be careful when pushing for implementation and demand evidence and usefulness. (27) This also entails putting greater emphasis on applying do-it-yourself (DIY) medical monitoring and services recognising that they are an essential part of preventing and predicting personal health risks before they evolve into real health problems in need of treatment. (25)	Expert report does recognize the importance of personalized medical treatment s well as the role that personal lifestyle and preventative care can play with regard to EU future healthcare challenges. CIMULACT also mentions skills training for docotrs and public so as to close the knowlege gaps between them and create	

		more equal dialogue.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	Promoting self-care and patient empowerment is a critical challenge to be addressed in the near future if we are to succeed in relieving pressure on the healthcare sector. (25) This also entails putting greater emphasis on applying do-it-yourself (DIY) medical monitoring and services recognising that they are an essential part of preventing and predicting personal health risks before they evolve into real health problems in need of treatment. (25)	Alignemnt = med Expert report does discuss self-care and patient empowerment, which both imply greater access to the necessary tools and treatments to allow this. CIMULACT again emphasize localized knowledge and practice as critical areas of engagement between	Alignment = low

		healthcare system and general public.	
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	Empowerment and education of people with knowledge and skills to make informed choices about their health and wellbeing and motivate them to become better selfmanagers is a further key topic.(24) For a more inclusive research we need further patient involvement. One way to achieve this is to include and educate members of organizations as research project partners. In NIHs prioritizing and evaluations it is now common practice to include patient advocates. Patient empowerment and advocacy will also be important for translation of new relevant research into clinical practice.(27) An increasing amount of research activity focuses on mobile health (mHealth) solutions. An emerging technology, mHealth (wireless healthcare) can change how a person's health may be monitored.(25) Biomedical research of high quality should be conducted in an open, honest, and transparent way and people and patients should be more greatly involved	Alignemnt = high Again expertreport mentioins topics related to entirety of CIMULACt vision - well-informed decision making, self-care and management, citizen empowerment, inclusive research, and technological co-development. CIMULACT alsomentions	Alignment = med

	at all stages. For a more inclusive research we need further patient involvement.(27) This also involves a system of scientific publications and information retrieval in which free access to all (published) information is guaranteed. Open access could be provided through institutional repositories by the authors or by directly publishing in open access journals with publishing costs paid by the authors' institutions, grants, or philanthropic support. (27)	curricula reform for healthcare practicitoners and patients alike.	
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	The major goals for health in Europe are to improve the lifelong health and wellbeing of all Europeans. The idea is not just "to add years to your life", but "life to your years".(23) Multidisciplinary research is essential for a healthy ageing from conception to old age, including focus on developmental disorders.(25)	Alignemnt = med Expert report correctl makes connection to quality and quantity of 'life' and calls for multidisciplinary research to frame such discourses. CIMULACT	Alignment = low

		additionally promotes social and cultural research into generating healthy relationships across generations and lifelong learning.	
Topics mentioned only in the expert based study			
Re-emergence of Infectious Disease and Antimicrobial Resistance		Alignemnt = none Too specific for CIMULACT.	Alignment = none
Obesity and related conditions		Alignemnt = none Too specific for CIMULACT.	Alignment = none
Research Infrastructure	Research excellence needs excellent research infrastructures that not only underpin research but also	Alignemnt = low	Alignment = none

	lead its development and create an attractive climate for world-class researchers. (24)	Expert group makes more general call for research infrastrcuture, particularly to attract international talent. CIMULACT address more localized and inclusive research methods and frameworks.	
Integrative IT and Modelling	Modelling can lead to groundbreaking innovations in many areas of utmost interest, for example from pharmacokinetics to cancer treatment; the interpretation of medical imaging to data mining in statistics; and from the design of prostheses to the use of electronic aids. The ESFRI proposals are relevant for this.(24)	Alignemnt = none Too specific for CIMULACT	Alignment = none

Unified EU professional taxonomy, research calssification schema, and biomedical standards.	An important tool will be European cooperation schemes and the enhancement of student and researcher mobility... The benefits of a common approach for classifying research portfolios applied across research organisations are clear.(27)	Alignemnt = none Thi smight be implict in CIMULACT calls, but becomes an important suggestion in expert report.	Alignment = none
Tissue engineering	Nanomedicine and synthetic biology are emerging technologies, which are quickly establishing themselves as key enabling technologies. These are promising approaches to realise the vision of a bio-based European economy through research and innovation as well as to delivering competitive and sustainable growth in Europe.Development and optimization of artificial, bioartificial and tissueengineered organs are related to this.(25)	Alignemnt = none Too specific for CIMULACT.	Alignment = none

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignemnt = none	Alignment = none
Balanced work-life model Research should rethink the definition of “work” and develop approaches that permit to recognize and reward as “work” all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they		Alignemnt = none	Alignment = none

experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money		Alignemnt = none	Alignment = none
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere.		Alignemnt = none	Alignment = none

the community level: group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society		Alignemnt = none	Alignment = none
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	Therefore, food and diet should be seen as a more interactive component of the overall healthcare system which may help realise great potentials for value creation for European industry to produce foods that meet these perspectives and to develop technologies for export. (31) Understanding how dietary health and nutrition needs vary between individuals and population groups, not only across the whole lifespan but also as a consequence of their genetic make-up, is very important for the development of more healthy products and diets tailored to specific health and nutrition needs. (33) An effort in terms of education related to good, safe and sustainable food should be made towards citizens of all ages and with special focus on opinion makers. (38) In terms of the promotion of healthy diet, there should be emphasis on the informed consumer choice. But this way of thinking is typically individualistic in its approach and neglects the understanding and critical analysis of the social context of food choice. In many cases it has been demonstrated that simply providing information does not lead to change, thus new (practice-based) ways of addressing these issues are needed. (33)	Alignemnt = high Expert report certainly emphasizes food and diet as critical issues. This report frames food education, individual choice, and agricultural technologies as working together to shape food futures.	Alignment = med

Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.	A shift from the classical linear approach to a more interactive learning loop is needed to get new knowledge implemented at more practical levels (from farm management to industrial food production), and to feed more practice-based knowledge inputs into research objectives and planning.(32)	Alignemnt = low Expert report does mention food diversity as important for understanding alternative needs and knowledge bases. Call for an 'interactive learning loop' to better understand diverse diets and life-styles.	Alignment = low

Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	A pivotal issue for food- and agri-research in Europe is to address the complex matrix of both challenges and the huge opportunities with strong multidisciplinary and cross-cutting research and innovation programmes to support the development of excellent solutions for food security, health, climate change and sustainable agricultural production (locally and globally), embracing the five other societal challenges identified and defined in Horizon 2020. (31-32) Researchers of this field should work closely with technology developers, environmentalists, industry, policymakers and growers to evaluate the relevance and estimated impact of the proposed projects – and any new technologies and machineries developed should be scrutinised for efficacy, cost-efficiency and environmental performance and impacts, including effects on up- or downstream activities. (34) The necessary multidisciplinary, cross-cutting approach to research and innovation requires the development, acceptance, and application of new technologies where strategies and priorities from	Alignemnt = high Expert report acknowledges that potential benefits that food research can bring to both EU nations, and across a broader global context. The report further views food research as a component of complexity research that have impacts across the entriety of social systems.	Alignment = high

	both natural and social sciences should be combined – at programme and project levels. (35) Research and innovation activities addressing the complex challenge of “Food security, sustainable agriculture, marine and maritime research and the bio-economy” should be linked to and coordinated with relevant existing initiatives at the European level, such as ERANET, ERA-NET+, Article 185, and JTIs. (37)		
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	Important mitigating options are to reduce competition among animals and humans for land exploitation, improve plant and animal health, improve plant water and fertilizer-use efficiency and reduce pesticide inputs, (32) Another urgent topic for integrated research is the interaction between the soil microbial flora and plant materials (crops, processed raw materials and leftovers from food and biorefinery production processes).(32)	Alignemnt = low Expert report tends to highlght components of land-use topic, but does not address zoning or land-use policy more general nor towrds the same ends as CIMULACT.	Alignment = med
Topics mentioned only in the expert based study			

Holistic Life Cycle Approaches	Hence, a full chain approach should be taken, ensuring overall optimisation and providing solutions that truly link raw materials, the conversion processes and the needs of consumers and other actors in the food chain.(33)	Alignemnt = low This might be implied in some of the CIMULACT suggestions, but it is not so eloquently or explicitly mentioned with the context of food research.	Alignment =
Intellectual Property Rights from research	Since companies normally will not invest in participation in public research and innovation programmes unless there is some protection of future income from innovations in that area, agreement on intellectual property rights (IPR) are generally a prerequisite and should be prepared upfront.(37)	Alignemnt = none CIMULACT only mentions this by calling for more open research, and does not mention IP with regards to food research.	Alignment =
Blue growth	Unravelling the life principles in extreme oceanic environments should be a particular research tar-	Alignemnt = none	Alignment =

	get as life forms under high pressure, low temperatures or combinations thereof would be of particular interest for application in processing technology (microbial systems and novel enzymes) for food, feed and ingredients (33)	CIMULACT does nto seem to address possibilities of large-scale aquaculture.	

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future	Secure, clean, and efficient energy is rightly chosen as a primary goal in the EU research agenda for 2014-2020. Much depends on the success of the Horizon 2020 programme in efficiently addressing these challenges if the EU is to become self sufficient with secure, clean, reliable and affordable energy midway through this century. (41) Stronger national and transnational efforts are needed and require European-scale management and support in order to: (1) enable a decisive contribution to climate protection; (2) achieve European technology leadership; and to (3) give the highest possible support to European industry.(42) In line with this, more emphasis could be given to social, system, and user-driven innovations, in contrast to the main focus on technology-driven innovation. (43) Technological research needs to be accompanied by technology assessment and systems analysis, keeping an eye on the overall system and on societal aspects, like public acceptance. (43) The framework of smart cities provides adequate solutions for future urban challenges through radical innovations and new urban concepts... this particular integrative aspect has to be tackled on two distinctive scales: integrated, process-level, multiple stakeholder participation and systems approaches that embrace different infrastructural layers and technologies.(45) Focus should not be on energy technologies alone, but also on the socio-technical systems, including organisational, social, cultural, and behavioural aspects (45)	Alignemnt = med Expert review imnplies more localized, prosumer approach to energy governance, but does not expliocitly address the governance of supply and demand systems that are called for in CIMULACT. At times expert report calls for less technology based solutions (calling for social innovation), but then reverses course and looks to 'radical disruption.'	Alignment = low

need for “energy communities” in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders’ interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation	The SET-Plan provides a well-balanced technology roadmap incorporating relevant technologies needed to steer Europe towards a sustainable energy future... The SET-Plan provides a well-balanced technology roadmap incorporating relevant technologies needed to steer Europe towards a sustainable energy future. (46) Integrated interdisciplinary approaches and (66) transdisciplinary[1] research focusing on solutions; and pilot schemes or experiments aiming at solutions to the resource challenges facing society (e.g. focusing on sustainable cities and sectors). (66)		
Topics mentioned only in the expert based study			
Previous and On-Going Energy focused Programs		Alignemnt = none	Alignemnt = none
Intellectual Property Rights from R&I		Alignemnt = none	Alignemnt = none

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by “local” and what is meant by “communities that are organized locally” as this is not necessarily the same as “rural”. However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is “What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the “rural”), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the “local” with the “urban” and the idea of “self-sustainability” of local communities.	Apart from greenhouse gas (GHG) emissions the majority of the negative impacts from transport occur in and around major urban areas where the majority and an increasing share of Europe’s population live. This calls for intensified research in the challenges related to urban mobility. (51) Developing new technological solutions, like electric vehicles, will have to be closely linked to a better understanding of user behaviour, car buyers’ risk aversion and preferences as well as mobility patterns in general in order to target and accelerate innovation by ensuring that the novel solutions match the needs and hence can gain a foothold on the market. (53) Research strategies should in a timely fashion assess and predict impacts of new technologies and measures on the transport system as a whole. The impact assessment should take into account end-user behaviour and preferences and be evaluated against the societal needs and goals. (54) Improved understanding of travel and travel demand.(56) The cultural, political and economic underpinnings for learning architectures connecting transport governance	Alignemnt = low Expert report does take a more system view of transportation, and the socio-technological solutions to challenges, but frame them under more general economic terms. However, CIMULACT proposals are framed under the idea of sustainability (time and material resource efficiency), interconnectivity, and personal agency.	Alignment = high

This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.	effectively to surrounding societal needs and developments are to be studied. (59) Transport research and innovation can significantly contribute to solving the challenges of the transport sector, however only if research results are applied in politics, by industry, and by citizens. (60)		
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	Demand management and optimising the utilisation of existing network capacity by widespread use of pricing and ICT will have to play a key role along with improving public transport and cross-modal integration. If not, we can end up in the paradoxical situation that too much transport will hamper our mobility, in particular in and around major urban areas. (52) Linking land use and transport planning. (56) Here, we need to strengthen the scientific understanding and our ability to quantify how the direct benefits of a well-functioning transport system, in terms of high mobility and accessibility, enable economic growth and make a city or region attractive for settlement of people and business.(54)	Alignemnt = low Expert report acknowledgeds importance of tranportation supply and demand, but fails to mention needs or urban and rural communities, let alone the building of transport systems that adequately bridge these two communities in a sustainable way.	Alignment = med
Moving together (more collective transport options)	A significant change of modal split away from cars is necessarily an essential part of the solution. This will also	Alignemnt = high	Alignment = med

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).	make cities more liveable, but it will require both sticks and carrots to achieve, e.g. urban road pricing schemes accompanied by more competitive public transport and facilities for cycling and walking. (51) The earlier mentioned expectations for increasingly scarce funding for infrastructure improvements highlight the need for cross-modal integration as a means to improve overall efficient and sustainable mobility rather than effectiveness at modal level... Concepts such as door-to-door mobility, seamless connectivity, and global interoperability can contribute to developing more customer-oriented services. Deployment of robust co-modal systems calls for more advanced transport optimization methods (53) A customer-oriented European railway system. (58) Urban public transport. Radical improvements in the quality and cost effectiveness of urban public transport are required to achieve the 2011 Transport White Paper's goals. (59)	Expert report outlines many types of mass transportation needs and technologies under development. IT asks for servcing multiple and diverse communities and their specific needs. Also it calls for more comprehensive understanidng of transport system efficiency in dense urban settings.	
Topics mentioned only in the expert based study			
Technology Focused Research (ICT, Energy, Egineering)	• Cleaner and safer vehicles of all modes; • Cost-effective alternative fuels, (electric) drives, propulsion technologies, battery and chemical storage of energy and new materials for vehicle construction;	Alignemnt = none CIMULACT focuses less on teh technologies, and more on the social innovations and system	Alignment = none

	• Advanced ICT for personalised real-time travel information, modal integration, metropolitan traffic management and smart payment systems; (54) Microscopic European travel and transport data.(56) Concepts such as door-to-door mobility, seamless connectivity, and global interoperability can contribute to developing more customer-oriented services. Deployment of robust co-modal systems calls for more advanced transport optimization methods which have become increasingly more vigorous as modern ICT such as Global Navigation Satellite System (GNSS), Radio Frequency Identification (RFID), smartphones etc. further improves the quality of real-time tracking of goods and generate vast amounts of relevant data from real-life transport operations. (53)	frameworks that can enable communities to self-organize and meet their own needs more efficiently.	
Trans-disciplinary Research	It is welcomed that social and behavioural sciences will be fully integrated within each of the main pillars of Horizon 2020. Yet, one should be cautiously aware of the risk that the above-mentioned important social science aspects will not get due attention in the research priorities of the calls when compared with the obviously important, technology-oriented projects (54) Classical cost benefit analysis has developed in recent decades into more advanced appraisal methods that more adequately value time savings ... and encompass environmental and safety impacts and other derived effects. (57) The cultural, political and economic underpinnings for learning architectures connecting transport governance effectively to surrounding societal needs and developments are to be studied. (59)	Alignemnt = none	Alignment = none

Global Freight Transport	... overriding challenges also relates to long-distance freight transport which call for further R&D&I. (55) Transport research therefore should be (and have been) using multidisciplinary approaches ranging from several branches of engineering to various disciplines in social sciences, such as economics, sociology, psychology, geography and political science. (18)	Alignemnt = none	Alignment = none
Road Fatalities	Reaching ambitious targets such as ‘move close to zero’ requires a paradigm shift and a Safe System approach is considered to be a very promising such transformation. The road system should be redesigned taking into account the fallible and vulnerable human being. (55)	Alignemnt = none	Alignment = none
GOVERNANCE, FINANCING AND ORGANISATION	During the past 25 years, so-called new public management (NPM) reforms have marked the organisational shaping of the public sector, and not least the transport sector. (57-58)	Alignemnt = none	Alignment =
Improving railways	However, the research in new solutions has to be conducted taking into account the political and institutional barriers in individual countries for creating radically different, harmonised framework conditions and in recognition of the inherent complexity of operating on the same railway tracks local, regional, and international services as well as of balancing passenger and freight. (59)	Alignemnt = none	Alignment =

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	A truly green economy cannot be based on the current growth paradigm and research into the building of an alternative, sustainable economy must urgently be instigated... Therefore, a prominent component of Horizon 2020 should be research on transformations to global sustainability (transformation research), which must be an integrated part of each of the six challenges identified in Horizon 2020. (63) Societal transformation to sustainability cannot be achieved without taking human interactions with the Earth system as a whole into consideration... actions directed towards ameliorationof the climate change challenge are indicative of the types of actions required for achieving sustainable resource use more generally. (64) The scientific understanding of human impacts on the climate system is already more than sufficient to initiate political action designed to equitably share all climate-related resources, thus leading to a general adaptation of our individual and collective behav-iour where necessary. This needs to be supported by a better understanding of societal values and their roles in enhancing or preventing societal transformation. (67)	Alignemnt = high The expert report address most amjor components of the CIMULACT proposal, including policy frameworks, systemic understanding, indivudal and collective behavioral research, and social innovations.	Alignment = high

	Research into the most efficient ways of changing our shared behavioural patterns...While climate change is global, adaptation is essentially a local problem and tools that allow local decision makers to determine at what level of change natural systems and societies become vulnerable need to be developed. Adaptation strategies require the development of climate projections at spatial and temporal scales relevant for users (regional and decadal). (69) The complexity of, for example, climate change, along with the central role of societal values and behaviour for efficient climate action, implies that maintaining a dynamic and participatory approach is essential... This involves continuous processes of dialogue between researchers, stakeholders, decision makers, and society with the aim of changing our communal behaviour. (70)		
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy well-being are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and	However, the unsustainable use of natural resources permeates all parts of our current society, thus causing the nature of the climate and resource challenges to be allembracing, and almost all research to be potentially relevant. (64) Distribution of rights to the Earth's limited resources will be an increasingly important political issue in coming years and it is not clear whether or how they can be successfully addressed. (65) Research is needed to show how to manage a shift in focus from what we live on, to what we live for, in order to solve problems such as climate change, biodiversity loss, or inequity.(71) The common, human endeavour is to find a way of living within the means of the planet. Everybody must see themselves as stakeholders in the research that seeks to understand the problems of unsustainability and finding solutions. (72)	Alignemnt = med Expert report accurately suggests that consumer behavior is complex, and that complexity is amplified with larger populations, and both of these need research. CIMULACT additionally calls for numerous community experimentation, the	Alignment = med

renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).		promotion of alternative economic schems, and policy development to shift emphasis away from material well being.	
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	At present, human impact on the Earth system is to a large extent rooted in behaviour rather than in meeting basic needs... In order to optimise the societal response to climate change and resource scarcity, climate and other resource economising actions should be implemented, monitored and evaluated in constant dialogue with all stakeholders.(64) In terms of society's short-term economic development, however, it seems clear that there will be an increasing demand for technologies and processes that increase the efficiency of society's use of natural resources (energy, water, food, rare metals, phosphorous etc.)(65) It is time to consider practical solutions aimed at mitigating the impacts of climate change and resource scarcity that are inevitable over the next decades. Identifying problems and solutions at all levels and scales that can be acted upon is important. (69) It is important not to focus solely on optimising 'the bottom (economic) line' on the short term without keeping overall long-term goals with respect to human society's use of natural resources insight. (72)	Alignemnt = low Expert report suggest that production processes are part of the problem concerning unsustainable systems and economic growth models, but does not make the call for legislation to incentivize more sustainable practices, and experimnetation to discover additional new practices.	Alignment = low
Topics mentioned only in the expert based study			
Resource Scarcity	A general paradigm for dealing with resource scarcity is reducing the need for – and more efficient use of – the resource, combined with the adaptation of human activities to changed conditions and/ or the recognition of resource scarcity. (63)	Alignemnt = none CIMULACT only tends to ellude to resource use that is more sustaina-	Alignment =

		ble, not about resource scarcity itself as a problem area.	
Earth System Mechanism and Interactions	Main research areas include: • Research into mechanisms behind climate change and their interactions on spatial and temporal scales, in particular using the past; • Research into the hydrological cycle and its interaction with the Earth system; • Assessment of vulnerability to climate change of specific ecosystems and societies; and • Better understanding of the interactive role of biological processes of the climate system and their responses to climate change. (67) It is an important and necessary element of especially climate research to improve our understanding of climate change and use this knowledge to improve the climate models, hence providing more accurate future climate projections (68)	Alignemnt = low CIMULACT tends to promote more citizen-based, localized, and community practice with regard to global systems. CIMULACt is aware of Earth systems, but doesn't represent that concern in the same language or mode as expert report.	Alignment =
Bioeconomic Development	Traditionally, Europe has been strong in the development of a bio-based and more sustainable economy but must be prepared to meet increased global competition. (32) One challenge of the European bioeconomy will be to build secure and sustainable agricultural, horticultural and aquaculture supply and product processing chains to meet the increasing demand for food, feed, fibre, chemical feedstock and biomass for energy. (31)	Alignemnt = none This level of specifict is largely only implied in CIMULACt.	Alignment =

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	We need better integration of land use planning and transport planning, and as an input to this, better integration in transport models of household and company localisation decisions and transport behaviour. (57)	Alignemnt = low Expert group does not specifically address most of the major concerns highlighted in teh CIMULACT report. It mentions transport as part of better overall urban planning, but tends to neglect rural communities needs or potentials.	Alignment = low
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area:	Urban areas display a huge potential for increased energy efficiency due to their morphology (building density and distribution) and could become centres for innovation with significant impact in several infrastructure layers... Focus should not be on energy technologies alone, but also on the socio-technical systems, including organisational, social, cultural, and behavioural aspects. (45) The core questions for research are how to control land use development and retrofit existing urban areas to sustainable transportation; how	Alignemnt = med Expert group also sees potential to garner resource efficiency from urban areas and highlights many of the issues raised	Alignment = med

The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of “promising/good” practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	to develop attractive mobility solutions bridging between access, choice, and resource efficiency, and how to manage transport infrastructures, traffic, and environmental qualities in dense, urban settings.(57) […], i.e. an urban road pricing scheme accompanied by more competitive public transport and facilities for cycling and walking (55)	in CIMULACt, though with slightly differnet language.	
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	We share the vision of a reinvented European welfare state in a globalising learning economy. This requires Europe to position itself as a leader in promoting inclusiveness in numerous aspects of daily life, bringing innovation from the laboratory to society worldwide. (75) Protecting epistemological pluralism, the scientific equivalent of bio-diversity, can strengthen the robustness of results towards social changes.(77) Innovation can be achieved by embedding the ‘problem definition’ with societal actors, citizens, and communities ... (78) Variations among sectors, regions, and company structures are among the important variables where Europe’s diversity can be better exploited as providing a laboratory. (78) Divergency and Diversity are redefining European Unity.(79) Research into sources of challenges and thereby into general economic, social, and political transformation – which often demands more abstract theory – is needed to understand the conditions for inclusion, innovation, and security. Research contributes to solutions in these areas both by relatively concrete instruments and practices and, very often, by designating areas that need more	Alignemnt = high Expert report tends to emphsize the importance of the same issues highlighted in the CIMULACT research visions.	Alignment = high

	political attention because they cause exclusion, stagnation, or insecurity.(79) To adopt innovative practises in the way societal actors compete and cooperate to achieve inclusion, innovation, and security, it is necessary to both generate societal knowledge about the changing nature of these social 'values' – inclusion, innovation, and security are not stable goals, but change their meaning and form under new conditions – and to make it relevant to especially those actors who shape processes and conditions for others. (81) Stakeholders need to be involved, not only in terms of dissemination and impact, but at all stages of research. Stakeholders should include members of NGOs and the voluntary sector as well as representatives of government and industry. More - exible ways to involve stakeholders during the projects should be pursued. (83) .		
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking	Corresponding to a vision comprising a broader mobilisation of societal energies are forms of research that employ a wider selection of methodologies and theories to study the dynamics of society as productive and generative, rather than as the site of problems to be solved.(75) European societies are in rapid transformation. This may change previous pat-	Alignemnt = high Expet report discusses challenges and research vectors for addressing them in similar fashion to CIMULACT.	Alignment = high

Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions	terns and thereby upset established correlations. We therefore not only need statistical data and evidencebased lessons, but, equally so, conceptual and theoretical work on deep shifts in the dynamics of societies. (76) To enable social scientists to go beyond the borders of their national statistics and address border-crossing issues concerning innovation, inclusion, and security production, access to empirical data concerning a wide range of social scientific and humanistic issues should be underpinned through a common, European data strategy. (79-80) Technologies and methodologies should be developed in some areas with the explicit understanding that they function as a road to reflexivity at the European level.(80)		
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion	Creativity and innovation are meta-issues, as these capacities can be used to	Alignemnt = high Expert report discusses many of the	Alignment = med

and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	foster social innovation and promote inclusiveness.(75) Inclusiveness means reducing regional disparities within and among the member states and regions of the EU. Being an inclusive society also means having a greater level of tolerance in terms of culture and income, not to mention avoiding the emergence of ghettos and other disadvantaged areas.(79) ...a crucial task in research and innovation policy is to convince stakeholders, at various levels and in various sectors, about the opportunities of knowledge-intensive governance. (81)	CIMULACT issues with similar language. The calls for inclusion, and cohesion building across diverse populations as central to research are critical, as are joint decision making modles for governance, and social action.	
Topics mentioned only in the expert based study			
EU community within a global context	Attention should be given especially to analysing and operationalising specific forms of cooperation that emerge in the era of global power dispersion and non-western powers. (77)	Alignemnt = low CIMULACT tends to frame its resarch suggestions within a more local or inter-EU framing, without	Alignment =

		explictly mentioning the global context (at lest in this section).	

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	Research needs to go beyond technical questions to more controversial areas like global power shifts, sources of the economic crises and malaises affecting political participation, legitimation and self-steering. In such times of deep change, not all statistical relationships will remain stable, and European social knowledge therefore needs both improved databases and theoretical work.(75) Also, the nature of collective self-reflection and self-organisation in Western societies is undergoing dramatic change, and for research on innovation, inclusion, and security to have innovative impact on actual innovation, inclusion and security, it is crucial to update institutional arrangements. (82)	Alignemnt = med Expert report mentions citizen empowerment through a number of different languages, and calls for research into social ecologies, participatory decision-making, and at times technologies that might intervene in such matters.	Alignment = low
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	The sharing of risks between the public party remaining responsible for legal acts, concessions, specification of public and user requirements, supervision, acceptance and payment on the one hand,	Alignemnt = med Expert report also calls for research that is meaningful for communities,	Alignment = low

	and the private party fulfilling the contractual obligations and getting remunerated is changing from project to project and country to country.(58) Researchers should be encouraged to engage with stake-holders to produce science, which most ef ciently can be made relevant for society.(83) In selecting problems and research areas it is important to keep in mind that innovative research and activity grow from the bottom up.(84)	and for co-development frameworks for conducting such research.	
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	A global approach must be encouraged and mechanisms must be put into place to support an international approach for both research and innovative applications.(83) The pronounced need for multidisciplinary and crosscutting approaches, especially with regard to societal challenges, emphasises how essential it is to develop new and appropriate instruments without increasing the administrative burden. (83)	Alignemnt = med Expert report does addres need for scalar issues and thinking across multiple layers of complex problems. CIMULACT additionally calls for new governance strucutures and decision making proces that can facilitate this	Alignment = med

		type of thinking more generally.	
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	Openness between stakeholders should be encouraged and facilitated. Excessive secrecy and rights agreements as the first prerequisite for any collaboration are killing innovation. A condition for getting an activity funded should be that communication and the exchange of ideas be carried out in an open atmosphere. (83)	Alignemnt = low Expert group is calling for less secrecy around the terms of reserach and acquiring funding, where as CIMULACT is calling for a more general type of transparency across governing systems. Expert group does acknowledge openenss in other passages.	Alignment = none
Topics mentioned only in the expert based study			
			Alignment =

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	In a global knowledge economy, characterised by deep changes in the international division of labour and a decreasing role of states in general... Economies, politics, and research do not follow state boundaries. In trans-governmental networks, Europe can play a crucial role, but not for the old reasons.(76) Inclusiveness and a resilient society mean greater learning, but the financial and institutional conditions necessary to promote more learning are currently absent in many regions and especially in rural communities. (79) Similarly, current economic woes need to be addressed squarely. Europe faces severe economic difficulties of strong social andpolitical import. Serious attention needs be devoted to understanding the sources, nature, and shape of these crises. Europe is notserved by following the widespread fashion of only talking bout'opportunities' and 'challenges' when research actually can help by investigating the causes of serious problems if allowed to use'negative' designations, also in specific research calls;(77)	Alignemnt = low Expert report mentions the global knowledge economy, but does not differntiate this in detail, nor explain how it could be considered vastly different from current economic structures. CIMULACT is calling for economic system overhaul (like circular economy, sharing economy, etc.). Expert group also acknowledges current economic woes that are a byproduct of current economic system.	Alignment = low
Social economy		Alignemnt = none	Alignment = none

Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.			
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects		Alignemnt = none UBI is not mentioned in Expert report.	Alignment = none
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems	Research must, therefore, also address resilience of natural as well as societal and economic systems and strive for a better understanding of what makes systems resilient against what disturbances, considering different time frames and system borders. (65)	Alignemnt = low Expert report acknowledges role of economic systems in creating resilience (or lack thereof) in the face of disuptive factors and events. However, the expert group does not goes so far as to call for	Alignment = low

at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.		Alternative economic systems in and of themselves.	
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transfer this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.	Many disciplines, from economic history and comparative institutionalism to macro-sociology, can enrich the understanding of options and constraints. A general restructuring of rights and duties is on the agenda, and could easily amount to a general rethinking of 'labour'. (78)	Alignemnt = low This link is tentative at best, as the expert report is talking very vaguely about values and duties, while CIMULACt is calling for reforma nd regulation of ecoonomic institutions.	Alignment = low
Topics mentioned only in the expert based study			

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	Education strategies and programmes must include a focus on improved entrepreneurial skills and the development thereof at both undergraduate and graduate levels. (32) A great challenge is education at every level, first of all, to provide innovative industries in the sector with highly qualified personnel to help them capitalise on the results, but also to help citizens become informed about the new technologies and their acceptance of these. (38) Future research has to be organised in ways that avoid disconnecting more ‘micro’ and local knowledge about, e.g. inclusion, equality, and education from macro conceptions of general processes. (79) Europe needs a strong new generation of researchers trained to tackle the different aspects of research. Critical in this training programme is cross-disciplinary and international mobility. (83)	Alignemnt = med Expert report calls for research that informs citizens about new technologies, whereas CIMULACT calls for more co-development and educational opportunities through participatory design and innovation. Experts call for a new generation of researchers with global experience, whereas	Alignment = high

		CIMULACT emphasizes the ability to transform localized knowledge.	
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.	By introducing a dialogue with the end user where the end product, along one line of thinking, is considered the starting point of a new development, a circular process is initiated. This concept is also called the learning loop or user-driven innovation... (38)	Alignemnt = low Expert report discusses a type of iterative process which is essential to design thinking, but CIMULACT report outlines more throughly how curricula could be adjusted across the education system through the pedagogical move.	Alignment = none

Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	In order to increase research quality and impact, recruitment of the best brains must be secured through special emphasis on instruments encouraging young people to attend educational programmes, preferably addressing cultural dimensions that might present obstacles for optimal dispersion of knowledge. Student exchange programmes should be implemented at all relevant levels. (37) The introduction of the discipline of complexity science into Earth system thinking. (65) Europe needs a strong new generation of researchers trained to tackle the different aspects of research. Critical in this training programme is cross-disciplinary and international mobility. (83) In selecting problems and research areas it is important to keep in mind that innovative research and activity grow from the bottom up.(84)	Alignemnt = low Expert report proposals increased international exposure to increase rersercher capacity to overcome obstacles. CIMULACT emphasizes tighter integration of education within society (local based learning through doing) as a mode for fostering cultural awareness, social integrity of research, etc.	Alignment = low
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment	To also serve a social purpose, technology should be linked to the advancement of civic education projects	Alignemnt = low Expert report emphasizes	Alignment = low

Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	designed to further involvement of citizens. New technologies can provide new opportunities in the collection of empirical material about current transformations and it can also be utilised to develop new ways of disseminating knowledge and entering into public discussion for the SSH.(81)	technlogical deployment for social awarness raising, but doesn't seem to discuss technological integration with current educational systems, or as recognized place-based educational systems as have been proposed.	
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.	The implementation of climate change action will require our society to grow a culture of climate, ecosystem, and resource-use responsibility, hence demanding extra efforts of researchers in areas of communication and education. (70)	Alignemnt = low CIMULACT emphasizes education as learning about systems and interactions, and stimulating creative and criti-	Alignment = med

		cal thinking. Expert report views ecolgoical and earth systems thinking as important, but doesn't address the educattion ecology itself as focal point for reform.	
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	A system of scientific publications with free access to all (published) information is needed. (84) In terms of infrastructure development, Europe needs to focus massively on the development of data handling, longterm storage and accessibility, and advanced data analysis, including validation of models developed for complex systems dynamics.(37)	Alignemnt = med Expert report suggests that more open access to information is needed, as well as secure lines for data transmission, storage, and analysis. This echoes CIMMULACT, which adds the need for data literacy skills trainings, data security, ethical data use training, and data as used in participatory decision making (not just open data for research).	Alignment = low
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.	This involves both education that fosters an appreciation of change and creativity and the transmission of innovative ideas as a social goal.(82) Future EuropeanResearch should be planned and performed in a context with a genuinely holistic approach with inter- and multidisciplinary research groupsworking in Europe jointly with the rest of the world. (15)	Alignemnt = med While the expert group implies many of the details mentioined in CIMULACt the general vaguness of their suggestion leaves much to be desired. CIMULACT on the ohter hand produces multiple research lines that could be explored regarding the shaping of a social midset that is scalar in nature.	Alignment = low

Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	To adopt innovative practises in the way societal actors compete and cooperate to achieve inclusion, innovation, and security, it is necessary to both generate societal knowledge about the changing nature of these social 'values' – inclusion, innovation, and security are not stable goals, but change their meaning and form under new conditions – and to make it relevant to especially those actors who shape processes and conditions for others. (82) The transition toward sustainable energy will also require profound changes in the everyday life of European itizens and in the organisation of cities. Collaboration of social sciences and humanities with the "hard sciences" ust be recognised as necessary and organised and funded accordingly.(48) An important task for economists is to establish a socially acceptable and morally just way of including environmental concerns in the price of coal, oil, gas, and nuclear energy. (48) To succeed, Horizon 2020 needs to engage the public and multiple stakeholders much earlier and more comprehensively in the development and deployment of new sustainability technologies. Ultimately, the citizens of Europe need to feel proud ownership of the transition. (66)	Alignemnt = med Expert report outlines the complexity of the proposal within CIMULACTs call, by describing the inherent instability of certain terms (innovation, inclusion, etc) and in framing the issue of sustainabilitiy as practice of everyday life, global collaboration, and transdisciplinartiy. CIMULACt calsl for more direct experimentation with regard to legal and policy frameworks that can better incentivize such research, including research governance itself.	Alignment = med
Topics mentioned only in the expert based study			

Foresight Services to Support Strategic Programming within Horizon 2020 (2014), Ed. RAND Europe, Brussels: Report prepared for the European Commission Directorate General for Communications Networks, Content & Technology

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, Demographic Change and Well-Being

1.1 Personal development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: - Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. - Better understanding the labor market and its future changes through theories, models and foresight approaches. - New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) - Exploring possible roles of communities for enabling alternative life-job-education pathways.	The STELLAR project (2012) has synthesised four areas of tension between technology-enabled trends and values that could impact the development and adoption of technology-enhanced learning solutions. Finding solutions to these tensions would be worthy of further investigation within European programmes: 1) Privacy and data analytics for learning, 2)Widening digital divides despite technology spread, 3)Focused and critical processing of information vs ubiquitous learning opportunities, and 4)Standardised vs individual learning paths. (33) ...highlight loss of jobs and technology dependency as the main concerns. Linked to this,a critical issue for societies and policymakers could be to provide economic assistance and retraining to individuals who could be made redundant due to the widescale deployment of robots. (65) Larger scale projects implementing (on a large-scale) new learning systems will be necessary. Such projects will have to take into consideration the evolutions in traditional educational systems, which (will) focus more on modularisation, lack of physical infrastructures and lifelong learning, thus revolving around change management in Europe's diverse education landscape. (97)	Alignment = med Expert report describes multiple factors that can alter the job-market and its skills requirements, and offers some suggestions for social policies that can alleviate such disruptions. CIMULACT also calls for solutions to address individual psychological conditions, and greater social empowerment.	Alignment = med

Rethinking (the new) job market needs - Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability - Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	The ability for connected economies to support European competitiveness also depends on the education sector. Employment and contribution to growth hinge upon a European education system and lifelong learn-ing facilities equipping the workforce with the necessary knowledge and skills for digital innovation. (24) Governments around the world (and European countries within the framework of the Digital Agenda) are focusing on incorporating e-skills in curricula for formal and continuing education.49 Differences in education policy towards ICTs and the fact that most available information is in English risk widening the digital divide within Europe. (31) A key factor that would potentially hold back the progress of a thriving robotics industry, particularly in Europe, is skills and resource shortages in specific areas such as engineering and computer science... A field of robotics within which there have been relatively few breakthrough developments and innovations over the years is that of robotic actuators; this is an area in which it is was felt that Europe could lead the way in the future. (64-5) ...highlight loss of jobs and technology dependency as the main concerns. Linked to this,a critical issue for societies and policymakers could be to provide economic assistance and retraining to individuals who could be made redundant due to the widescale deployment of robots. (65	Alignment = low Expert report addresses changes to job market and necessary skills training adjustments. CIMULACT additionally calls for ethical and social accountabilitiy training, inclusive social processes, personal fulfillment, and societal well-being, all of which are only addressed via economic assitance in the expert report.	Alignment = med
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics:	Demographic trends, together with quick developments in technology and a trend towards the digitalisation of production together with blurring lines between formal and informal ways of learning also create demand for novel ways to learn. In addition, they raise the need and relevance of lifelong learning.(30) This, however, also requires further advances in other complementary research areas, such as defining appropriate legal regulatory frameworks and mechanisms, especially regarding personal data protection, as well as more research in the current shifts in the organisational and societal structures that underpin the movement towards more open, transparent and integrated poli-	Alignment = med Expert report emphasizes life-long learning along with other educational reforms, and these are connected to social strucutres and mechanisms, along with change management. CIMULACT additionally calls for redefined values and	Alignment = low

• Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	cymaking systems. More research should also be conducted to design and implement pan-European interoperable systems that allow data sharing across national systems. (88) Smaller research projects, focusing on metrics and blending between on- and offline educational systems may be useful areas to fund under H2020 programmes. Projects that attempt to understand the requirements for change management also need to be implemented given the wealth of tools and the lack of large-scale uptake. (97)	social welfare to guide policy.	
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	In this regard, over the last few years, surgical robotics has been an area of great interest in the research community. Furthermore, numerous surgical robotic products are being developed and commercialised and recent figures demonstrate that the sales of medical robots are increasing at a considerable rate. Robotic technologies are also increasingly being deployed to assist individuals with diminished mobility. (62) ...many surgical robotic systems still have limitations such as 'less dexterity, limited traction, issues with hand-eye coordination, and judgement'. Indeed, Griffen and Sugar (2013) highlight that surgical robotic technologies are 'simply inaccessible'... (65) Larger-scale coordinating actions and/or projects that 'critically accompany' the established [Robotics] research community's activities should be supported at the EU level, given the need to understand how to recognise the place of advanced robotics in our societal context. As the trend analysis for this theme indicates, the focus should also consider how to overcome the 'European Paradox' of getting such technologies to market. This may be driven by longer-term testing of prototypes and transposition of technologies from the factory to various 'human' areas of research, such as offices, homes, and hospitals. Such activities should also ensure that the (legal and ethical) conditions for increased take up of robotics technology are addressed. (102-3)	Alignment = low Expert report focuses on technical solutions, robotics, to healthcare challenges, and does not seem to address the complex and localized needs that are central to CIMULACT.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this	Science is building on the proliferation of data of many types, from satellite imagery to health records, and information collected by sensors in forests, buildings, human bodies and elsewhere. Genomic information and health data are enabling the development of stratified medicine, which promises to tailor health interventions to individuals' particular needs. (78)	Alignment = low Expert report gathers technical developments across vari-	Alignment = low

purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. • For the citizens to be trained on health and digital literacy.	The development of eGovernment is being strongly encouraged at the EU level to improve innovation and efficiency in various areas (e.g. health, education, environment, transport, public procurement, etc.) to provide user-centric and user-driven solution in response to citizens' needs while reducing costs. (82)	ous and diverse sectors to address macro trends in various fields including healthcare. The specific conerns of CIMULACT are not addressed: holistic healthcare, data skills training for patients and doctors, etc.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to:		Alignment = None	Alignment = none

a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.			
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	With an ageing population, IoT in healthcare (MDTmag 2014) is another area in which Europe could lead the way. (52) The effort to sequence the human genome is a high profile example of large-scale scientific collaborations that are becoming more common and feasible. New types of journals have also emerged, (77) Science is building on the proliferation of data of many types, from satellite imagery to health records, and information collected by sensors in forests, buildings, human bodies and elsewhere. Genomic information and health data are enabling the development of stratified medicine, which promises to tailor health interventions to individuals' particular needs. (78)	Alignment = low Expert report mentions some of the technical trends that will influence this topic (big data collection and analysis, genome sequencing), but fails to connect these trends to the call for open access, collaborative development, and citizen empowerment.	Alignment = low
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle		Alignment = none	Alignment = one

factors promoting neuroplasticity and neurogenesis - fundamental biological and psychological processes involved in the ageing process - the conditions promoting intergenerational relationships - the societal and economical impact of the melting of sociocultural borders between different ages - the impact of the adoption of healthy lifestyles and lifelong learning on employment, innovation and social change			
Topics mentioned only in the expert based study			

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignment = none	Alignment = none
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their		Alignment = none	Alignment = none

personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the "analog" activities overcoming the notion that time is money		Alignment = none	Alignment = none
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere.		Alignment = none	Alignment = none

the community level: group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	Digital technologies can also be used to improve transparency, and to identify inefficiencies and safety problems in the food supply chain. Using labelling to track data from every step of the food chain could unlock a potential for self-organisation in the supply system. (71) Interviewees highlighted the potential for ICT technology to play a role in measuring the 'true cost' of activity in this sector by monitoring the environmental or public health impacts resulting from food production or availability(73) globally, irregular access to resources, technologies and food are more significant risks for food security than limitations in productivity and availability. (73)	Alignment = low Expert group recognizes technical developments that apply to this area, and the importance of accesss to resources, technology, and food. CIMULACT calls for a research regime focused on providing details to causes for food inequality, education programmes, and experiemnts in new social welfare programs.	Alignment = low

Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.	Digital technologies can also be used to improve transparency, and to identify inefficiencies and safety problems in the food supply chain. Using labelling to track data from every step of the food chain could unlock a potential for self-organisation in the supply system. (71) Community-building exercises across all aspects of this food cycle should be considered, alongside smaller focused projects that present new innovations in the field.(103)	Alignment = low Expert group highlights some technical solutions to problems within the CIMULACT topic, and makes vague calls for recognition of community and social factors in the food complex. Tenuous connection at best.	Alignment = low

Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	Data are playing an increasingly critical role in agriculture and the types of data relevant for agriculture and food are diverse. Information collected by sensors, drones and satellites can be combined with genomic information or climate data to better inform farm management decisions. Farmers can use real-time market information to make better business decisions, and data from labelling technology can gather information about the food supply chain.(71) Interviewees highlighted the potential for ICT technology to play a role in measuring the 'true cost' of activity in this sector by monitoring the environmental or public health impacts resulting from food production or availability(73) They suggested that data could be shared and managed collectively, following the model of cooperative farming, with ICTs enabling the virtual aggregation of farms. Meanwhile, parallel developments in the democratisation of science (see Theme 9) could enable farmers to contribute to innovation. (74) Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should closely coordinate with the Joint Programming Initiatives on agriculture. Furthermore, coherence across the entire food chain, examining consumption, consumer behaviour, labelling, monitoring and waste should be considered. (103)	Alignment = med Expert report cites numerous modes for technological development applied to the food sector, in particular digital agriculture and big data analysis. This does not however address CIMULACT's call for sustainable food, new food paradigms, braod dissemination of data and research, nor regulations, policies, and practices of current governing institutions.	Alignment = med

	Community-building exercises across all aspects of this food cycle should be considered, alongside smaller focused projects that present new innovations in the field.(103)		
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	One of the most important ways that digital technologies are impacting agriculture is through precision agriculture, defined as an approach 'that uses information technologies to bring data from multiple sources to bear on decisions associated with crop production.' (70) With the potential to do a range of functions, from ploughing and planting to spraying, milking and picking, robots may also play an increasingly significant role in agriculture and could help reduce food waste by im-proving efficiency in harvesting and food processing (71) Interviewees highlighted the potential for ICT technology to play a role in measuring the 'true cost' of activity in this sector by monitoring the environmental or public health impacts resulting from food production or availability(73) Community-building exercises across all aspects of this food cycle should be considered, alongside smaller focused projects that present new innovations in the field.(103)	Alignment = low Expert report focuses on digital agriculture technologies that could be applied to land-use practice and policy, but does not make the explicit connection. CIMULACT additionally calls for inclusive, multi-level governance.	Alignment = low
Topics mentioned only in the expert based study			
Precision Agriculture	One of the most important ways that digital technologies are impacting agriculture is through precision agriculture, defined as an approach 'that uses	Alignment = none	Alignment =

	information technologies to bring data from multiple sources to bear on decisions associated with crop production.' (70) They suggested that data could be shared and managed collectively, following the model of cooperative farming, with ICTs enabling the virtual aggregation of farms. Meanwhile, parallel developments in the democratisation of science (see Theme 9) could enable farmers to contribute to innovation. (74)	Too specific for CIMULACT	
Agriculture Robotics	With the potential to do a range of functions, from ploughing and planting to spraying, milking and picking, robots may also play an increasingly significant role in agriculture and could help reduce food waste by improving efficiency in harvesting and food processing (71) Particular applications highlighted in the report include automated ripeness sensing and picking, site-specific spraying...controlling weeds without the need for herbicides... automated systems for the inspection and sorting of plant or animal products, small inexpensive robots to assist humans in harvesting strawberries, aerial vehicles that can take water samples from remote areas and improved robotics for handling large numbers of live plants or animals (USDA 2013). Interviewees also highlighted the importance of unmanned aerial vehicles (drones)... (71) Larger-scale coordinating actions and/or projects that 'critically accompany' the established [Robotics] research community's activities should be supported at the EU level, given the need to understand how to recognise the place of advanced robotics in our societal context. As the trend analysis for this theme indicates, the focus should also consider how to overcome the	Alignment = none Too specific for CIMULACT	Alignment =

	‘European Paradox’ of getting such technologies to market. This may be driven by longer-term testing of prototypes and transposition of technologies from the factory to various ‘human’ areas of research, such as offices, homes, and hospitals. Such activities should also ensure that the (legal and ethical) conditions for increased take up of robotics technology are addressed. (102-3) Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should closely coordinate with the Joint Programming Initiatives on agriculture. Furthermore, coherence across the entire food chain, examining consumption, consumer behaviour, labelling, monitoring and waste should be considered. (103)		

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered	A crucial aspect will be the policy apparatus that will be required to ultimately deliver the Internet (e.g. rural broadband roll-out) to the places where the 'things' will be.119 The complex systems engineering challenges associated with deploying IoT ecosystems on a large-scale is another area that could potentially be addressed under Horizon 2020, particularly as the IoT is going to be the critical infrastructure for 'smart-X' markets. (52) The development of eGovernment is being strongly encouraged at the EU level to improve innovation and efficiency in various areas (e.g. health, education, environment, transport, public procurement, etc.) to provide user-centric and user-driven solution in response to citizens' needs while reducing costs. (82)	Alignment = low Expert report mentions eGoernment, and access to Internet, both of which are reltaed to Smart, inclusive, energy governance as defined by CIMULACT, but they do not address the more specific components as called for by CIMULACT.	Alignment = none

as an important aim for the governance models, as should the future need for “energy communities” in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders’ interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most	The development of eGovernment is being strongly encouraged at the EU level to improve innovation and efficiency in various areas (e.g. health, education, environment, transport, public procurement, etc.) to pro-vide user-centric and user-driven solution in response to citizens' needs while reducing costs. (82)	Alignment = low Expert report ties trnasportation governance to the more broad category of eGovernment without providing specific calls for research and goals as found in CIMULACT.	Alignment = low

appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).		Alignment = none	Alignment = none
Moving together (more collective transport options)		Alignment = none	Alignment = none

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).			
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.		Alignment = none	Alignment = none

Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	Community-building exercises across all aspects of this food cycle should be considered, alongside smaller focused projects that present new innovations in the field.(103)	Alignment = low Expert report acknowledges critical role of community in creating lasting change in consumer behavior, but only within the context of food consumption.	Alignment = none
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development.	Besides convenience and potential economic savings, 3D printing can also influence our mindset. Campbell (2012: 49), for example, writes 'Playing with 3D printing exposes that everything in our built environment is designed by somebody who makes choices for us about how we should or shouldn't use our possessions. They dictate when we should buy things and how quickly we should dispose of them. We're about to have more of a say in this process, if we so choose.' This leads to a sense of freedom previously not experienced by a large part of the population. The DIY eco-system has also ignited a maker	Alignment = med Expert report mentions technologies (3D printing) that could radically change production processes, planned obsolescence, and DIY communities. It also calls for altered design strategies	Alignment = low

Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	movement, which is an umbrella term for independent inventors, designers and tinkerers (55) As such there is a need for recyclable materials to use for 3D printing endeavours. If such materials arrive, there is room for a more positive scenario where supply and demand will be better coordinated especially if consumers only manufacture what they need (57) Two specific directions emerge for research in this area under H2020: (i) the development of technologies that will enable and encourage the prevalence of sustainable methods of 3D printing, if and when sustainable means arise to deal with this phenomenon, and (ii) greater understanding of what open hardware, open software and 3D printing mean for economic models. Smaller research projects may be used to encourage alternative conceptions of these models. (101)	and research experiments within alternative economic models resulting from widespread use of said technologies. It does not mention much in terms of understaindg full product costs, or promoting public education.	
Topics mentioned only in the expert based study			
Distributed Manufacturing	The fluctuation of roles and responsibilities, either through the blurring of lines or the development or intro-duction of new actors, leads to legal challenges and questions. Mota (2011) asks ‘While the manufacturing industry is currently subject to regulations concerning the safety, quality and environmental impact of the goods they produce, how can these be applied to the objects individuals fabricate themselves? Who is liable if someone gets injured by one of these home-made objects?’(55) As such there is a need for recyclable materials to use for 3D printing endeavours. If such materials arrive, there is room for a more positive scenario where supply and demand will be better coordinated especially if consumers only manufacture what they need (57) Two specific directions emerge for research in this area under H2020: (i) the development of technologies that will enable and encourage the prevalence of sustainable methods of 3D printing, if and when sustainable means arise to deal with this	Alignment = low Expert report spends long time detailing possible ramifications of technology on production practices. This is related to CIMULACT's call for Production Awareness, but overly technically specific.	Alignment =none

	phenomenon, and (ii) greater understanding of what open hardware, open software and 3D printing mean for economic models. Smaller research projects may be used to encourage alternative conceptions of these models. (101)		
Automation and Consumer Robots	The traditional key players in the global robotics market – Japan,135 USA, Republic of Korea and Germany – continue to dominate overall, representing about 50 per cent of the global market. It should be noted, however, that there has also been an upsurge in industrial robot installations in other Asian (e.g. Taiwan, India and Indonesia) and Central and Eastern European countries. (59) The yearly figures for the number of patent publications and families have tripled since 2004.137 In terms of global distribution of (priority) patents (Figure 28), Japan is the clear leader with approximately 31 per cent of all patents first filed here [Europe is second with approx. 14%] (60) There have also been an increasing number of 'prize' or 'challenge' competitions in the field of robotics, several of these to tackle challenging 'real world' application scenarios such as disaster recovery, manufacturing, safe operations in oil and gas environments, and space applications. (61) Away from health, robotics has also found application in areas such as agriculture (e.g. crop management), environmental remediation (e.g. trash collection, clearing up after nuclear disasters, etc.), search and rescue, transport (e.g. autonomous vehicles and drones), professional (e.g. inspection of power plants and infrastructure such as bridges) and domestic services (e.g. autonomous vacuum cleaners and lawn mowers) and space exploration.(62) A key factor that would potentially hold back the progress of a thriving robotics industry, particularly in Europe, is skills and resource shortages in specific areas such as engineering and computer science. (64-5) Moreover, laws concerning liability for robotic errors are still untested and since ethical and cultural laws vary across the	Alignment = none Too technically specific for CIMULACT.	Alignment = none

	world, deciding on a standard set of laws to tackle this issue is a cause for concern (65) Another potential barrier to progress, particularly with robotic tasks becoming progressively more complex, is that of technical standards concerning robots (e.g. international safety standards). (65) ...many surgical robotic systems still have limitations such as ‘less dexterity, limited traction, issues with hand-eye coordination, and judgement’. Indeed, Griffen and Sugar (2013) highlight that surgical robotic technologies are ‘simply inaccessible’... (65) From a European policy perspective, enhancing research and innovation in the field of robotics is one of the focal priorities of the Digital Agenda for Europe...For example, actively supporting an SME culture in Europe will potentially facilitate robotics technologies to diffuse into new markets; in this respect, ensuring that EU-funded robotics projects move beyond academia into deployment is vital(67) Furthermore, the ‘gap’ between academia and industry needs to be closed using mechanisms like technology transfer171 and more collaboration could be encouraged between European researchers and their counterparts in, for example, the USA. (67) Finally, it is crucial that the ethical, legal and social implications of robotics are not ignored while rapid technological advances are being made in the field. (67) [Robotics] research should focus on near-market actions to translate a broad research base into practical commercial innovations where there is no current market incentive. Funding grand challenge competitions along the DARPA model may provide best results within the H2020 context. (102)		

Urban and Rural development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	Important related actions would involve promoting open data and technologies, and providing education, medical care and digital infrastructure in rural areas. In this way, ICT could help boost productivity in areas that currently depend on low-productivity agriculture, so that farming could become a more viable and attractive way of life. (74) They argued that two key goals in Europe are to diversify economies in rural areas and to protect natural landscapes and cultural heritage, but that these goals are currently under threat in an environment that favours industrial agriculture. In this environment, they said, production is increasingly being separated from the sociocultural aspects of agriculture. (74) Community-building exercises across all aspects of this food cycle should be considered, alongside smaller focused projects that present new innovations in the field.(103)	Alignment = low Expert report views rural area as place for economic development through technology and cultural preservation policy. CIMULACT calls for research towards more balanced development between urban and rural spaces, high degrees of participatory governance between communities.	Alignment = med
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area:		Alignment = none	Alignment = none

The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.			
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.		Alignment = none	Alignment = none
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including:		Alignment = none	Alignment = none

Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions			
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	Community-building exercises across all aspects of this food cycle should be considered, alongside smaller focused projects that present new innovations in the field.(103)	Alignment = low Community building is mentioned within expert report only with regard to food sector cycles. The term is also employed in a rather vague manner.	Alignment = low
Topics mentioned only in the expert based study			

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	Digital technologies are providing new ways for the general public to participate in the arts and sciences, allowing members of the public to play a role in creating and curating art, doing science, and choosing to provide financial backing directly to particular art and science projects. (76) While technological advances have significantly altered the way governments interact with citizens and share information, the impact of this enhanced flow of information remains uncertain.200 Some of this uncertainty concerns the way in which people participate in the political process and how these trends will influence governance and policymaking dynamics.(81) In addition, there are some tensions between the public's lack of trust in government and the concomitant rise of social medias as a powerful tool of political participation that could bypass traditional forms of political expression. (81-2) An over-enlarged circle of participation may lead to policies that leverage the 'lowest common denominator' in decisions, building on short-term consideration at the expense of solutions that would require a longer-term view.(83) Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of gov-	Alignment = med Expert report acknowledges the technological impact on political participation, but highlights tensions, uncertainty, and ulimately calls for limited participation. CIMULACT on the other hand is keen to find technological designs that can promote inclusivity and authentic participation.	Alignment = med

	ernment in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)		
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	A future stream of research suggested by the literature (Dvorak 2012; Skaržauskaitė 2013) could empirically investigate the role of organisations in using co-created processes and motivations of consumers to participate in these processes and for industry on how to leverage co-innovation instruments efficiently. (22) Important related actions would involve promoting open data and technologies, and providing education, medical care and digital infrastructure in rural areas. In this way, ICT could help boost productivity in areas that currently depend on low-productivity agriculture, so that farming could become a more viable and attractive way of life. (74) Digital technologies are providing new ways for the general public to participate in the arts and sciences, allowing members of the public to play a role in creating and curating art, doing science, and choosing to provide financial backing directly to particular art and science projects. (76)	Alignment = med Expert report highlights research towards co-creation processes, participatory design and innovation, and technical capacities to expand various form sof participation. CIMULACt further calls for greater awareness of public and private research, open access/scince practices, all within the context oc smaller, localized, communities.	Alignment = low

Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	An over-enlarged circle of participation may lead to policies that leverage the 'lowest common denominator' in decisions, building on short-term consideration at the expense of solutions that would require a longer-term view.(83)	Alignment = low Expert report emphasizes the challenges of increased participation on various scales, but CIMULACt calls for a more comprehensive approach to awareness rasing about scalar processes, actors, and grand scale flows.	Alignment = low
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	It also raises questions about the kind of governance mechanisms that will accompany the growing use of ICTs by public bodies and the emergence of new players in the provision of public services.(81) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82)	Alignment = low Expert report is primarily technocratic - examining issues concerning the gathering, analysis, and ownership of data - in its approach	Alignment = low

	Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)	to Transparency. CIMULACT calls for a broadened understanding of transparency within different modes of social governance.	
Topics mentioned only in the expert based study			
E-Government & Resistance	The development of eGovernment is being strongly encouraged at the EU level to improve innovation and efficiency in various areas (e.g. health, education, environment, transport, public procurement, etc.) to pro-vide user-centric and user-driven solution in response to citizens' needs while reducing costs. (82) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82) In parallel to these new forms of democratic consultation, initiatives such as Citizen Lab,214 a watchdog group based at the University of Toronto, and more	Alignment = low CIMULACT acknowledges the potential of digital technologies to alter forms of governance, but expert report goes to great lengthon details of technologies that could be involved in eGov.	Alignment = low

	recently WikiLeaks, illustrate the emergence of more radical forms of political engagement, which directly challenge governments' legitimacy and authority. Web 2.0 tools can enable local problems to win a global exposure. (84) The opening up of administrative and personal data will require the development of appropriate technical standards allowing data sharing and data reuse across systems and countries to stimulate innovation. (84) The lack of interoperability across national and European systems remains a potential barrier to the development of eGovernment and open data... Privacy concerns remain a major obstacle to the full development of political participation and full engagement with ICTs and social media as a tool for governing. (86) In addition, to fully exploit the potential of eGovernment and open data, citizens will need the skills that allow them to interact and understand large amounts of data and information. Communicating complex information is the key to involving citizens in decision-making, especially when huge datasets are opened up to the public. (87) This, however, also requires further advances in other complementary research areas, such as defining appropriate legal regulatory frameworks and mechanisms, especially regarding personal data protection, as well as more research in the current shifts in the organisational and societal structures that underpin the movement towards more open, transparent and integrated policymaking systems. More research should also be conducted to design and implement pan-European interoperable systems that allow data sharing across national systems. (88)		

	Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)		

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	Measuring economic prosperity in the digital era. How to measure innovation? What new metrics exist to measure the success of societies? Does the concept of measuring success by GDP need to be replaced or broadened to include well-being, happiness, health and quality of life? (41-2) Funding near-market research projects set up to operationalise and test a diversity of economic models are perhaps the most useful focus for this topic within the H2020 programme. (98)	Alignment = med Expert group both recognizes emerging challenges to the current economic framework, while also calling for small scale experimentation in alternative economic models.	Alignment = low
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.	Sustainable growth, innovation and technology. How can technology break the association between economic growth and resources consumption? How can 'distributed innovation' and the 'peer-to-peer' economy foster sustainable forms of economic growth and in what circumstances? (41)	Alignment = low Expert report calls for experimentation into alternative economic systems, and mentions sustainable growth (echoing circular economy) as one area for research. CIMULACT calls for a more	Alignment = low

		comprehensive approach to understanding diverse economic models, deployed towards societies ultimate benefit.	
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects		Alignment = none	Alignment = none
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports	Other challenges may also emerge, such as the difficulty in designing taxation frameworks for novel forms of value creation (24) As digital technologies become increasingly ubiquitous, they will give rise to the digital democratisation of production, distribution and consumption where each individual is at the centre.64 This shift will require economic models to (1) focus on 'me' as a unique economic agent, with unique behaviours and needs; (2) use large amounts of granular data; and (3) explore how technology can break the association between growth, resources consumption, pollution and carbon emission, thereby creating sustainable models of economic growth.(34) Sustainable growth, innovation and technology. How can technology break the association between economic growth and resources consumption? How can	Alignment = high Expert report does call for research into alternative economic models that can be deployed to achieve diverse ends across a society. This research includes answering inequality and transition	Alignment = med

the current economic model and the needed incentives that would promote a shift to a new economic model.	‘distributed innovation’ and the ‘peer-to-peer’ economy foster sustainable forms of economic growth and in what circumstances? (41) The consumer-Internet economy offers long-term scope for enhanced near-market actions to accelerate relevant technologies to market... Two further long-term topics of study are the impact of regulatory reform on the wider landscape of consumer regulations in the EU and the application of large-scale data flows to improve the efficiency and operation of emergent Internet economies. (95) Funding near-market research projects set up to operationalise and test a diversity of economic models are perhaps the most useful focus for this topic within the H2020 programme. (98) Long-term European research in this area should lean towards a more fundamental assessment of innovation processes, business models and linkage to broader policy objectives, while taking into account a need to mark out a specific ‘European’ approach to economic development in the global environment.(99) Two specific directions emerge for research in this area under H2020: (i) the development of technologies that will enable and encourage the prevalence of sustainable methods of 3D printing, if and when sustainable means arise to deal with this phenomenon, and (ii) greater understanding of what open hardware, open software and 3D printing mean for economic models. Smaller research projects may be used to encourage alternative conceptions of these models. (101) In the long term, this theme may cease to be a separate area of research. Many of the most promising trends in the DIY innovation ecosystem are likely to be ‘absorbed’ into the work of theme 4 (New Economic Models) and 2 (Consumer Internet Economy) by means of focus on production/consumption and the development of new economic models that respond to these changes. In short, it is projected that the DIY innovation trend will become widely embedded in the economic paradigm of Europe and will therefore be best furthered by a concentration in economic and consumer impact. (101) The long-term landscape of [Digital Governance] shows significant overlaps with trends covered in themes 9 (Digital Art and Science), 2 (Consumer Internet Economy) and 4 (New Economic Models). The theme represents an important	questions similar to that of CIMULACT.	

	long-term priority for Europe that will enable much of the research in these other themes to be successfully implemented. For this reason, one long-term research priority in the field should be the proactive incorporation of developments in other domains into the policy process through new technologies such as Big Data analytics. (106)		
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.	Long-term European research in this area should lean towards a more fundamental assessment of innovation processes, business models and linkage to broader policy objectives, while taking into account a need to mark out a specific 'European' approach to economic development in the global environment. (99)	Alignment = low CIMULACT calls for increased regulation of financial sector with regard to social and environmental 'goods'. Expert calls for similar research, but much more broadly, without explicitly calling out financial sector.	Alignment = low
Topics mentioned only in the expert based study			
Consumer Internet Economy	As an emergent research and policy area, research undertaken under the auspices of Horizon 2020 should examine the relationship between the Digital Single Market legal and policy frameworks and these emerging characteristics of the Consumer Internet Economy. Smaller research projects may provide useful instruments to dig deeper into online behaviour and the societal impacts of co-creation and hyperconnectivity. Specific research into new technological developments could also be carried out in this area of research, with direct linkages to IoT research. (95) The consumer-Internet economy offers long-term scope for enhanced near-market actions to accelerate relevant technologies to market... Two further long-term topics of study are the impact of regulatory reform on the wider landscape of consumer regulations in the EU and the application of large-scale	Alignment = none	Alignment =none

	data flows to improve the efficiency and operation of emergent Internet economies. (95) In the long term, this theme may cease to be a separate area of research. Many of the most promising trends in the DIY innovation ecosystem are likely to be 'absorbed' into the work of theme 4 (New Economic Models) and 2 (Consumer Internet Economy) by means of focus on production/consumption and the development of new economic models that respond to these changes. In short, it is projected that the DIY innovation trend will become widely embedded in the economic paradigm of Europe and will therefore be best furthered by a concentration in economic and consumer impact.(101) Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should closely coordinate with the Joint Programming Initiatives on agriculture. Furthermore, coherence across the entire food chain, examining consumption, consumer behaviour, labelling, monitoring and waste should be considered. (103) The long-term landscape of [Digital Governance] shows significant overlaps with trends covered in themes 9 (Digital Art and Science), 2 (Consumer Internet Economy) and 4 (New Economic Models). The theme represents an important long-term priority for Europe that will enable much of the research in these other themes to be successfully implemented. For this reason, one long-term research priority in the field should be the proactive incorporation of developments in other domains into the policy process through new technologies such as Big Data analytics. (106)		
Crisis-Prone Economy	Crisi-prone economy. Regional instability, especially in the Middle East and South Asia, coupled with greater global multi-polarity (Lijn 2012; National Intelligence Council 2008) can result in global insecurity and economic instability (Atlantic Council 2012). This would be likely to hamper the capacity for developing new models of value creation for the digital economy. (41)	Alignment = low This could be a driver for CIMULACT's emphasis on alternative economies, but it is never specifically mentioned.	Alignment = low

Breaches of Trust	Security and privacy breaches. The event of major privacy or security breaches is likely to undermine trust among stakeholders in the digital economy. This mistrustful environment would severely compromise, if not reverse, some of the trends identified above, namely the 'me' economy, the 'peer-to-peer' economy and the 'distributed innovation'. (41) Thus the importance of developing proper frameworks for data handling and data protection cannot be overestimated. Indeed, it was noted that the EU could play a strategic role by trying to 'nudge' industry into doing verification and privacy by design (for example, by changing or enforcing law on liability). (52) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82) Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)	Alignment = low CIMULACt is concerned with trust as a social governance issue, but rarely mentions it so specifically.	Alignment = low
Role of Procurement	Role of procurement (private and public). What role can public procurement and private procurement (e.g. corporate-led business incubators and business accelerators) have in fostering the development of digital start-ups and thereby innovation, economic growth and job creation? (42)	Alignment = low CIMULACT does not discuss public procurement explicitly, though it could be inferred from some statements.	Alignment = low
Income Inequality	Growing income inequality. The benefits of emerging ICT may be unevenly distributed and could even contribute to widening income inequality.80 Highly	Alignment = low	Alignment = low

	skilled workers and owners of capital are likely to benefit from greater opportunities (MGI 2013). The new economic models, therefore, might need to put a greater importance on education and training as well as on how to best deal with income inequality. (40)	Again, this topic is brought up in various contexts within CIMULACT, but rarely addressed on its own.	
Intellectual Property	Inadequate IP and regulatory regimes. One challenge to the new models of value creation will be to craft ways of managing intellectual property across multiple stakeholders (users, producers, suppliers, competitors, researchers) around the world, who have different types of IP requirements and operate under very different legal and regulatory regimes (40) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82) The matter of intellectual property with respect to digital fabrication is an ongoing policy challenge, much the same as it has been for the Internet, where stakeholders maintain different interests and existing regulatory models appear to fall short of reaching a workable compromise between the different parties. (57)	Alignment = low CIMULACT promotes research and data that is open, and rarely discusses the ownership of ideas via IP law and policy.	Alignment = none
Entrepreneurial Environment	Entrepreneurial-unfriendly business environment. By and large, most European countries compare unfavourably with other developed economies in offering an entrepreneurial-friendly regulatory environment. (40)	Alignment = low CIMULACT calls for some increased entreprenneurialism, but only within certain contexts.	Alignment = none
Distributed Innovation	Several models of distributed innovation have been employed and are likely to continue to expand in the future (Bogers and West 2012). Among them are	Alignment = none	Alignment = low

	open innovation (Chesbrough 2012, 2006) and user innovation (Greer et al. 2012)... Sophisticated online platforms will make it easier and simpler to manage, support and mediate among a distributed network of innovation stakeholders72 – companies, users, universities, entrepreneurs, research centres, etc. (38) Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)	CIMULACt does not address this issue explicitly, but it could be inferred from some of its research topic proposlas.	

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	Facer and Sandford (2010) discuss several prospective socio-technical developments that could take place over the next 25 years and their implications for research into educational technologies. The study synthesises the following questions that can guide our thinking about education: 1) Reconsidering the centrality of the individual in education, 2) Reconsidering the role of the school, and 3) Considering whether different values (e.g. wellbeing) may be a more important goal for education than knowledge-economy competitiveness. (26-7) A highly important policy challenge is enabling European students to learn through technologies that reflect European needs and values (e.g. respect cultural differences), and find a place for open source approaches.(31)	Alignment = high Expert report acknowledges the multiple shifts that must take place across educational systems, and includes technologies but only so far as they reflect values and traditions (which implies	Alignment = med

	Larger scale projects implementing (on a large-scale) new learning systems will be necessary. Such projects will have to take into consideration the evolutions in traditional educational systems, which (will) focus more on modularisation, lack of physical infrastructures and lifelong learning, thus revolving around change management in Europe's diverse education landscape. (97)	a participatory approahc to tech deployment).	
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.		Alignment = none	Alignment = none
Learning for society Research should explore the following aspects:	The ability for connected economies to support European competitiveness also depends on the education sector. Employment and contribution to	Alignment = high	Alignment = med

• Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of “education into action” and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	growth hinge upon a European education system and lifelong learning facilities equipping the workforce with the necessary knowledge and skills for digital innovation. (24) Rather, they are concerned with the systemic setup and the societal practices that influence what we define as education, and the definition of values and practices that society considers important. Emerging technologies may act as enablers and define the landscape in which these transformations take place.(27) Larger scale projects implementing (on a large-scale) new learning systems will be necessary. Such projects will have to take into consideration the evolutions in traditional educational systems, which (will) focus more on modularisation, lack of physical infrastructures and lifelong learning, thus revolving around change management in Europe’s diverse education landscape. (97)	Expert report again mentions educational development and changes to educational systems as complex and operating across different scales and communities.	
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and “out of the box” thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people “smarter”. Going beyond and reinvent-	Trends towards converging disciplines and technologies (e.g. bioinformatics) are likely to mean a greater demand for interdisciplinary skills and lifelong learning, which may be beyond the reach of traditional educational channels (29) Smaller research projects, focusing on metrics and blending between on- and offline educational systems may be useful areas to fund under H2020 programmes. Projects that attempt to understand the requirements for change management also need to be implemented given the wealth of tools and the lack of large-scale uptake. (97)	Alignment = med Expert report calls for technolgical deployment in education, but only in so far as they compliment and reflect community values and traditions (something that can only be	Alignment = low

ing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.		approached through an open dialgoue with a framework like SWOT).	
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.	Investigating the design principles necessary for useful learning games for European students is therefore another potential field of research.(33) The STELLAR project (2012) has synthesised four areas of tension between technology-enabled trends and values that could impact the development and adoption of technology-enhanced learning solutions. Finding solutions to these tensions would be worthy of further investigation within European programmes: 1) Privacy and data analytics for learning, 2)Widening digital divides despite technology spread, 3)Focused and critical processing of information vs ubiquitous learning opportunities, and 4)Standardised vs individual learning paths. (33)	Alignment = low Expert report suggest numerous types and conditions of educational reform, but does not explicitly mention systems thinking, or a narrative based approach to pedagogy.	Alignment = low
Topics mentioned only in the expert based study			
Data Literacy and Security	Institutions will face the challenge of devising support frameworks that facilitate the success of European companies in the global consumer Internet economy. This could include fiscal and non-fiscal incentives, e.g. intellectual property and VAT frameworks, but also finding ways in which incentives trickle down to the creative consumers rather than stopping at the company level (24)	Alignment = low CIMULACT does mention data literacy as an important skill to encourage, but it doesn so across numerous	Alignment =

	Finally, big data and analytics are likely to transform the way research is done in higher education institutes. However, tensions are likely to emerge between an increasing importance of data privacy and the utility of data tracking for personalised learning.(28) The STELLAR project (2012) has synthesised four areas of tension between technology-enabled trends and values that could impact the development and adoption of technology-enhanced learning solutions. Finding solutions to these tensions would be worthy of further investigation within European programmes: 1) Privacy and data analytics for learning, 2)Widening digital divides despite technology spread, 3)Focused and critical processing of information vs ubiquitous learning opportunities, and 4)Standardised vs individual learning paths. (33) Pertinent questions are being asked about security issues affecting Internet infrastructure, privacy, data protection and ethical considerations related to individual freedom... It has also been suggested that educating customers about privacy and security of data generated will become increasingly important as IoT networks become more widespread (51) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82)	contexts of other research topics (health, econonmics, social communities, etc.). Expert report spends a significant amount of time detailing critical components of digitaliteracy and technologies involved...not how they are to be applied within more specific contexts.	

	In addition, to fully exploit the potential of eGovernment and open data, citizens will need the skills that allow them to interact and understand large amounts of data and information. Communicating complex information is the key to involving citizens in decision-making, especially when huge datasets are opened up to the public. (87) This, however, also requires further advances in other complementary research areas, such as defining appropriate legal regulatory frameworks and mechanisms, especially regarding personal data protection, as well as more research in the current shifts in the organisational and societal structures that underpin the movement towards more open, transparent and integrated policymaking systems. More research should also be conducted to design and implement pan-European interoperable systems that allow data sharing across national systems. (88) Work is also necessary on developing proper frameworks for data handling and data protection, which may be facilitated by engagement with international standards bodies (where appropriate). For these, a variety of different instruments can be used. For example, smaller projects that develop potential new applications and tools could be supported, alongside larger networks of researchers that monitor and react to technological/legal/policy developments. (100) Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new		

	roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)		
Digital Divides	The STELLAR project (2012) has synthesised four areas of tension between technology-enabled trends and values that could impact the development and adoption of technology-enhanced learning solutions. Finding solutions to these tensions would be worthy of further investigation within European programmes: 1) Privacy and data analytics for learning, 2)Widening digital divides despite technology spread, 3)Focused and critical processing of information vs ubiquitous learning opportunities, and 4)Standardised vs individual learning paths. (33) This, however, also requires further advances in other complementary research areas, such as defining appropriate legal regulatory frameworks and mechanisms, especially regarding personal data protection, as well as more research in the current shifts in the organisational and societal structures that underpin the movement towards more open, transparent and integrated policymaking systems. More research should also be conducted to design and implement pan-European interoperable systems that allow data sharing across national systems. (88) Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake	Alignment = low CIMULACt does imply digital divide across some of the inequalities it hopes to adddress, but never explicitly.	Alignment =

	and future device development. Such research will provide a strong basis for continued EU leadership in the field.(100) The long-term landscape of [Digital Governance] shows significant overlaps with trends covered in themes 9 (Digital Art and Science), 2 (Consumer Internet Economy) and 4 (New Economic Models). The theme represents an important long-term priority for Europe that will enable much of the research in these other themes to be successfully implemented. For this reason, one long-term research priority in the field should be the proactive incorporation of developments in other domains into the policy process through new technologies such as Big Data analytics. (106)		
Art Questions Technology	... disharmony between, for instance, scientists and artists, is positive because it increases the potential for change. In addition, the arts can act as a glue bringing together areas with disparate aims, such as pharmaceutical businesses and the sciences, to look at complex problems like antibiotic resistance. (80) Small exploratory research projects focusing on developing multiple disciplinary approaches to understanding the role of the hard/exact sciences in technological innovation would be useful to help set a future research agenda. These smaller projects would need to elaborate on the mechanisms and processes with which art can contribute to the innovation process.(104) [Digital Art and Science] may also further broaden the stakeholder base of future research programmes. Community building between these different	Alignment = low CIMULACT does highlight creativity as something to be ecnouraged, but does not discuss art as critical lens for science.	Alignment =

	worlds would also be useful, through continuation of previous EU-funded activities in this area.(105) The long-term landscape of [Digital Governance] shows significant overlaps with trends covered in themes 9 (Digital Art and Science), 2 (Consumer Internet Economy) and 4 (New Economic Models). The theme represents an important long-term priority for Europe that will enable much of the research in these other themes to be successfully implemented. For this reason, one long-term research priority in the field should be the proactive incorporation of developments in other domains into the policy process through new technologies such as Big Data analytics. (106)		

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	Public-private partnerships (in research, education and data ownership among others) may be an important tool in research funding to involve companies in developing new solutions supporting European competitiveness (23) Data privacy, data control and data monetisation. Used well, the explosion of data holds tremendous potential to boost innovation, productivity, efficiency and, ultimately, economic growth and social value. At the same time, the use of all this data presents challenges in terms of privacy, security, data curation and data 'monetisation' – ensuring that individuals share the benefits of the data collected about them. These issues need to be addressed in a forward looking way so we can ensure privacy, security, data control and data value sharing without undermining the capacity for society to discover data-driven innovative offerings and better ways of living. (41) Thus the importance of developing proper frameworks for data handling and data protection cannot be overestimated. Indeed, it was noted that the EU could play a strategic role by trying to 'nudge' industry into doing verification and privacy by design (for example, by changing or enforcing law on liability). (52)	Alignment = med Expert report discuss many aspects of data (privacy, monteisation, owernship), but does not seem to espouse open data, open access practices that are central to CIMULACT. Expert report more centered on personal data collection and usage, whereas CIMULACT more interested in opening up databases and	Alignment = med

	The digital humanities, which combine text and data mining with traditional humanities approaches, continue to evolve as new data tools and types become available... Art can offer new perspectives for visualising, understanding and relating to data. (78) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82) The opening up of administrative and personal data will require the development of appropriate technical standards allowing data sharing and data reuse across systems and countries to stimulate innovation. (84) Access to and use of personal data will also be determined by further regulatory developments. Concerns have risen regarding the penetration of private economic actors in the provision of online public (but also economic) services, and their resulting access to a vast amount of personal data. The ability of national governments to provide effective responses to system security and data privacy requirements will be crucial going forward but remains slow, (84) Work is also necessary on developing proper frameworks for data handling and data protection, which may be facilitated by engagement with international standards bodies (where appropriate). For these, a variety of different instruments can be used. For example, smaller projects that develop potential new	broadley teaching data skills.	

	applications and tools could be supported, alongside larger networks of researchers that monitor and react to technological/legal/policy developments. (100)		
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		**Alignment = none**	Alignment = none
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices	As Misuraca et al. (2013) synthesises: 'Evidence of impacts of Web 2.0 on our society is largely anecdotal and in most cases not systematically gathered and analysed. Existing metrics are not able to make sense of the transformations enabled by these emerging technologies as the changes they convey seem to be more behavioural and cultural than primarily ICT-driven.' Therefore, research support efforts could aim at closing this gap. (22-3) Sustainable growth, innovation and technology. How can technology break the association between economic growth and resources consumption? How can 'distributed innovation' and the 'peer-to-peer' economy foster sustainable forms of economic growth and in what circumstances? (41)	Alignment = med Expert report tends to mention numerous specific technologies that can have a braod impact on environment and or people. CIMULACT more specifically calls for participatory development of	Alignment = med

- Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly - Reducing bureaucracy, speeding up the research and implementation of new initiatives	Although still in a relatively early stages of development, the next evolution of the Internet – the Internet of Things (IoT) – is seen by many as one of the fastest-growing technology segments with the potential to greatly impact society, businesses and economies. (42) Although novel energy harvesting technologies are being investigated (Gorlatova et al. 2013; Shwe & Liang 2009), the need for prolonged battery life and energy optimised solutions is likely to remain one of the foremost constraints for the large number of miniature devices that constitute the IoT ecosystem (Atzori et al. 2010; Miorandi et al. 2012.), particularly if it is to be ensured that the IoT contributes to a sustainable environment.(50) Additionally, the governance of the Internet itself and the interaction among the different stakeholders needs to be taken into consideration, with new models and frameworks emerging to shape the evolution of the Internet at a policy level. (52) The fluctuation of roles and responsibilities, either through the blurring of lines or the development or introduction of new actors, leads to legal challenges and questions. Mota (2011) asks 'While the manufacturing industry is currently subject to regulations concerning the safety, quality and environmental impact of the goods they produce, how can these be applied to the objects individuals fabricate themselves? Who is liable if someone gets injured by one of these home-made objects?'(55)	such technologies, as opposed to the implied hierarchies of the expert report.	

	As such there is a need for recyclable materials to use for 3D printing endeavours. If such materials arrive, there is room for a more positive scenario where supply and demand will be better coordinated especially if consumers only manufacture what they need (57) Finally, it is crucial that the ethical, legal and social implications of robotics are not ignored while rapid technological advances are being made in the field. (67) Digital technologies are providing new ways for the general public to participate in the arts and sciences, allowing members of the public to play a role in creating and curating art, doing science, and choosing to provide financial backing directly to particular art and science projects. (76) The effort to sequence the human genome is a high profile example of large-scale scientific collaborations that are becoming more common and feasible. New types of journals have also emerged, (77) Some authors suggest research should target aspects of Science 2.0 itself. Schneiderman (2008) states that researchers need new ways of working to understand the collaborative socio-technical systems that could link health records to health care or Facebook to disaster responses. Levin (2014) emphasises that as ways of conducting science are changing, so are the underlying values of science, and he recommends these changes be studied. (80) Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake and future		

	device development. Such research will provide a strong basis for continued EU leadership in the field.(100) Larger-scale coordinating actions and/or projects that 'critically accompany' the established [Robotics] research community's activities should be supported at the EU level, given the need to understand how to recognise the place of advanced robotics in our societal context. As the trend analysis for this theme indicates, the focus should also consider how to overcome the 'European Paradox' of getting such technologies to market. This may be driven by longer-term testing of prototypes and transposition of technologies from the factory to various 'human' areas of research, such as offices, homes, and hospitals. Such activities should also ensure that the (legal and ethical) conditions for increased take up of robotics technology are addressed. (102-3) [Digital Art and Science] may also further broaden the stakeholder base of future research programmes. Community building between these different worlds would also be useful, through continuation of previous EU-funded activities in this area.(105)		
Topics mentioned only in the expert based study			
IoT & Wireless Connetivity Research	Innovative techniques such as spectrum sharing (Ofcom 2014a) and 'white space'92 spectrum access (Weightless 2014a; Ofcom 2014a) are being investigated in the particular context of the IoT to meet the increasing growth in demand for wireless data capacity. Research is also being carried out to investigate	Alignment = low Too specfici for CIMULACT, though it is interwoven throughout the	Alignment = none

	the feasibility of using fifth generation (5G) wireless communications technology to support IoT (45) First, the sheer number and diversity of connected devices in the IoT creates significant scalability, heterogeneity (Iera et al. 2010; Miorandi et al. 2012) and systems engineering issues. (50) A crucial aspect will be the policy apparatus that will be required to ultimately deliver the Internet (e.g. rural broadband roll-out) to the places where the ‘things’ will be.119 The complex systems engineering challenges associated with deploying IoT ecosystems on a large-scale is another area that could potentially be addressed under Horizon 2020, particularly as the IoT is going to be the critical infrastructure for ‘smart-X’ markets(52) As an emergent research and policy area, research undertaken under the auspices of Horizon 2020 should examine the relationship between the Digital Single Market legal and policy frameworks and these emerging characteristics of the Consumer Internet Economy. Smaller research projects may provide useful instruments to dig deeper into online behaviour and the societal impacts of co-creation and hyperconnectivity. Specific research into new technological developments could also be carried out in this area of research, with direct linkages to IoT research. (95) Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake and future device development. Such research will provide a strong basis for continued EU leadership in the field.(100)	CIMULACT research topics.	

	Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should closely coordinate with the Joint Programming Initiatives on agriculture. Furthermore, coherence across the entire food chain, examining consumption, consumer behaviour, labelling, monitoring and waste should be considered. (103)		
Internet - Architecture and Infrastructure	The successful evolution of the web's architecture will also be largely dependent on the characteristics and patterns of the traffic that will be communicated across the IoT, with the majority of data being directed to and from 'machines' (51) Pertinent questions are being asked about security issues affecting Internet infrastructure, privacy, data protection and ethical considerations related to individual freedom (51) A crucial aspect will be the policy apparatus that will be required to ultimately deliver the Internet (e.g. rural broadband roll-out) to the places where the 'things' will be.119 The complex systems engineering challenges associated with deploying IoT ecosystems on a large-scale is another area that could potentially be addressed under Horizon 2020, particularly as the IoT is going to be the critical infrastructure for 'smart-X' markets(52) Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake and future	Alignment = low Too specfici for CIMULACT, though it is interwoven throughout the CIMULACT research topics.	Alignment = low

	device development. Such research will provide a strong basis for continued EU leadership in the field.(100) Work is also necessary on developing proper frameworks for data handling and data protection, which may be facilitated by engagement with international standards bodies (where appropriate). For these, a variety of different instruments can be used. For example, smaller projects that develop potential new applications and tools could be supported, alongside larger networks of researchers that monitor and react to technological/legal/policy developments. (100)		

Further topics from the study

Singularity	On the positive side, singularity could lead to 'utopian post-scarcity world' where disease has been eradicated, and humanity has everything it could possibly want and need (Solez et al. 2013: 113). The negative outcome paints the opposite picture and describes a catastrophe that could even mean the end of humanity. (7) The uncertainty of the arrival of singularity and its potential consequences requires policy makers to at least consider the implications of singularity related developments. This directly leads into the policy challenges of this theme. Since the projections of what may happen in the future are largely based on speculations due to the unpredictable nature of the developments, policy makers are challenged to consider how research can ensure a positive outcome. (9) Programming European research in this field is relatively difficult, given the uncertainty of the theme; however, crossovers between this theme and others described below may prove incredibly fruitful and develop new understandings and rationales for innovation processes. Mapping activities, such as those already underway in the form of the Human Brain Project, are very useful for identifying potential areas of research. This theme may be most appropriately considered for larger scale coordination and/or support actions. (93) Future research into the theme is best managed in the respective industrial and social domains that govern sub-topics such as robotics for cyber-physical	Alignemnt = none	Alignemnt = none

	enhancements or large-scale computing systems for machine intelligence. In the long term, the topic of 'Singularity Research' is likely to be an unproductive grouping of diverse research streams. It is recommended that clearly focused research projects that make use of trends in this theme be pursued under other domains to maintain their focus on subject-specific areas. (93-4)		
Whole Brain Emulation	Whole brain emulation (WBE), also referred to as uploading or downloading, would take a particular brain, scan its structure in detail, and take that scan to construct a software model which, when run on the appropriate hardware, will behave in the same way as the original brain (Sandberg & Bostrom 2008). (8)	Alignment = none	Alignment = none

Studie: Envisioning 2030: US Strategy for the Coming Technology Revolution (2013), Ed. The Atlantic Council of the United States …

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.		Alignment = None	Alignment = 0
Rethinking (the new) job market needs • Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability • Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	The TIR [=Third Industrial Revolution] is also raising the age-old question of whether new advances in technology will eventually create a myriad of new jobs and more widely distributed wealth, as has been the case in the past, or will new technologies lead to long-term structural unemployment, exacerbating already high levels of inequality and potentially sparking social instability (15) robotics could eliminate the need for human labor entirely in some manufacturing environments with total	Alignment = low Expert report recognizes current and historical trends in automation of the work place, and the impact it has on the job-market. It outlines the need for new skills training,	Alignment = low

	automation becoming more cost-effective than outsourcing manufacturing to developing economies. (20) Certainly the skill sets required for jobs are changing dramatically, with many low-end skills gradually being eliminated, while many mid-level jobs have already been eliminated by information and communications technology in the past two decades.(21)	but tends to prioritize technical over social skills. No call for resilient redesign of education system, ethical accountability in work place, or personal fulfillment.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	The great social issue before mid-century could be what will replace the notion of work and a job as the central activity that gives us income, health care, and ultimately meaning.(23)		Alignment = low
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	A security strategy is needed that minimizes the dangers posed by dual use of synbio without undermining development of the field.(19)	Alignment = low Expert report only acknowledges that synthetic biology could have impacts on health and well-being, but does not go further into this issue.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to:		Alignment = None	Alignment = 0

• For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. • For the citizens to be trained on health and digital literacy.			
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.		Alignment = None	Alignment = 0
Health empowerment through “Everyone’s science” An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in		Alignment = None	Alignment = 0

the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.			
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change		Alignment = None	Alignment = 0
Topics mentioned only in the expert based study			
Reacting to new health threats	While there are a huge number of potentially beneficial products of the synbio revolution, there are also growing concerns about the potential for the bioengineering of deadly viruses by error or design. (17f.)	Alignment = low CIMULACT does not exolicitly consider the health threats imposed by new biotechnologies, but does call for co-development framework to	

		help pinpoint such danger.	

1.3 Work-life balance and wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	The TIR [=Third Industrial Revolution] is also raising the age-old question of whether new advances in technology will eventually create a myriad of new jobs and more widely distributed wealth, as has been the case in the past, or will new technologies lead to long-term structural unemployment, exacerbating already high levels of inequality and potentially sparking social instability (15)	Alignment = low Expert report views possibilitiy of improved quality of life (through redistribution of funds and job growth) as equally likely with respect to massive jobloss due to automation. Wellbeing can only be inferrred as a possible outcome of increased personal wealth - a tenuous connection.	Alignment = low
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with	The great social issue before mid-century could be what will replace the notion of work and a job as the central activity that gives us income, health care, and ultimately meaning. (23)	Alignment = Low Expert report breifly open the possibility to societies without work and job as we have come to know them, whereaas CIMULACT seeks to find economic and employment models that balance some work with other life	Alignment = low

their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.		duties and qualities.	
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the "analog" activities overcoming the notion that time is money		Alignment = None	Alignment = 0
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere.		Alignment = None	Alignment = 0

the community level: group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society		Alignment = None	Alignment = 0
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level		Alignment = None	Alignment = 0
Evolving food culture in growing cities Research should investigate the following aspects:	The idea behind the vertical farm is to produce a lot of food on a very small parcel of real estate	Alignment = Low	Alignment = low

• Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.	by stacking greenhouses one on top of the other (13). Aquaponics—the marriage of fish farming (aquaculture) with plants grown in water (hydroponics)—is an analogous idea. Here, aquaponic farms located on rooftops and other urban spaces can produce high-quality food.(13)	Expert report speak more to technologies that could allow cities to meet the growing and diversifiying demands that accompany urbanization trends. These are land/space-use technologies, and the expert group doesn't directly address cultural diversity and its impact on food logistics.	
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and in-	Meat bioprinting not only would eliminate animal suffering, but also reduce the energy, feedstock, and water inputs necessary to raise domesticated animals. The technology's advocates contend that these resource savings	Alignment = low Expert grou only mentions one food related tech-	Alignment = low

formation base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	would be enormous—over 90 percent water and energy savings, for instance.(13)	nology with respect to ongoing research, and does not mention most of the topics brought up in CIMULACT.	
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	The idea behind the vertical farm is to produce a lot of food on a very small parcel of real estate by stacking greenhouses one on top of the other (13). Aquaponics—the marriage of fish farming (aquaculture) with plants grown in water (hydroponics)—is an analogous idea. Here, aquaponic farms located on rooftops and other urban spaces can produce high-quality food.(13) The percentage of land in cities now dedicated to cars, about 60 percent, could be substantially reduced by cars being available on demand, summoned by apps, and in constant use, drastically reducing the need for parking spaces as well as the overall number of cars, which, as	Alignment = med Expert group addresses technological solutions that could be employed to lessen the impact that urban appetites have on farm and agricultural land. Expert report does not discuss multi-level or inclusive governance of land use.	Alignment = med

	personal vehicles, are idle 90 percent of the time. (20)		
Topics mentioned only in the expert based study			

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy communities" in	A smart grid combined with improved storage would bring new efficiencies to both consumers and utilities. The provision of electricity could more easily be a two-way street (7)	Alignment = Low Expert report mentions smart grid technology briefly, but does not reflect teh more nuanced imagaination of governance demands, prosumerism, trust and fairness across a social fabric. etc.	Alignment = low

which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
Shale Revolution		Alignment = None	

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban"	Putting in place a large number of easily accessible charging stations and the standardization of the costs and rules for use by electric vehicle (EV) owners are all looming issues that localities, state utilities, and the federal government are only beginning to sort out. (6) The most effective urban technical systems combine high-tech solutions with low-tech or even non-tech solutions that incorporate insights developed by people who are neither scientists nor engineers, including architects, urban planners and designers, activists, and ordinary citizens. Bike-sharing systems are a good example...they produce a form of low-carbon urban transport that contributes to the health and well being of the city's residents.(9)	Alignment = med Expert report mentions some technical components of sustainable solution, but emphasizes teh need for social (low- or non-tecnological) solutions for developing low carbon transport systems in urban settings.	Alignment = med

and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).		Alignment = None	Alignment = 0
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible)	Emerging technologies for application to public transit, intercity rail transport, personal vehicles, human-powered transport, etc. (11)	Alignment = low	Alignment = low

or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).		Expert report mentions primarliy infrastrucutural based solution to transport system design. It also mentions non-tech solutions for urban settings (see above), but fails to suggest research streams that could be the source of R&I calls.	
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.		Alignment = None	Alignment = 0
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.		Alignment = None	Alignment = 0

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).			
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.		Alignment = None	Alignment = 0
Topics mentioned only in the expert based study			

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts		Alignment = None	Alignment = 0
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and	How cities are managed will go far in determining the shape of global governance and security, for effective management can turn cities into either sources of national and global governance success and security or sources of failure and instability. (9) These challenges range from the ecological (natural resource scarcities, climate change mitigation	Alignment = high Expert report rightly acknowledges the importance of urban design and management as important for shaping global governance issues. The expert report	Alignment = med

suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	and adaptation) to the economic and technological (innovation and employment) to the political (effective governance).(9) While the "smart city" concept is now in use by many companies, cities, and institutions for their own purposes, the concept's simplest definition is of a city that leverages ICT to maximize citizens' economic productivity and quality of life while min mizing resource consumption and environmental degradation.(10) Emerging technologies for application to public transit, intercity rail transport, personal vehicles, human-powered transport, etc. (11) Cities are where much of the climate change battle is going to be won or lost. On the mitigation side, cities produce most of the world's carbon dioxide; on the adaptation side, cities are where climate change's worst effects will be felt the most. (12) The self-driving car could thus lead to a redesign of cities and a transformation of urban life styles. Such a shift to robotic vehicles, especially if accompanied by a change in patterns of ownership and use, would be highly disruptive to the global economy, especially the auto industry. (20)	also emphasizes the various challenges that will be necessary to address during urban management.	
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.		Alignment = None	Alignment = 0
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data		Alignment = None	Alignment = 0

Specifying the relation between citizens' and experts' contributions			
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action		Alignment = None	Alignment = 0
Topics mentioned only in the expert based study			

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.		Alignment = None	Alignment = 0
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.		Alignment = None	Alignment = 0
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and		Alignment = None	Alignment = 0

implementation of new governance structures, transparency policies, and decision-making processes.			
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.		Alignment = None	Alignment = 0
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging worldwide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation		Alignment = None	Alignment = 0
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.		Alignment = None	Alignment = 0
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working.		Alignment = None	Alignment = 0

Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects			
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.	The great social issue before mid-century could be what will replace the notion of work and a job as the central activity that gives us income, health care, and ultimately meaning. (23)	Alignment = low Expert report suggests that major economic upheaval could be the result of increasing automation, but fails to acknowledge how alternative economic models could be debated, designed, tested, or implemented.	Alignment = low
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.		Alignment = None	Alignment = 0

Topics mentioned only in the expert based study			

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = None	Alignment = 0
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.		Alignment = None	Alignment = 0

Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development		Alignment = None	Alignment = 0
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	The development of a new generation of robots that are easier to program and are safer and easier for humans to interact with is making it possible for people and robots to work alongside each other. It has also become possible to substitute robots for human labor in more manufacturing and service jobs. (19)	Alignment = low	Alignment = 0
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking:		Alignment = None	Alignment = 0

1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.			
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	We will be able to monitor virtually everything from urban congestion to pollution in the environment to what plants need for growing and becoming better foodstuffs. With the proliferation of sensors, more and more systems can be self-regulating, not requiring human intervention, for them to operate at high efficiency, while at the same time uploading massive amounts of big data into the cloud. (1)	Alignment = low Expert report acknowledges the importance of big data collection and analysis, but fails to mention open access, increasing data literacy amongst citizens, and data security issues.	Alignment = low
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an inter-disciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		Alignment = None	Alignment = 0

Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	We would argue that technology is at a tipping point from changing the meaning of “work” to potentially solving the resource crunch to being the key for a better urban future and helping individuals and societies cope with aging. (1) The most effective urban technical systems combine high-tech solutions with low-tech or even non-tech solutions that incorporate insights developed by people who are neither scientists nor engineers, including architects, urban planners and designers, activists, and ordinary citizens. Bike-sharing systems are a good example...they produce a form of low-carbon urban transport that contributes to the health and well being of the city’s residents.(9) One such technology is the protocell, which is a form of synthetic biology that enables designers to mimic the behavior of living organisms. While protocell applications are some years away, designers argue that protocell-based materials might enable building exteriors to interact with natural surroundings, similar to the function of skin in modulating between a person’s insides and her immediate surroundings. These protocellbased building exteriors could be designed to filter and purify airborne pollutants, capture and retain excess rainwater until needed, or modulate sunlight so as to help keep building interiors at optimum temperature and lighting conditions. (13)	Alignment = low Expert report view technology as a major driver of change regarding work, aging societies, and other challenges. However, the expert report does not give detailed descriptions about citizen inclusion in decision-making and other forms of governance processes and structures. The report also views technology as more of a problem solution in an of itself, and doesn't acknowledge thecnologies environmental impact (resource use, waste production etc.) as also in need of address.	Alignment = med

	Second- and third-order effects are an omnipresent byproduct of technological innovation, and while such effects likely cannot be avoided, they should at least be considered in advance (14) 3D printing is likely to play a significant role in economic and environmental sustainability by dramatically increasing the efficiency of resource use and in lowering overall carbon emissions, from the process of manufacturing to delivering products to the end user. (17)		
Topics mentioned only in the expert based study			

Studie: Preparing the Commission for future opportunities- Foresight network fiches (2015), Ed. European Commission …

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: - Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. - Better understanding the labor market and its future changes through theories, models and foresight approaches. - New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) - Exploring possible roles of communities for enabling alternative life-job-education pathways.	Across Europe the number of grassroots non-profit and social entrepreneurship organisations that un-dertake social innovation is increasing. Social innovation responds to the need of social cohesion and it involves private, public and third sector. (p.109)	Alignment = low Expert report mentions social innovation and entrepreneurship, which is tenuously related to individual empowerment within a particular eonomic regime.	Alignment = low
Rethinking (the new) job market needs - Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability		Alignment = none	Alignment = 0

• Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being			
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	-High performance computing could be a significant technology in developing complex simulation and projection of the socio-environmental-economic situation of the EU, including integrated policy evaluation and impact assessment in the context of smart regulation.(09) -Behavioural science studies how people make choices in their day-to-day life. It relies on the insights and methods of behavioural economics, behavioural and social psychology and cognitive science. (113)	Alignment = low Expert report highlights technological development (high performance coputing) as a mode of choice management, without mentioning the inherent drawbacks and limitations of such technology in regards to the analysis of complex, often quantitative, data. Expert report also mentions behavioral sciences as a way to approach more subjective decision making processes, but offers no direction for research streams.	Alignment = low
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	-What is clear is that although an increasing number of regenerative medicines are entering clinical trial phase, their development is more complex and intensive of time and resources than initially envisaged and continuity of support is needed for the new therapies to emerge. (46) -Behavioural insights [from behavioural sciences] can influence health awareness and implementation of health policy, e.g. promotion of healthy food, prevention of tobacco use, reduction of obesity, etc. (114)	Alignment = low Expert report mentions limitations to an individual technological development (regenerative medicine), and again points to behavioral sciences as source of insights into how to best raise awareness of helath issues and craft policy to adddress them. This tends to ignore the localization of knowledge and practice, and the more comprehehsive systemic analysis, called for by CIMULACT.	Alignment = med
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this	Some of the benefits are: (i) closing the digital divide gap – it enables organisations and private users to obtain ICT services (from storage to more advanced IaaS services) for a fraction of what it would cost to build a data centre; (ii) benefits for education: new generation	Alignment = med Expert report discusses evidence collecting	Alignment = med

purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: - For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. - For the citizens to be trained on health and digital literacy.	of teaching tools delivered though the cloud enable anyone with a broadband connection to learn wherever they are; (iii) science: in sectors facing a steep rise in demand for computing power (04) Evidence-based policies is an often used term but apart from a general notion of impact assessment there is little 'evidence' that evidence-based decisions in society have become standard practice. It is not even clear whether evidence-based decisions are feasible or even desirable in all cases. Analysis and research is needed across behavioural science, political sciences and technology. (21) -How to manage the integrity, trustworthiness, confidentiality and quality of personalized health data 'in the cloud' and how to deal with (new) information monopolies regarding (personalised) health data?.(42) -Citizens want to and need to actively manage their personal data, genetic data, health and wellbeing data. There could be little, if anything, more private to the individual than the knowledge of his genetic make-up (62)	in scientific research on the broadest of levels (not specific to healthcare). It does mention security and management issues concerning cloud-based, personalized health data, but does not address the doctor and patient skills and education suggestion put forth by CIMULACT.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care.	-Prosthetics and body implants: The current double-digit growth rates will continue. The exploding medical opportunities will burden health insurances and foster inequality. (49) -Among future research fields that have to be addressed, one can mention social innovation to overcome the inequalities of health and re-pattern the social determinants of health; social innovation in rural areas and societies; social innovation in the financial sector and the private sector; and social innovation for managing diversity. (111)	Alignment = low Expert report gives some examples of technologies that are unequally available, and are likely to remain so, and	Alignment = low

2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.		calls for general research into the conditions that create inequality. CIMULACT additionally calls for localized research, and holistic treatments and services as essential to overcoming inequality.	
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	-In domains such as health care, the integration of personal genomes and real time monitoring data can help identify high risk patients and lead to preventive strategies and more effective and safer treatments. Sharing of medical data at the initiative of the individual is rapidly increasing, opening new avenues for knowledge generation but also posing a risk of misuse of data against the interest of the individual. (37) -Citizens want to and need to actively manage their personal data, genetic data, health and wellbeing data. There could be little, if anything, more private to the individual than the knowledge of his genetic make-up (62)	Alignment = low Expert report points toward increasing personalized data collection, and the security issues that invoves, as closely linked to future scientific research. CIMULACT's conception of everyone's science is inclusive research regimes, coupled with more open access to results and a scientific and	Alignment = low

		helathcare community trained in better communicating research findings to general public.	
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	advanced autonomous systems will help the elderly to maintain an independent live style – and if they are in care, these systems will relieve and support care workers (19)	Alignment = low Expert report mentions aging populations only in regard to possibility of robotic and other automated systems that could be employed to help them maintain active lifestyles. CIMULACT points toward more non-technical solutions to addressing aging population issues: community building, intergenerational communcation, neuroplasticity research, and research into	Alignment = low

		biological proceses of aging in general.	
Topics mentioned only in the expert based study			
Human Enhancements	Pushed by military and medical research, human enhancement might change the day-to-day life experience of many Europeans in a few years from now-on, e.g. by creating an "augmented reality" and receiving information from IT via nerves-IT-interfaces. The big potential in terms of economic growth will be accompanied by policy and regulatory challenges and maybe even a societal divide. Any regulatory response must build on international cooperation to be efficient. (p.51)	Alignment = none Expert report highlights a technical development that carries no influence in CIMULACT suggestions. Too speific.	
Synthetic Biology	Scientific advances in synthetic biology are expected to provide the foundations for realising the full innovation potential of biotechnology in contained-use applications, mainly in health and industrial biotechnology applications. It will provide innovative solutions for the conversion of our current unsustainable fossil-based industries into sustainable and competitive bio-based industries for bioproducts (e.g. chemicals, polymers) and bioenergy, for new antibiotics and vaccines, and	Alignment = none Expert report highlights a technical development that carries no influence in	

	new diagnostics and treatments for cancer and rare diseases. (p.53)	CIMULACT suggestions. Too speific.	

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignment = none	Alignment = 0
Balanced work-life model Research should rethink the definition of “work” and develop approaches that permit to recognize and reward as “work” all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within bounda-	-With respect to labour markets, one recent study concluded that advanced autonomous systems could replace 47% of all jobs in the US within the next two decades. While the labour market structure in Europe is somewhat different from the US, a similar picture is likely to emerge in Europe. (18) -Crowdsourcing: cloud solutions enable new form of collaboration for people who share a common objective; getting people working on the same idea from around the world gets easy, cost and environment friendly. (04)	Alignment = low Expert report mentions possible impact of automation on general job market, and alternative employment schemes that are trending upward. CIMULACT focuses on finding new	Alignment = low

ries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.		equilibirums between the definition of work, its compensation, and increased flexibility in workload (and its assessment).	
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money		Alignment = none	Alignment = 0
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere.	Concrete application examples are improvements in personal health-affecting behaviours, the design of motivating environments, tools and tasks for work and education or the design of buildings and public spaces with various intentions in mind, whether motivation to shop, easy	Alignment = med Expert report acknowledges the importance of	Alignment = med

the community level: group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.	escape or prevention of unwanted behaviour. (p.114)	the built-environment in shaping cognitive processes and personal behaviors. It promotes the construction of environments that can postivley affect health, but doesn't address the specific outcomes in CIMULACT - co-operation, pleasnatness, inter-personal relationship strengthening, etc.	
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers		Alignment = none	Alignment = 0

• [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society			
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	-Like all human activities, fisheries and aquaculture have to be managed sustainably. Overfishing continues to be critical worldwide (75) -Global production of fish from marine capture fisheries should level out around current levels of 85 million tonnes and would contribute substantially to food security. However, if international governance systems fail, there is a high risk that stocks will be depleted and production will fall. This would seriously threaten the world's food security. (77)	Alignment = low Expert report addresses food insecurities through only one sector of the food supply systems - fisheries and aquaculture. CIMULACT calls for comprehensive food system analysis, particularly at localized levels with regard to unique practices, knowledge, and culture. CIMULACT additionally calls for wide ranging research into best practices for nutrition education, UBI, and food supply regulation.	Alignment = low
Evolving food culture in growing cities		Alignment = none	Alignment = 0

Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.			
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the	-A major bottleneck for innovation as raised in a Horizon2020 stakeholder consultations is the perceived "distance" between research and practice and /or the difficulties in applying complex research outputs. Accordingly, the management of knowledge exchange between agricultural sciences and the user communities (farmers, breeders, advisory services) is gaining	Alignment = med	Alignment = med

relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	in importance and developing into a dynamic discipline on its own (68) -An important growth area of PA is the development of biological and electronic sensors with the ability to detect minute amounts of organic and inorganic compounds emitted in the atmosphere. This mix of compounds is as unique as the human fingerprint. Under conventional agricultural applications, these sensors detect the presence of plant disease or pests. In food safety applications, the sensors can be used to detect naturally occurring toxins commonly known as mycotoxins in grains, fruits, vegetables, and dangerous path-ogens that threaten our food supply. More importantly, these sensors can be used to detect the presence of pathogens or other dangerous agents in foods in less disruptive, more efficient and less costly ways than current sampling methods. (72) -There are several products in the pipeline some of them really innovative that could have beneficial impact on consumers particularly for healthy aging, weight management, food for special medical purposes. The outcome of ongoing research can be applied in novel or optimized food products and processes (sustainable food production, street food, personalised diets, functional foods, convenience foods, food design) and innovative marketing models and supply chains (short, local, regional, personalised).(80)		
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural pro-	-Competition between food and industrial uses of agricultural and forestry resources will be avoided by valorising the non-edible residues from these areas for industrial uses on the basis of establishing advanced biorefineries in the EU. (55)	Alignment = med Expert report addresses increasing efficiency in current landuse	Alignment = med

duction. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	-Yields of major food crops for example have doubled in the last 50 years but the amount of external nitrogen used in the same period increased by seven times and that of phosphorus tripled. Since the green revolution, energy inputs in agriculture increased by 50 times. (67) -Precision livestock farming lead to increased food safety and better animal welfare. (73) New sustainable lifestyles for a more efficient use of natural resources; supporting the socio-ecological transition, the green economy and smart urban futures.(106) Agricultural technologies, innovative foods using alternative protein sources, aquaculture and urban farm-ing will become more prominent and will provide for more alternatives alongside traditional agriculture thus creating a diverging urban landscape.(p.156)	patterns (larger crop yields, precision livestock, etc.), and broad implications of biotechnologies that could influence landuse policy. It implies more 'sustainable' practices in agriculture, while acknowledging inertia of current practice.	
Topics mentioned only in the expert based study			

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an im-	-As the IoT will contribute to the democratisation of innovation in design and manufacturing and to direct policy involvement of the citizens, open access for everybody both as users and service providers needs to be ensured. (31) -Energy as central societal topic in a democratic society, issues of adoption/adaptation by citizens, dealing with concerns with excluded/vulnerable social segments, basic energy rights.(94) -The Vision: a future in which millions of individual players can collect, produce and store locally generated renewable energy in homes, offices, factories, and vehicles, and share their power generation with each other across a Europe-wide intelligent hydrogen energy web. (99) -Research, development and demonstration is and will remain important to reduce costs and improve technology performance in terms of higher overall efficiency and reduced global, regional and local environ-mental impact of hydrogen and fuel cell technologies (99) -In the EU urban areas are responsible for around 70% of the overall energy consumption. Cities are therefore major contributors to GHG emissions, but smart cities	Alignment = high Expert report acknowledges the social, economic, and political issues at stake in working toward the report vision for this sector - a vision that ultiamtely algins well with that of CIMULACT.	Alignment = med

portant aim for the governance models, as should the future need for "energy communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation	represent an opportunity for a more sustainable future. (138) In the field of energy, behavioural science could contribute to the understanding of how to make the shifts towards more sustainable energy and transport systems: a) at individual level, from energy as a good to energy as a service, b) at community and city level, towards an integrated sustainable planning of energy, buildings and transport systems and c) in energy markets, to equilibrate the demand/supply side. (p.114)		
Topics mentioned only in the expert based study			

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most	-Efforts geared towards enabling better integration and connectivity will have to be stepped up in order to ensure a truly efficient and 'smart' transport system. (144)	Alignment = low Expert report discusses need for better connectivity via transportation, but seems limited in its capacity to consider the complex arrangements between social, economic, and design factors that will create the conditions called for in CIMULACT.	Alignment = low

appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	-Efforts geared towards enabling better integration and connectivity will have to be stepped up in order to ensure a truly efficient and 'smart' transport system. (144)	Alignment = low CIMULACT calls very specifically for transportation design that maximizes individual agency in making other life-style choices. Expert report vaguely calls for more efficient transport and connectivity.	Alignment = low
Moving together (more collective transport options)	In the field of energy, behavioural science could contribute to the understanding of	Alignment = low	Alignment = low

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).	how to make the shifts towards more sustainable energy and transport systems: a) at individual level, from energy as a good to energy as a service, b) at community and city level, towards an integrated sustainable planning of energy, buildings and transport systems and c) in energy markets, to equilibrate the demand/supply side.(p.114)	Expert report calls for behavioral science as design input into tightly integrated urban system planning (energy, transport, buildings, etc). CIMULACT calls for more community based research, acknowledging local and contextual nuance, with respect to the same problem set.	
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	New sustainable lifestyles for a more efficient use of natural resources; supporting the socio-ecological transition, the green economy and smart urban futures.(106) Changing attitudes towards consumption as a means of politically and/or ethically correct behaviour, e.g. fair trade or conscious consumption, and emergence of new role models for (sustainable) consumption.(p.156)	Alignment = med Expert report promotes supporting new sustainable lifestyles, and research into changing valuesystems and behaviors, that can lead to new social models. CIMULACT goes further by including social innovation, legislative protections for ecologies, and more broad social governane issues.	Alignment = med
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are	New sustainable lifestyles for a more efficient use of natural resources; supporting the socio-ecological transition, the green economy and smart urban futures.(106)	Alignment = high Expert report frames the vision of more sustainable	Alignment = med

all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	Changing attitudes towards consumption as a means of politically and/or ethically correct behaviour, e.g. fair trade or conscious consumption, and emergence of new role models for (sustainable) consumption.(p.156) -We are used to see consumption as a key driver of economic activity. Its current level, composition, associated production methods and resource use are not sustainable though. (168)	and healthy socieites and lifestyles in much the same way CIMULACT does. Understanding behaviors, values, and how they translate into social structures and policies is critical to research agenda in this area.	
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	-Competition between food and industrial uses of agricultural and forestry resources will be avoided by valorising the non-edible residues from these areas for industrial uses on the basis of establishing advanced biorefineries in the EU. (55) -Lack of high-quality life cycle data and of robust sets of quantitative life cycle indicators, makes it difficult to define coherent / science-based targets for prevention and recycling of waste. (86) -But new technologies alone are not sufficient. The preservation of terrestrial and marine biodiversity is key for healthy carbon sinks. Healthy oceans are of ultimate importance for climate regulation. (89)	Alignment = high Expert report also examine production processes and consumer behavior regarding prodcuts themselves as critical areas for research in creatig more sustainable systems of production and consumption. It also highlights the need for incentivizing policies that	Alignment = med

	Few incentives for sustainable consumption and production exist... Consumption and production become dislocated at global scale. (p.155) -3D printing has many advantages over conventional manufacturing methods as it skips many traditional manufacturing steps, reduce the amount of material wasted and energy consumption and enables more complex, lighter and more solid manufactured products. Moreover, 3D printing enables the mass-customization of goods adapted to consumers' needs through online 3D marketplaces and personal 3D printers (162) -Monitoring technologies will make citizens more aware of resource use and could change behaviours (168) -Alongside mass production, custom-made production just-in-time allows more sustainable consumption through production "only on demand" (e.g. 3 D-printing) but also lowers real prices and hence boosts demand. (168)	can spur producers into generating more sustainably designed goods.	
Topics mentioned only in the expert based study			

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	-Among future research fields that have to be addressed, one can mention social innovation to overcome the inequalities of health and repattern the social determinants of health; social innovation in rural areas and societies; social innovation in the financial sector and the private sector; and social innovation for managing diversity. (111)	Alignment = low Expert report barely mentions the disparities between urban and rural communities and life-styles, but does see rural communities as source of possible social innovation.	Alignment = low
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area:	-In the EU urban areas are responsible for around 70% of the overall energy consumption. Cities are therefore major contributors to GHG emissions, but smart cities represent an opportunity for a more sustainable future. (138) - A smart city is "a city seeking to address public issues via ICT-based solutions on the	Alignment = med Expert report is aware of challenges of urbanization (in terms of emmissions, and resource	Alignment = med

The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	basis of a multi-stakeholder, municipally based partnership", with an embedded idea of participatory governance. (138)	use), but envisions the smart city (ICT based) as potential solution base. CIMULACT asks for more community or citizen-based approaches to addressing sustainability of urban areas.	
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	-Among future research fields that have to be addressed, one can mention social innovation to overcome the inequalities of health and re-pattern the social determinants of health; social innovation in rural areas and societies; social innovation in the financial sector and the private sector; and social innovation for managing diversity. (111) -New forms of poverty and exclusion in multi-ethnic cities will need local holistic approaches together with participatory models for urban renewal and sustainable regeneration, in a continuous evolution of communication habits, for new places and forms of social dialogue. (141)	Alignment = high Expert report discusses potential of social innovation while recognizing need for 'holistic approaches with participatory models' to address various form of inequality, particularly those that run along cultural or ethnic lines.	Alignment = med
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention pro-	-Evidence-based policies is an often used term but apart from a general notion of impact assessment there is little 'evidence' that evidence-based decisions in society have become standard practice. It is not even clear whether evidence-based decisions are feasible or even desirable in	Alignment = med Expert report recognizes need for increased in-	Alignment = med

grams for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions	all cases. Analysis and research is needed across behavioural science, political sciences and technology. (21)	tegration of 'evidence' based policy, and calls for a broader definition of 'evidence' and its collection methods. CIMULACT goes further by suggesting sources and methods of evidence gathering.	
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	-Across Europe the number of grassroots non-profit and social entrepreneurship organisations that undertake social innovation is increasing. Social innovation responds to the need of social cohesion and it involves private, public and third sector (109)	Alignment = low Expert report views current trends in community development through the lens of social innovation groups (NGO's, unofficial communities, etc.) CIMULACT calls for developing local communities as defined by spatial proximity, cultural cohesiveness, and	Alignment = low

		with regard to inclusive decision-making.	
Topics mentioned only in the expert based study			

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	-As the IoT will contribute to the democratisation of innovation in design and manufacturing and to direct policy involvement of the citizens, open access for everybody both as users and service providers needs to be ensured. (31) -Empowered citizens and consumer preferences will be at the heart of human-centred cities. Their needs will trigger technological change and social innovation and digitally enabled citizens could become more engaged and participative, favouring the inclusion of all. (141) -New forms of poverty and exclusion in multi-ethnic cities will need local holistic approaches together with participatory models for urban renewal and sustainable regeneration, in a continuous evolution of communication habits, for new places and forms of social dialogue. (141)	Alignment = med Expert report recongizes need for 'empowerment' across multiple sector - production and consumption, and addressing social inequities. CIMULACT additionally calls for citizen empowerment along policy and governance (decision-making) actions, and research that can address the development of successful practices, tools, and methods.	Alignment = med
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	-Text and data mining involves various tools, techniques and technologies for the automated processing of large volumes of texts and data that is often unstructured or not uniformly structured. Mining is undertaken for purposes such as the identification and selection of relevant information, retrieval, extraction, interpretation, analysis, etc. of such information, and the identification of relationships within/between/across documents and datasets.	Alignment = low Expert study tends to view meaningful research for localized communities through the lens of data collection and analysis. It does	Alignment = none

	This allows data miners and analysts to obtain new knowledge and insights and discover patterns and trends. (13)	mention (see above) other forms of community development (ie social innovation hubs). It does not address CIMULACT's call for open science, and open data, nor the differentiation between public v. private research, nor the methods of inclusive evaluation of research data.	
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	-Text and data mining involves various tools, techniques and technologies for the automated processing of large volumes of texts and data that is often unstructured or not uniformly structured. Mining is undertaken for purposes such as the identification and selection of relevant information, retrieval, extraction, interpretation, analysis, etc. of such information, and the identification of relationships within/between/across documents and datasets. This allows data miners and analysts to obtain new knowledge and insights and discover patterns and trends. (13) -The Internet of Things is an essential element of the hyper-connected society vision, where the Internet of Things, cloud computing and Big Data will endow every human being and every object with immense additional abilities to observe, learn, decide,	Alignment = med Expert group alludes to the need for resaerching scalar process knowledge and its impact on individual and communal behavior, but it does so through implications spread across the entirety of report, in relation to different contexts. CIMULACt calls	Alignment = med

	act and communicate, and where objects, from the macro right down to the nanoscale dimension, will become smarter, cognitive, communicating and 'thinking'. (30) -As the IoT will contribute to the democratisation of innovation in design and manufacturing and to direct policy involvement of the citizens, open access for everybody both as users and service providers needs to be ensured. (31) -At European-level, multi/pluri/inter/trans-disciplinary research is often promoted in order to tackle the various dimensions dealing with *knowing* (data, statistics, indicators), *explaining* (tools, definitions, methods), *understanding* (context, causes, mechanisms), *forward looking* (modelling, foresight, scenarios) and *recommending* (from knowledge to policy). (106) - A smart city is "a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership", with an embedded idea of participatory governance. (138) -New forms of poverty and exclusion in multi-ethnic cities will need local holistic approaches together with participatory models for urban renewal and sustainable regeneration, in a continuous evolution of communication habits, for new places and forms of social dialogue. (141)	more directly for research into awareness raising methods and their influence on behavior.	
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision mak-	-As the IoT will contribute to the democratisation of innovation in design and manufacturing and to direct policy involvement of the citizens, open access for everybody both as users and service providers needs to be ensured. (31)	Alignment = low Expert report seems to equate abilitiy to collect data, and offer it in open accesss	Alignment = low

ing processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.		terms, with transparency in governance. CIMULACT calls for more broad understanding of transparency within 'diverse social contexts.'	
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	-if autonomous systems really do have a strongly negative impact on income equality and employment, this might call into question our current social and economic models, and new governance and taxation models might need to be developed taking into account the growing role of capital (19) -Across Europe the number of grassroots non-profit and social entrepreneurship organisations that undertake social innovation is increasing. Social innovation responds to the need of social cohesion and it involves private, public and third sector (109)	Alignment = low Expert report does not directly address alternative economic models, but implies their possibility through various other technical and social indicators.	Alignment = low
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.	-if autonomous systems really do have a strongly negative impact on income equality and employment, this might call into question our current social and economic models, and new governance and taxation models might need to be developed taking into account the growing role of capital (19) -Across Europe the number of grassroots non-profit and social entrepreneurship organisations that undertake social innovation is increasing. Social innovation responds to the need of social cohesion and it involves private, public and third sector (109)	Alignment = low Expert report does not directly address alternative economic models, but implies their possibility through various other technical and social indicators.	Alignment = low

Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects		Alignment = none	Alignment = 0
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.		Alignment = none	Alignment = 0
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking	-if autonomous systems really do have a strongly negative impact on income equality and employment, this might call into question our current social and economic models, and new governance and taxation models might need to be developed taking into account the growing role of capital (19) -Among future research fields that have to be addressed, one can mention social innovation to overcome the inequalities of health and re-pattern the social determinants	Alignment = low Expert report calls for social innovation movements to overcome inequalities, while CIMULACT calls	Alignment = low

at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.	of health; social innovation in rural areas and societies; social innovation in the financial sector and the private sector; and social innovation for managing diversity. (111)	for more direct intervention in financial institutions via policy and regulation.	
Topics mentioned only in the expert based study			

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	-19th and 20th century models of teaching and learning, in particular the frontal lecture, still dominate large parts of modern education systems, but societal life and skills needs, labour market demands and student expectations regarding content and pedagogies have changed drastically. The gap to 'real life' – the world outside formal education – is often too wide as large parts of education and learning still occur with suboptimal methods and with materials that are only of limited relevance to learners' lives. (121)	Alignment = med Expert reoprt acknowledges need for systemic educational reform, but does not offer specific research agenda for discovering and implementing successful models as CIMULACT does.	Alignment = low
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research	While the 'reality gap' and the mental shift from 'education' to 'learning' have become apparent, knowledge, skills and values have become more important than ever before... Such learning needs and interests drive the emergence of new forms of learn-ing providers, the branching-out of current providers into new fields... (p.121)	Alignment = low Expert report acknowledges general concept of new learning needs and frameworks, and their	Alignment = low

should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.		emergence, but does not equate this specifically within the 'design' framework, or fostering creativity.	
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	At European-level, multi/pluri/inter/trans-disciplinary research is often promoted in order to tackle the various dimensions dealing with knowing (data, statistics, indicators), explaining (tools, definitions, methods), under-standing (context, causes, mechanisms), forward looking (modelling, foresight, scenarios) and recommending (from knowledge to policy). (p.105)	Alignment = low Expert report acknowledges influential social factors in modelling future education systems, whereas CIMULACT calls for community integrated learning centers and methods, and a focus for learning and research to be more localized in focus and function.	Alignment = low

SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	-Progress in learning technologies, pedagogies and research on the neuroscience and the science of learning is rapid and wide-ranging. Among others we can expect learner-controlled and immersive learning environments (e.g. virtual reality [[LINK: Human/Computer Interaction]]), gamification (educational tools that use game elements to increase motivation and information retention) while personalised learning (learning ana-lytics/metrics [[LINK: Big Data, Data Mining/Semantic Web]]) will collect and use data during students' learn-ing process to dynamically assess progress and adjust material, difficulty, pace and means. (122)	Alignment = med Expert report metnions various technological developments that could impact education models, but it does not discuss the co-development of such technology/curricula regimes, nor a framework through which technologies can be inclusively assessed.	Alignment = med
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services.	Building and supporting a more resilient, innovative and creative European society; EU demographic changes (enabling, educating and training the young generation and including the ageing popula-	Alignment = low CIMULACT calls for systems thinking integration into curricula and	Alignment = low

2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.	tion); EU social par-ticipations, inclusion and cohesion (equity in education through ICT tools; access for the disabled; etc.). (p.106)	innovative learning methods (narrative-action paths) as specific areas for research. Expert report notes that education will be important in addressing the general social ecological evolution of EU.	
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	-Data protection aspects of the cloud computing services are often related to the lack of transparency, trust and confidence to the cloud customers that the personal data is processed with an appropriate level of data protection. (04) -Information and communication technology (ICT) systems use data in order to implement a function. Ensuring the security of such systems requires a guarantee of confidentiality, availability, and integrity of both data and functionality. (23) -some governments and companies have difficulties to set their limits and to limit the interference with fundamental rights of their data collection practices. As a result these actors foster the weakening of the very ICT systems they need their citizens to trust in order for the economy to prosper. Organizations and governments that listen to citizen and user outcry, and address the issue on the basis of democratically agreed proportionate and transparent rules, may be able to counter the expansion of the practice of unaccountable	Alignment = med Expert report adequately recognizes the significance of data collection and analysis, the importance of security and protection, and the technical systems that can be deployed (and their concomitant risks). CIMULACT additionally calls for data co-production, ethical data use, quality and standardization of data, and training to increase data literacy across society.	Alignment = med

	and systemic surveillance, before it becomes an unstoppable arms race (25) -The Internet of Things is an essential element of the hyper-connected society vision, where the Internet of Things, cloud computing and Big Data will endow every human being and every object with immense additional abilities to observe, learn, decide, act and communicate, and where objects, from the macro right down to the nanoscale dimension, will become smarter, cognitive, communicating and 'thinking'. (30)		
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.	-there is a need for greater behavioural insights into online behaviour and how it should be regulated. Also, we need to keep in mind that there is no longer a clear boundary between on-line and off-line behaviour, as we are on-line all the time, even while driving our cars for example. So there is a ripe area for research there. (115)	Alignment = low Expert report mentions digital tools as technology to breakdown the boundary between online and offline selves and actions/behavior. This only just relates to the themse ecnouraged by CIMULACT report - euqla internet access, public investment into communication tech, virtual mobility, and the aquisition of a global view.	Alignment = low
Transforming technologies for planet and people	-Cloud computing can strengthen Europe's efforts in combating climate change and help to reduce the environmental footprint of ICT and impact of the increase of data flow over	Alignment = med Expert report focuses on technologial developments and their complex	Alignment = med

In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	the internet. This is mainly due to pooling of cloud data centre infrastructures – thus reducing over-allocation of infrastructure, sharing application instances between multiple organisations, as well as improving data centre efficiency. It is esti-mated that cloud can reduce Green House Gases (GHG) emissions by up to 90%. (04) -High performance computing could be a significant technology in developing complex simulation and projection of the socio-environmental-economic situation of the EU, including integrated policy evaluation and impact assessment in the context of smart regulation.(09) -But new technologies alone are not sufficient. The preservation of terrestrial and marine biodiversity is key for healthy carbon sinks. Healthy oceans are of ultimate importance for climate regulation. (89) -The benefits of nanomaterials range from saving lives, breakthroughs enabling new applications or reduc-ing the environmental impacts to improving the function of everyday commodity products. (157) -Photonics and light technologies (158) -3D printing has many advantages over conventional manufacturing methods as it skips many traditional manufacturing steps, reduce the amount of material wasted and energy consumption and enables more complex, lighter and more solid manufactured products. Moreover, 3D printing enables the	ramifications. CIMULACT moderates its enthusiasm for technologies by calling for research into scientific and technological areas that can create the conditions for more sustainable, participatory socities. CIMULACT further suggests that this research be done to orient further technological development towards greater wellbeing for people, and not oriented towards profit maximizing.	

	mass-customization of goods adapted to consumers' needs through online 3D marketplaces and personal 3D printers (162)		
Topics mentioned only in the expert based study			

Van Woensel, Lieve/ Geoff Archer/ Laura Panades-Estruch et.al. (2015): Ten Technologies which could change our lives: Potential im-pacts and policy im-plications, Brussels : European Parliamen-tary Research Ser-vice

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: - Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. - Better understanding the labor market and its future changes through theories, models and foresight approaches. - New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) - Exploring possible roles of communities for enabling alternative life-job-education pathways.		Alignment = none	Alignment = None
Rethinking (the new) job market needs - Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability - Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	The world of education is changing through the proliferation of Massive Open Online Courses (MOOCs)... In principle the technology is based on the premise that the internet can be used for open education around the world and, at least in terms of accessing the course, is often free of charge. (p.7)	Alignment = Low CIMULACT topic mentions the need for investigating new models for the educatory system and sets several targets for what should be taught. The expert report mentions one technology that	Alignment = low

		could be used within such new systems.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	A clear impact of MOOCs has been significant cost reductions for education, widening access to sections of the population who might not have previously availed of higher education. (p.7)	Alignment = med CIMULACT topic mentions the need for promoting life-long learning for individuals as well as organisations and sets out to find solutions. Expert report mentions a technology that would be such a solution, but does not mention social or organizational innovations.	Alignment = low
Topics mentioned only in the expert based study			
Wearable technologies		Alignment = low	Alignment = low

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.		Alignment = none	Alignment = None
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to:	The medical benefits offered by bio-printing are significant, for example there are predictions that we are only years away from being able to treat severe burns with a spray on substance, produced from a bio-printer making use of copies of a patient's own cells and collagen. (p.5) Wearables: The development of wearable technologies offers huge potential for both the type of medical care that	Alignment = med Expert report aligns well with the CIMULACT topic on the technological solutions for delivering personalized healthcare, but does	Alignment = low

- For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. - For the citizens to be trained on health and digital literacy.	patients receive and the way in which such care is delivered. Remote delivery of care could provide many benefits but who is likely to benefit from this widening of access (p.12)	not mention the accompanying need for skill training in doctors and patients confronted with data-based healthcare.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.		Alignment = none	Alignment = None
Health empowerment through "Everyone's science"	Applications of wearable technologies, such as outlined for healthcare, will require a huge amount of data collec-	Alignment = med	Alignment = med

An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	tion and assimilation. Everyday forms of wearable technology, such as 'smart' watches, would link automatically to social network accounts and potentially share personal data automatically. The concept of information privacy in this context could be placed under significant threat if such technologies could bypass user consent to data sharing so easily and subtly. For example, who may be collecting, storing, and analysing information obtained from wearable pieces of technology and for what purpose? (p.12)	CIMULACT topic and Expert report align well with regard to big data usage for empowering users to look after their own health. However, Expert report sees data privacy as an emerging issue, while CIMUALCT topic focusses on exploring correct interpretation and communication of data results.	
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change		Alignment = none	Alignment = None

Topics mentioned only in the expert based study			

1.3 Work-life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	There have also been debates over the use of wearable technology in the workplace, particularly in monitoring employee activity. Whilst there are data protection and privacy issues to consider, there are also ethical questions to answer: how much right should an employee have to privacy in the workplace? Where would the 'workplace' boundary be in this situation? (p.12)	Alignment = high There is a high alignment with regard to workplace technologies (e.g. wearables), adhering risks (e.g. worker exploitation, privacy) and their governance.	Alignment = low
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility		Alignment = none	Alignment = None

within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the "analog" activities overcoming the notion that time is money		Alignment = none	Alignment = None
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various		Alignment = none	Alignment = None

activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. - integration of 'free time' in the work place - new ways of employment where employees are more like volunteers / freelancers - [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** - the impact of work-life balance policies, - the impact of different business models on workers' time autonomy and quality of life - the psychological acceptance of new forms of work, both individually and by society		Alignment = none	Alignment = None
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	The use of aquaponics could lead to the development of a more closed-loop system of agriculture wherein resource efficiency is prioritised, resulting in minimal economic throughput. This offers an opportunity to produce food in a more economically and environmentally sustainable way with produce being grown using a low level of resource-input. (p.15)	Alignment = low Expert study only aligns with CIMULACT topic one the level of increasing resource efficiency in agriculture, which could if food prices are lowered as a result lead to a more equal access to more sustainable food for citizens. However the topic's main aims of mapping food access, socioeconomic inequalitiesand supply regulations to gain a better knowledge base as well as improving education towards teaching healthier nutritional behaviors and exploring basic universal income as a solution for food poverty are not touched upon by expert study.	Alignment = low

Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.		Alignment = none	Alignment = None
Good food research		Alignment = none	Alignment = None

Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.			
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	In addition, the versatility of many aquaponics systems means that they would potentially allow for the growing certain food-types in atypical locations, such as urban areas. (p.15)	Alignment = none	Alignment = low
Topics mentioned only in the expert based study			
Aquaponics	The use of aquaponics could lead to the development of a more closed-loop system of agriculture wherein resource efficiency is prioritised, resulting in minimal economic throughput. (p.15)	Alignment = none	Alignment = None

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an im-	Smart Homes could provide homeowners with increased flexibility of energy consumption, both directly and indirectly. (p.17) Electricity storage technologies are also thought to be vital in developing so-called 'smart grids' for electricity generation and supply. The combination of electricity storage technology with smart grids offers a significant opportunity to optimise the consumption of energy through such systems. (p.19)	Alignment = low Expert report mentions some technologies (smart homes, smart grids) that could be part of the solutions for the development that the CIMULACT topic sketches out. But it does not mention the concept of participatory governance of the energy system, the topics main intention.	Alignment = low

portant aim for the governance models, as should the future need for "energy communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
Electricity Storage	Hydrogen (p.19)	Alignment = none	Alignment = None

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by	given AVs are likely to be an electrified form of transport, localised vehicle-exhaust pollution could thus be significantly reduced (p1). Autonomous vehicles: Rental-orientated business models for the EV market are likely to emerge from the telecommunications sector. (p.1)	Alignment = low Expert report mentions Autonomous vehicles and rent orientes business models as one solution for the demands raised by CIMULACT, yet it stays within this narrow focus. CIMULACT topic aims to investigate a broader concept of transport for rural areas.	Alignment = low

“digitalisation”) for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).		Alignment = none	Alignment = None
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).	autonomous vehicle technology can be integrated with existing parking infrastructure to produce 'driverless parking systems' accessible via existing personal electronic devices such as smartphones (p.1)	Alignment = med Expert study shows med alignment with regard to framing technological solutions for a shared transportation.	Alignment = low
Topics mentioned only in the expert based study			

Drone Delivery	The use of drones to deliver commercial goods and services, such as transport of goods, is widely expected in the future.(p.14)	Alignment = none	Alignment = None

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	Aquaponic systems are small in comparison to traditional methods of farming and require less space, although they are expensive to operate. Cities are therefore ideal locations for the use of aquaponics and policy-makers may need to consider what the effect of a shift towards more decentralised forms of food production might be on both rural and urban landscapes.(p.16)	Alignment = low Expert study mentions one technology that could help make food production more sustainable, and also applicable in urban areas. The CIMULACT topic however aims at research to explore how to promote sustainable lifestyle in society.	Alignment = low
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.	With more homes becoming 'smart' there is a great potential for efficiency gains both in terms of resource and time savings to consumers and to energy suppliers.(p.17)	Alignment = low Expert report only mentions one	Alignment = low

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).		technological solution that could help implementing the broad paradigm shift towards responsible consumption the CIMULACT topic is focusing on.	
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	- A macro-level impact of 3D printing could be the way in which it shifts our consumer-based economy and the societal behaviours associated with this. (p.5) On the other hand graphene could also be used to deploy cheaper, more efficient and more versatile photo-voltaic (PV) cells on almost any surface. Could this 'democratise' the use of renewable energy and what would the implications be for decarbonisation of the EU power sector? (p.4) Aquaponic systems integrated into everyday architecture could also help to reconnect populations with food production.(p.17)	Alignment = med Expert studies mentions several technologies to increase production awarness as aimed for by CIMULACT topic. It does not mention governance targets such as banning planned obsolence or implementing circular economy concepts.	Alignment = low
Topics mentioned only in the expert based study			

Graphene	Concrete technologies, such as Graphene, aquaponics, smart home technologies	Alignment = none	Alignment = None

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	Aquaponic systems are small in comparison to traditional methods of farming and require less space, although they are expensive to operate. Cities are therefore ideal locations for the use of aquaponics and policy-makers may need to consider what the effect of a shift towards more decentralised forms of food production might be on both rural and urban landscapes. (p.16)	Alignment = med Expert study mentions a tangible technology for achieving targets that the CIMULACT topics is setting with regard to linkig rural and urban spaces and decentralizing production. It also hints that there could be social and cultural effects of decentralising food production. It does not mention participatory governance or exploring drivers of migration.	Alignment = low
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following	Aquaponic systems integrated into everyday architecture could also help to reconnect populations with food production. (p.17)	Alignment = med Expert report aligns well with regard to technological solutions for	Alignment = low

areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.		improving well-being in cities. It does not mention the participatory governance of such solutions, identifying best practices and social innovation.	
Topics mentioned only in the expert based study			
		Alignment =	

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.		Alignment = none	Alignment = None
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data		Alignment = none	Alignment = None

Specifying the relation between citizens' and experts' contributions			
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action		Alignment = none	Alignment = None
Topics mentioned only in the expert based study			

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.		Alignment = none	Alignment = None
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.		Alignment = none	Alignment = None
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments		Alignment = none	Alignment = None

linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.			
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.		Alignment = none	Alignment = None
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	Virtual currencies such as Bitcoin are expanding the frontiers of our digital economy. How can their potential to stimulate a new form of economy be balanced with the cyber-safety needs of citizens? (p.9)	Alignment = low Expert report mentions one technology and its implications for a new form of economy in a specific way. CIMULACT topic is broader, aiming at fostering a general dialougue on new forms of economy, as well as transforming society.	Alignment = low
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.		Alignment = none	Alignment = None

Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects		Alignment = none	Alignment = None
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.		Alignment = none	Alignment = None
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations,	- The anonymity afforded to users of Bitcoins forms the basis for the major impact of Bitcoins: removal of the need for a 'third-party verifier' of transactions. Bitcoin usage would help to 'de-fragment' the global financial market, which has always been the preferred market model by banks around the world seeking to (thus far) prevent the emergence of a global electronic currency (p.9.)	Alignment = med Expert report mentions a technology which could be part of what would be investigated under	Alignment = low

<table>
<tr><td>technical skills and other practices, thus making the “Sustainable and Responsible Investment (SRI)” approach more adopted.
To develop a green system for an effective interaction between the lender and borrowers.</td><td>A virtual currency such as Bitcoin relies instead upon records of transactions to be noted in an anonymous online ledger known as a 'blockchain'. This prevents double-spending of Bitcoins and removes the need for third-party verification of transactions, a function traditionally performed by financial institutions such as banks. (p.9)</td><td>the CIMUALCT topic, which is much broader.</td><td></td></tr>
<tr><td colspan="4">Topics mentioned only in the expert based study</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
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6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = none	Alignment = None
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.		Alignment = none	Alignment = None

Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of “education into action” and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	- Policy-makers may also need to think about how best to market MOOCs, particularly to disadvantaged groups such as older generations with lower computer and internet skills. (p.8)	Alignment = none	Alignment = low
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and “out of the box” thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people “smarter”. Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	- MOOCs combine existing forms of highly innovative communication technologies such as social media, and could disrupt education practices similar to the use of 'torrenting' for downloading music and film. (p.7)	Alignment = none	Alignment = low
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking:	- Moocs: In principle the technology is based on the premise that the internet can be used for open education around the world and, at least	Alignment = med Expert report mentions one	Alignment = low

1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.	in terms of accessing the course, is often free of charge. (p.7)	technology for open education. CIMULACT topic sets out to investigate how such technologies or other innovations can be used for educating people regarding ecosystem service and facilitating behavioral change.	
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	- Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	- The use of wearable technologies, designed to monitor and analyse our personal information through the 'Internet of Things' (often surreptitiously) raises questions of data protection and privacy. This includes both privacy of the public, (what if a Google Glass-wearing user took unauthorised pictures you?), and of individual wearers for whom data may be automatically uploaded into 'the cloud' in a non-transparent way. (p.12) - Together, the increased commercial and public use of drones is expected to impact significantly upon the safety and security of the public as well as having serious implications for public privacy. (p13)	Alignment = med Expert report focuses on data protection and privacy, while mentioning concrete technologies. CIMULACT topic has a broader scope, additionally regarding data literacy, collective decisonmaking.	Alignment = low
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools.		Alignment = none	**Alignment = None**

There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.			
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives		Alignment = none	**Alignment = None**
Topics mentioned only in the expert based study			
Social Behavior Change	Smart homes and data privacy: The impacts on social behaviours, both within and outside of private home lives, individual privacy and security and the universality, or not, of smart home technologies represent just some of such concerns which have yet to be fully addressed by policy-makers (p.18)	Alignment =	Alignment = None

Global Trends to 2030: Can the EU meet the challenges ahead? (2015), Hg. European Strategy and Policy Analysis system

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: - Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. - Better understanding the labor market and its future changes through theories, models and foresight approaches. - New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) - Exploring possible roles of communities for enabling alternative life-job-education pathways.	Engage with empowered individuals and focus on delivery: in a complex, interconnected economy and in highly sophisticated societies, change has to be progressive and fully inclusive. The successful participation of citizens cannot be separated from the modernisation of political parties, trade unions and all other groupings involved in representative institutions. (78) More empowered and better connected individuals will be more creative, more dynamic and less wedded to life-time jobs, but they will also be more demanding and critical. Evolution such as this could allow countries to fundamentally rejuvenate their 'social contracts' and to invent new forms of governance. (8)	Alignment = high Expert study aligns well with regard to empowerment but does not mention the need for understandning the drivers for resignation, depression etc.	Alignment = high
Rethinking (the new) job market needs - Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date	**A rethinking of education.** The return on investment in education must be reassessed thoroughly throughout Europe. Currently high levels of spending are not preventing growing skills mismatches, digital illiteracy and premature school dropout, resulting in the exclusion of many young or indeed older workers from the labour	Alignment = med Expert report focuses on the redesigning the educational system with regard to labor market needs, but	**Alignment = high**

knowledge, ethical skills/competences and social accountability • Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	market. Inadequate linguistic training acts as a brake on labour mobility. Europe's earlier advances in key enabling skills are sometimes being lost compared to other leading or emerging economies. New education and life-long training policies should aim at lasting excellence and wider participation in the labour force. (p.9) Europe needs a new platform for sustainable, durable economic growth. There are real dangers in regarding growth as a cyclical phenomenon that is bound to return. High debt levels are a serious handicap in Europe and elsewhere in the world and the emerging countries are not necessarily destined to be powerful engines for the global economy. The goal of a European renaissance can mostly be delivered by innovation, not merely digital, not only technological, but also societal and in the design and practice of governance. (p.8) More scientific and technical skills will be needed. Everybody will need to be proficient and knowledgeable in the use of these 'tools of our time'. Students will need to 'learn how to learn', in order to adapt to new skills and ever changing job opportunities. New jobs, like those involving big data, require enhanced science skills and new mind-sets adapted to sharing information in a context of co-disciplinary thinking. (p.58) The focus should be on improved primary and secondary education, inclusive but affordable healthcare, less rigid labour markets and fewer barriers to initiative and competition. The purpose remains to ensure more flexible careers and appropriate incomes. The new tools are life-long learning, an open job market, and longer participation in the labour force, by more citizens, as well as retirement practices considered in the light of life expectancy lengthening. (p.78)	does not mention the need for aquiring ethical skills and competences and social accountability as CIMUALCT topic demands.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an	More empowered and better connected individuals will be more creative, more dynamic and less wedded to life-time jobs, but they will also be more demanding and critical. Evolution such as this could allow countries to fundamentally rejuvenate their 'social contracts' and to invent new forms of governance...Pressure will increase for greater accountability and transparency at the different levels of governance. (8)	Alignment = med Expert report focuses on the redesigning the educational system with regard to labor market needs, but does not mention the	Alignment = high

individual and organisational level. Solutions can be social, organisational as well as technological innovations.” Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	For citizens affected by or at risk of total exclusion, measures should equip them with the skills demanded in the labour market and generally promote their insertion in active community life. (p.9) Complexity is already part of everyday life for many people and it will certainly be more pervasive by 2030 (2). Several forces are driving this process, including societies’ ever-increasing environmental and social demands, and popular appetites for more consumer goods, greater thrills and more leisure. It also derives in part from the mobility of people and goods and the possibilities of enjoying several lives in the timescale and framework of just one. Thus, complexity begins with the individual. (12) However, the accelerating change triggered by these disruptive new technologies also raises fundamental challenges for the economy, society and policy-makers. The flexibility of the labour market and the adaptability of individuals will be tested, and risks of exclusion may increase. Anticipating and managing change will become an important part of the strategic activity of public and private structures (p.56) More scientific and technical skills will be needed. Everybody will need to be proficient and knowledgeable in the use of these ‘tools of our time’. Students will need to ‘learn how to learn’, in order to adapt to new skills and ever changing job opportunities. New jobs, like those involving big data, require enhanced science skills and new mind-sets adapted to sharing information in a context of co-disciplinary thinking. (p.58)	need for redefining values and welfare as CIMUALCT topic demands	
Topics mentioned only in the expert based study			
Combating Inequalities	Combating inequalities calls for comprehensive solutions Long-term analyses confirm that more attention needs to be paid to the impact of inequalities on economic and political systems. Inequalities not only affect those who suffer from them but also the overall economic performance and political stability of states and societies. These effects can be magnified by a lack of social mobility, which	Alignment = 0	Alignment = None

	limits opportunities an d prospects for improvement for the most deprived members of society. (p.62)		

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	A combination of nano-, bio- and information-technology will revolutionise healthcare (63). Howev-er, delivering high-tech, personalised forms of treatment while ensuring universal access to healthcare may create budgetary strains when shaping future health policy. (34)	Alignment = med Expert report aligns well with regard to mentioning new developments in healthcare as well as mentioning universal acces to the healthcare system. It does not mention the need for identifying best practices and emphasizing on the implementation at local level.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research	A combination of nano-, bio- and information-technology will revolutionise healthcare (63). Howev-er, delivering high-tech, personalised forms of treatment while ensuring universal access to healthcare may create budgetary strains when shaping future health policy. (34)	Alignment = low	Alignment = low

on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. • For the citizens to be trained on health and digital literacy.			
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	A combination of nano-, bio- and information-technology will revolutionise healthcare (63). However, delivering high-tech, personalised forms of treatment while ensuring universal access to healthcare may create budgetary strains when shaping future health policy. (34)	Alignment = med Expert report aligns well with regard to mentioning new developments in healthcare as well as mentioning universal acces to the healthcare system for all citizens. It does not mention the need for setting indicators, comparative analysis, and integrating local knowledge and practices.	Alignment = low
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves.		Alignment = none	Alignment = none

On the side of the recipient: target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.			
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	Under current healthcare and pension conditions, demographic change, especially population ageing and a fall in the active population, will make European Union Member States' financial situations more onerous by 2050. (62) **Human-technology fusion**...In addition to organ regeneration, stimulation of cognitive capacities, genetic choices, delayed ageing or even human augmentation may be possible. Over time, this could deeply affect intra-societal relationships, especially between the humans thus transformed and those who are not. (36)	Alignment = low While expert report focuses on financial impacts of ageing societies and technological human enhancement, CIMULACT topic focuses on understanding socil, economic and biological factors of the ageing process, intergenerational relationships as well as exploring impact of lifelong learning schemes	Alignment = low

Topics mentioned only in the expert based study			

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	At a more fundamental level, digital technologies may affect our relations with other individuals and make it more difficult for some to distinguish between reality and virtual reality. An ever-increasing abundance of information may impact cognitive and ‘attentional’ capacities, with implications for human interaction. (p.35)	Alignment = med Expert report mentions the need for looking into negative impacts of digital technology but does not mention the co-production of such technologies as a solution for evading such impacts.	Alignment = low
Balanced work-life model Research should rethink the definition of “work” and develop approaches that permit to recognize and reward as “work” all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair).		Alignment = none	Alignment = none

However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the "analog" activities overcoming the notion that time is money		Alignment = none	Alignment = none
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere.		Alignment = none	Alignment = none

the community level: group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. - integration of 'free time' in the work place - new ways of employment where employees are more like volunteers / freelancers - [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** - the impact of work-life balance policies, - the impact of different business models on workers' time autonomy and quality of life - the psychological acceptance of new forms of work, both individually and by society		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	In 2030, managing scarcity will be the principal challenge for food and water supply. Demand for food is expected to be 50 % higher than in 2008 (71). This rise is mainly due to the improving living standards of the fast-growing middle class in the major emerging economies. The availability of agricultural land will pose another major challenge, as will some agricultural inputs, in particular those based on potassium. (37)	Alignment = low As the expert report align with CIMU-LACTtopic in terms of describing the challenge of food security, it does not mention details for directions to find solutions as CIMULACT does: mapping existing food access and food poverty, checking supply regulation or investigating food inequalities as	Alignment = low

		knowledge basis for educational programmes.	
Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.		Alignment = none	Alignment = none

Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.		Alignment = none	Alignment = none
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	In 2030, managing scarcity will be the principal challenge for food and water supply. Demand for food is expected to be 50 % higher than in 2008 (71). This rise is mainly due to the improving living standards of the fast-growing middle class in the major emerging economies. The availability of agricultural land will pose another major challenge, as will some agricultural inputs, in particular those based on potassium. (37)	Alignment = low Expert report aligns with CIMULACT topic on the matter of describing approaching challenges with regard to land use, but does not detail directions for finding solutions.	Alignment = low
Topics mentioned only in the expert based study			

Water Shortage	Unless some significant technological break-through occurs, water shortages will have a major impact on agriculture: in some countries, such as China, 90 % of water consumption is for food production. In 2030, between 1.9 and 2.6 billion people are likely to suffer from a lack of water. In Europe, the supply difficulties in the south and east are likely to worsen. (37)	Alignment = 0	Alignment = none
Food Water Energy Nexus	Food and water supply will be about managing scarcity — a problem made worse by climate change;By 2030, 93 % of the rise in energy consumption will be in non-OECD countries. (37)	Alignment = 0	Alignment = none

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy communities" in	Another way of giving consumers a more central role in the field of energy is to promote access by local groups to decentralised means of production, for example by encouraging the emergence of cooperative structures for the production of renewable energy — wind, solar or other — at local level. This would greatly increase acceptance by local populations of decentralised production plants, such as onshore wind farms. (p.64)	Alignment = high Expert report mentions in short form all of the key issues of the CIMULACT topic: encouraging the emergence of cooperative structures for the production of renewable energy.	Alignment = med

which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
Energy Union	Development of a genuine 'Energy Union' and the combating of climate change. The fragmented energy market and the transition towards renewables must be addressed rapidly and comprehensively, by policies that also reduce the seriously risky current dependence on outside sources. Security of supply and competitiveness should both be enhanced. The goal of a genuine 'Energy Union' should also contribute to the European Union's endeavours to reduce emissions in the light of the dangers posed by climate change. (p.9)	Alignment = 0	Alignment = none

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by “local” and what is meant by “communities that are organized locally” as this is not necessarily the same as “rural”. However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is “What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the “rural”), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the “local” with the “urban” and the idea of “self-sustainability” of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by	Technological convergence will transform the transport sector in the near future. Combined progress in, inter alia, robotics, automatic systems, electric or hydrogen engines, sensors and satellite navigation systems (65) will allow us to move in an autonomous vehicle while working or surfing online, or interacting with smart homes. Together with the use of mini-drones to transport objects, this evolution will revolutionise travel between and within urban centres (p.35) These developments take place in the context of an ageing population and an increase of ‘non-traditional’ families. They will also enable greater mobility for minors and for older persons unfit to drive who will no longer depend on someone else for transport. (35)	Alignment = med Expert report aligns well with CIMULACT topic on the issues of providing new solutions for the transport sector, but does not mention the need for investigating different needs of urban and rural areas.	Alignment = low

"digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	These developments take place in the context of an ageing population and an increase of 'non-traditional' families. They will also enable greater mobility for minors and for older persons unfit to drive who will no longer depend on someone else for transport. (35) Smart mobility, seen as a multi-modal service to which everyone has access and which incorporates a fast broadband connection, could therefore be a pathway to a fairer society. (35)	Alignment = med Expert report aligns well with CIMULACT topic on the issues of providing new solutions for the transport sector, but does not explicitely mention the need for investigating different transportation needs of urban and rural areas and connecting those with investigating different lifestyle choices..	Alignment = low
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective	Smart mobility, seen as a multi-modal service to which everyone has access and which incorporates a fast broadband connection, could therefore be a pathway to a fairer society. (35)	Alignment = low Expert report aligns well with CIMULACT topic on the issues of providing new solutions for the	Alignment = low

transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).		transport sector, but does not explicitely mention the directon of providing better community based, collective transport options.	
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.		Alignment = none	Alignment = none
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.	People's purchasing choices will drive the world economy, fuelled essentially by consumption by a greatly expanded middle class (13) Complexity is already part of everyday life for many people and it will certainly be more pervasive by 2030	Alignment = low While expert report focuses on the impact of increased consumption, and sees a	Alignment = med

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	(2). Several forces are driving this process, including societies' ever-increasing environmental and social demands, and popular appetites for more consumer goods, greater thrills and more leisure. It also derives in part from the mobility of people and goods and the possibilities of enjoying several lives in the timescale and framework of just one. Thus, complexity begins with the individual. (12) The new information and communication technologies, and a better awareness of the needs of the public, thanks to the use of big data, should enable delegation of more responsibilities to the people and facilitate their choices as individuals and consumers. (64)	solution in delegating responsiblity to consumers, CIMULACT topic's frame is different, investigating shared responsibilities of different actors and fostering a shift towards less materiality and circular economy.	
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts		Alignment = none	Alignment = none
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs.		Alignment = none	Alignment = none

Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.			
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	Countries with a high rate of migrants adhering to other beliefs than their mainstream religions will step up their integration policies in order to uphold a societal consensus of 'living together'. This will pose a challenge in particular to Europe and the United States. New ways of accommodating different faiths and corresponding views on the social consensus in largely secularised societies and state systems will have to be found in full respect of freedom of religion and belief, but also in respect of the large numbers of those who do not adhere to any faith and do not wish states to be marked by them. (70) Europe can also count on its specific political and social experience to develop uniquely open relations with the rest of the world, in a way perhaps more sensitive to the diversity of cultures and the historical depth of geo-political issues than other major players. (72)	Alignment = high Expert report aligns well with CIMULACT topic and metnions, in other words, most key issues within this topic.	Alignment = med
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including:	In most European Union Member States, they are an integral part of society and provide a necessary contribution to the labour market. Although far from forming homogenous groups, immigrant workforces tends to be younger and less skilled than average. Education is the best tool to avoid ethnic segmentation and exclusion, alongside effective diversity and non-discrimination policies. (61)	Alignment = low While expert report focusses on inclusion for successful communitybuilding, CIMUALCT	Alignment = low

Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions		topic has a larger scope, setting out to investigate how evidence-based decision making can be implemented into many aspects of community building.	
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	Engage with empowered individuals and focus on delivery: in a complex, interconnected economy and in highly sophisticated societies, change has to be progressive and fully inclusive. The successful participation of citizens cannot be separated from the modernisation of political parties, trade unions and all other groupings involved in representative institutions. (78)	Alignment = med Expert report mentions empowerment and participation but focusses o organisational change while thhe CIMUALCT topic applies a broader view, additionally	Alignment = med

		mentioning de-centralization and physical community spaces.	
Topics mentioned only in the expert based study			
Migration Debate	**Reshaping the migration debate**. Many European Union Member States face increasing pressure from high levels of migration challenging the cohesion of their societies. That pressure, especially from the Southern neighbourhood, is likely to increase further over the coming decades, for demographic and political reasons. There are no easy solutions to this problem. At the same time, ageing in Europe implies that over the longer term there will be fewer people of working age to keep the economy going. Before 2030, migration policies must be reframed, with a view to a more economically sustainable, humane and carefully managed migration strategy.(p.9) In most European Union Member States, they are an integral part of society and provide a necessary contribution to the labour market. Although far from forming homogenous groups, immigrant workforces tends to be younger and less skilled than average. Education is the best tool to	Alignment = low	**Alignment = low**

	avoid ethnic segmentation and exclusion, alongside effective diversity and non-discrimination policies. (61)		
Shfting International Power Centers	Analysts agree that globalisation is moving towards a more polycentric and segmented system, with a bigger cast of players, more interconnected economically, financially and technologically. Globalisation will continue to increase interdependence between states and between public and private sectors. (41) Global economic and geopolitical issues will be ever more interlinked. Negotiations on climate change, cyber security, finance or trade will be increasingly influenced by the geopolitics of assertive new powers. (44)	Alignment = 0	Alignment = none
EU R&D Strategy	But the European Union is not helped by the fragmentation of its R&D activities and investments — more effort could be brought to bear on mobility of scientists and researchers, in favour of more inter-disciplinary cooperation, as well as reinforcing an education system to promote STEM (science, technology, engineering, mathematics). (56) Public policy could focus on the development of innovative eco-systems, the incorporation of financing, infrastructure (centres of excellence), better connections be-	Alignment = low	Alignment = low

	tween industrial and academic R&D, and simpler regulations. The issue is no longer solely cross-disciplinary; it must be ‘co-disciplinary’, creating the possibility of interfaces between economists, entrepreneurs, scientists, other academics and society itself. (58)		

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	More empowered and better connected individuals will be more creative, more dynamic and less wedded to life-time jobs, but they will also be more demanding and critical. Evolution such as this could allow countries to fundamentally rejuvenate their 'social contracts' and to invent new forms of governance. (8) Improving delivery of policies and political accountability. The increased complexity of governance and the growing multiplicity of information mean that citizens often lose sight of the plans and promises made by political authorities at the national and European level. A lack of trust ensues, which can endanger political and social cohesion. Inclusive and efficient ways to safeguard and deepen democracy must be shaped at all levels, without undermining the values and fairness of the present governance systems. At European Union level, deep reforms in its interaction with states and citizens are needed. These could include: a clearer setting of priorities; systematic respect for subsidiarity; functional transparency; clearer communication systems; and modernised governance systems, including a better alignment between institutions and a clearer division of tasks between them (p.9) With more people empowered by technologies and a context more favourable to investment, scientific advance could generate more rapidly new products and new services, as well as new processes and practices in business and social care. Collaborative work, open sourcing and social innovation in a large number of domains might be important components of the complex 'innovative ecosystems' of the future. (53) More fundamentally, the challenge for European society is to adapt and change its structures and rules while maintaining its values. This requires a strong and inclusive social dialogue, openness to risk, and clear public policies at the service of individuals, so as to ensure their acceptance. The citizens of the knowledge economy cannot be satisfied with the same level of information and participation as those of the 1960s. As European Union decisions impact	Alignment = high Expert study mentions all key issues of this CUIMULACT topic.	Alignment = high

	them much more directly, corresponding progress in democratic accountability and legitimacy is required for the Europe system. (p.58) On the other hand, the opportunities to be informed and to participate in political life have all become much easier with the development of new technologies. At the European Union level, asserting the capacity to change not only the executive in charge but also its policy orientations might help to enhance confidence in the institutions. (63) Modernising the relationship between the individual and politics is a more sensitive matter, however, as it comes up against the complexity of political systems and vested interests. And yet, new avenues are opening up once again thanks to technology, which makes elections and popular consultations easier with electronic voting, allows online for a for discussion and decision-making, and enables authorities to disseminate information more effectively. Experiments in participative democracy using these changes are already being conducted locally, in towns and cities and even nationwide. (p.64)		
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	With more people empowered by technologies and a context more favourable to investment, scientific advance could generate more rapidly new products and new services, as well as new processes and practices in business and social care. Collaborative work, open sourcing and social innovation in a large number of domains might be important components of the complex 'innovative ecosystems' of the future. (53) Modernisation of public administrations in many countries through better use and applications of ICT, public-private partnerships, completion and reform of the single market, life-long education for a meaningful life in the digital society — these	Alignment = med Expert report mentions th opportunities of open innovation and participatory governance of innovation, but does not do this under CIMULACT	Alignment = high

	and other policy prescriptions have been analysed, debated and are in various phases of implementation across the Union. (55) [The Kübler-Ross Change Curve] is helpful in that it emphasises the importance of the relationship between decision-makers and the citizens experiencing the change at first hand. In particular it calls for: 1) transparency, 2) the creation of a calm, pro-change atmosphere, seeking to develop trust and common anticipation while minimising conflict, 3) the strengthening of good and effective governance at every level (local, national, European) to go together with an adequate citizens' representation at those levels, in order to capture and address their concerns throughout the transition. (59)	topic'S main impetus of sustainability.	
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	Complexity is already part of everyday life for many people and it will certainly be more pervasive by 2030 (2). Several forces are driving this process, including societies' ever-increasing environmental and social demands, and popular appetites for more consumer goods, greater thrills and more leisure. It also derives in part from the mobility of people and goods and the possibilities of enjoying several lives in the timescale and framework of just one. Thus, complexity begins with the individual. (12)	Alignment = high Expert report mentions all key issues of this CMULACT topic.	Alignment = med

	Public policy could focus on the development of innovative eco-systems, the incorporation of financing, infrastructure (centres of excellence), better connections between industrial and academic R&D, and simpler regulations. The issue is no longer solely cross-disciplinary; it must be 'co-disciplinary', creating the possibility of interfaces between economists, entrepreneurs, scientists, other academics and society itself. (p.58)		
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	The growing constraints imposed by the management of information, and in particular the difficulties in coping with both confidentiality and demands for transparency will also play a key role...Democratic nation states will have to extend their capabilities needed to intervene effectively in world affairs and widen them. (43) [The Kübler-Ross Change Curve] is helpful in that it emphasises the importance of the relationship between decision-makers and the citizens experiencing the change at first hand. In particular it calls for: 1) transparency, 2) the creation of a calm, pro-change atmosphere, seeking to develop trust and common anticipation while minimising conflict, 3) the strengthening of good and effective governance at every level (local, national, European) to go together with an adequate citizens' representation at those levels, in order to capture and address their concerns throughout the transition. (59)	Alignment = high Expert report mentions transparency as a main tool tool for good governance as spelled out in CIMULACT topic.	Alignment = med
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation		Alignment = none	Alignment = none
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.		Alignment = none	Alignment = none
Basic universal income so nobody is left behind		Alignment = none	Alignment = none

Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects			
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.		Alignment = none	Alignment = none
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted.	Europe needs a new platform for sustainable, durable economic growth. There are real dangers in regarding growth as a cyclical phenomenon that is bound to return. High debt levels are a serious handicap in Europe and elsewhere in the world and the emerging countries are not necessarily destined to be powerful engines for the global economy. The goal of a European renaissance can mostly be delivered by innovation, not merely digital, not only technological, but also societal and in the design and practice of governance. (p.8)	Alignment = high Expert report mention all key issues of this CIMUALC topic.	Alignment = med

To develop a green system for an effective interaction between the lender and borrowers.	Europe's policy agenda for reshaping its economy is a long list of actions that are mostly necessary, rather than optional. Acknowledging the impact of technological and social change will require a broader view of prosperity than only GDP figures. Sustainability, access to education and quality of life should also be taken into account. (55)		
Topics mentioned only in the expert based study			
Mobilisation of public and private investment	to help to boost Europe's economy. A stronger convergence of public and private investment, among other things tapping into private savings, would stimulate job-creation and help to sustain the European model of a social market economy.(p.8)	Alignment = 0	**Alignment = none**
European Single Market	Further efforts to complete the single market feature in every recommended strategy for improving Europe's economic performance. It is still not completed. The single market for goods is still hampered by uneven application of European Union regulations and non-tariff barriers, whilst only 20 % of service markets operate across intra-European Union borders. Elimination of the remaining barriers to trade in goods and services would help to triple the gains already achieved during the last 30 years, with a revenue gain around 15 % and a doubling of internal European Union trade. (54) However, many analysts consider that unless and until the European Union manages to lift EMU to the level of a more mature currency union, with a higher level of policy integration and risk-sharing, its construction will remain vulnerable and the European economy will not be able to reap all its potential benefits. (55)	Alignment = 0	Alignment = none
Enhanced governance of the euro area.	The management and reduction of public debt in the euro area, as well as the definitive repair of the banking system, will require political unity and resolve. The coordination and delivery of major economic reforms in Member States' economies and	Alignment = 0	Alignment = none

	the completion of Economic and Monetary Union (EMU) are the short- and medium-term tasks (p.9)energy		
Building a European research and innovation area.	Despite European Union programmes, fragmentation of R&D both in the public and in the private sector leads to inefficiency, lack of critical mass and multiple product standards. Mobility of scientists between academia and industry and bold initiatives are the likely keys to more streamlined investments and maximum innovation. (p.9)	Alignment = 0	Alignment = none

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	A rethinking of education. The return on investment in education must be reassessed thoroughly throughout Europe. Currently high levels of spending are not preventing growing skills mismatches, digital illiteracy and premature school dropout, resulting in the exclusion of many young or indeed older workers from the labour market. Inadequate linguistic training acts as a brake on labour mobility. Europe's earlier advances in key enabling skills are sometimes being lost compared to other leading or emerging economies. New education and life-long training policies should aim at lasting excellence and wider participation in the labour force.(p.9) The challenge is to see innovation policies in the broader context of a society for change. This suggests that a more systematic and comprehensive approach is needed for relationships between business, regulators, public and private sectors and education. (58) In most European Union Member States, they are an integral part of society and provide a necessary contribution to the labour market. Although far from forming homogenous groups, immigrant workforces tends to be younger and less skilled than average. Education is the best tool to avoid ethnic segmentation and exclusion, alongside effective diversity and non-discrimination policies. (61)	Alignment = high Expert report mention all key issues of this CIMUALC topic.	Alignment = high
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and		Alignment = none	Alignment = none

boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	In most European Union Member States, they are an integral part of society and provide a necessary contribution to the labour market. Although far from forming homogenous groups, immigrant workforces tends to be younger and less skilled than average. Education is the best tool to avoid ethnic segmentation and exclusion, alongside effective diversity and non-discrimination policies. (61)	Alignment = low While expert report focusses on education as a tool for inclusion of migrant workers, CIMUALCT topic is braoder in scope, exploring several starting points to foster education for community building.	Alignment = low

SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.		Alignment = none	Alignment = none
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			
Talent Scarcity	Improving the education system is crucial, in particular to ensure that as many citizens as	Alignment = 0	Alignment = none

	possible acquire the necessary skills and tools to cope with this new order. Recent modelling of demand in Europe points to a gap in the supply of e-skills of about 900 000 people by 2020. Moreover, this is likely to be a global phenomenon; therefore in an age of increased mobility Europe will have to compete in the world market place to attract and keep people endowed with these skills. (58)		

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	With the development of digital technologies, the volume of personal data will massively increase. People's concern regarding the difficulty in controlling their own data could lead to mistrust and aversion to technological innovation and the digital society. Therefore constantly updated regulations will have to guarantee the integrity of these data and ensure that they are not manipulated. (p.36) The new information and communication technologies, and a better awareness of the needs of the public, thanks to the use of big data, should enable delegation of more responsibilities to the people and facilitate their choices as individuals and consumers. (64)	Alignment = med Expert report mentiond data privacy and security as an issue but does not mention data literacy as one.	Alignment = high
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of	A true digital revolution. The European Union and its Member States need to catch up with the top actors to regain some leadership in technical and industrial innovation, especially in the fast-growing digital sector of the economy. Enabling operators to deliver top-level research and enter the market with less difficulty will be key. Individuals will need to take on board new patterns of consumption, work and communications. (p.9)	Alignment = med Expert report mentions investment in infrastructures and the need for individuals to deal with virtual and	Alignment = low

virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		physical mobility. It does not mention this in relation to negative aspects of such a shift as CIMULACT topic does.	
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: - Develop practices of participatory development of sustainable technologies - Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources - Establishing a legal framework for responsible technology development and monitoring the promoted practices - Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly - Reducing bureaucracy, speeding up the research and implementation of new initiatives	Such a technological revolution could reverse the downward growth trend in developed countries and provide new answers to global challenges, from climate change to energy issues, as well as greatly expanding possibilities for individuals. However, ethical and societal dilemmas are likely to be sharp enough to spark debates about the usefulness of certain innovations and whether they ultimately benefit people and societies. Impacts on the labour market could be permanent in some cases and transitional in others: historians will recall that the last industrial revolution wiped out almost 40 % of jobs at a time of demographic growth, with serious social effects that lasted for decades. Technology has to be trusted as well as mastered to deliver real success in the 21st century. (p.36)	Alignment = med While expert report mentions the current challenges adhering to technological innovation and the need for improving innovation processes, it does not detail targets such as a legal frame work for responsible technology development or encouraging	Alignment = med

		sustainable technologies.	
Topics mentioned only in the expert based study			
Security Threats	European Union is far from fully equipped with the appropriate policies, instruments and strategic focus to deal effectively with such threats. It will still need to: • Foster stability and development in its wider strategic neighbourhood, including engaging more deeply with key actors, while reversing the present downward trend in defence spending, in order to preserve the European Union's own security and to be able to act when necessary. • Reinforce the global system, by efficiently promoting a multilateral framework that is adapted to the newly multi-polar world and still remains based on universal values. • Further develop its alliances and engage with rising powers. Existing strategic partnerships should be deepened, notably with the United States as key partner. Such partnerships should promote economic integration, but also be reinforced wherever appropriate with security and defence dimensions, cross-investments and management of human flows. Rising global powers should not be isolated, but rather engaged	Alignment = 0	Alignment = none

	with and encouraged to take up greater global responsibilities. The rise of China, as a fundamental game-changer, calls for a reassessment of the European Union's relationship with this country in a way that matches its future importance. (p.10) ***The Eastern Neighbourhood: dealing with Russia's ambitions:*** Russia is attempting to establish itself as a pole, distinct from the European Union, and to organise Eurasian geography around its own interests and values. Given its economic weaknesses, it is uncertain whether Russia will succeed in its Eurasian project, but the latter will impact considerably on the nature of relations with the European Union, whatever happens. (68) ***The Southern neighbourhood and beyond: scene set for further unrest*** To the European Union's south and south-east, many countries are in a fragile state and there are multiple sources of instability. The main challenge will be to create the conditions of sustainable peace between the key regional actors — Turkey, Iran, Saudi Arabia and Israel — and to promote some cooperation between them, so that the region can stabilise with improved governance, economic prosperity and social development. (68) Continuous erosion of security and the spread of violent conflict recur ever more frequently in literature on global trends. Disturbingly, parallels are often drawn between the present situation and the eve of the First		

	World War. Observers note that historically, power transitions have often been precursors of, or accompanied by war. Currently there is a worrying combination of a multi-polar world, potential flash points for conflict and weak international governance. (45)		
Soft Power	For reasons to do with 'negatives' such as a lack of leadership, weak economic growth and pressure from its neighbourhoods, but also simply because of the rapid development of the rest of the world, the coming period could be one of gradual marginalisation for Europe, witnessing a relative, though by no means an absolute, decline on the international stage. The main question is whether Europe will be able to preserve its influence and continue to shape the world of the future. (71)	Alignment = 0	Alignment = none

Studie: The Global Economy in 2030: Trends and Strategies for Europe (2013) Gros, Daniel/ Linda Alcidi …

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: - Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. - Better understanding the labor market and its future changes through theories, models and foresight approaches. - New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) - Exploring possible roles of communities for enabling alternative life-job-education pathways.		Alignment = none	Alignment = 0
Rethinking (the new) job market needs - Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability - Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	The automation of knowledge work could bring great societal benefits – such as improved quality of health care and faster drug discovery – but it may also spark complex societal challenges, particularly in employment and the education and re-training of workers.(41) In this puzzle, technological and social innovation should act as unified forces and drivers of change. The former should boost labour productivity and produce more and better products while saving/freeing labour in the progressive sectors of the economy, while the latter aims to enhance the quality of	Alignment = med Expert report recognizes changes in the job market and needed training curricula as results of increasing automation. Further, the	Alignment = low

	environment, health, education and other personal care and social services provided to the population, while creating new jobs(42)	study views both technological and social innovation as sources for increased wellbeing in individual lives and lifestyles.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	**Work organisation and new forms of learning.** A wide range of educational innovations will occur, linked to the uptake of new learning platforms, such as mixed reality, pervasive mobile computing, adaptive learning platforms and gamification. A very promising development is the advent of massive open online courses (MOOCs) at the university level, which allow for large-scale online participation and operate via the creation of networks. (39)	**Alignment = low** Expert report highlights changes in education (including life-ling learning) as a result of increaed automation and technicological development in education field. However, expert report fails to connect these trends with changing values, social welfare, personal and organizational choice managemnt (though the	Alignment = low

		later is vaguely implied).	
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	In this puzzle, technological and social innovation should act as unified forces and drivers of change. The former should boost labour productivity and produce more and better products while saving/freeing labour in the progressive sectors of the economy, while the latter aims to enhance the quality of environment, health, education and other personal care and social services provided to the population, while creating new jobs...(42)	Alignment = low Expert report outlines the call for technical and social innovation to work towards better quality health and personal care options, but it is vague at how such a relationship can be conceived and how research can be organized.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to:	Given the current burden on public finances and the potential increase in expenditure due to ageing populations, technologies such as personalised medicine and brain-inspired technologies could not only increase the productivity of the sector which, being a non-tradable one, is not bound by international competition, but can also generate savings.(40)	Alignment = low Expert report notes that some technological developments can help to reduce financial stresses on current healthcare system.	Alignment = low

- For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. - For the citizens to be trained on health and digital literacy.		However, it does not mention that said technologies should be co-developed, nor that they shoudl be part of a more holistic approach to healthcare (ie lifestyle). CIMULACT also calls for education and traiing for both docotrs and citizens regarding data literacy and other important aspects of personalized data collection as used in healthcare.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply:		Alignment = none	Alignment = 0

1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.			
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	Health technologies (like specific mobile technology) could prove useful to reduce the expenditure on heath care.(40)	Alignment = low Expert report presents vague technocratic stance towards improving healthcare and systemic costs. CIMULACT calls for greater open dialgoue and research between healthcare professionals and citizenry, coupled with	Alignment = low

		revised healthcare education, localized health care knowledge, and greater communication between iindustry and patients.	
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and life-long learning on employment, innovation and social change		Alignment = none	Alignment = 0
Topics mentioned only in the expert based study			
Human augmentation	...human augmentation technologies will likely transform everyday life, particularly for the elderly and mobility-impaired populations.(40)	Alignment = none Too technologically specific for CIMULACT.	Alignment = none

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	In this puzzle, technological and social innovation should act as unified forces and drivers of change. The former should boost labour productivity and produce more and better products while saving/freeing labour in the progressive sectors of the economy, while the latter aims to enhance the quality of environment, health, education and other personal care and social services provided to the population, while creating new jobs...(42)	Alignment = med Expert report, though often times technocratic, does imply that technology works best when coupled with citizen participation in development and deployment. CIMULACT also notes need for education in technological use, governance of data and its use, and conflating online and offline actions and consequences.	Alignment = low
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the	The idea of a fixed physical workplace will change as new technologies allow remote working with realistic experiences. (39)	Alignment = low Expert report recognizes changes in workplace, but dos not	Alignment = low

sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.		speak to CIMULACT's call for balanced work-life, quality of life, shifting recognition of work (domestic work, child-care, etc.), nor new basis of negotiation between employers and employees.	
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money		Alignment = none	Alignment = 0
Promoting well-being through relating environments Research should be developed at different levels:	**Work organisation and new forms of learning.** A wide range of educational innovations will occur, linked to the uptake of new learning platforms, such as	Alignment = low	Alignment = low

the working environment: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.	mixed reality, pervasive mobile computing, adaptive learning platforms and gamification. A very promising development is the advent of massive open online courses (MOOCs) at the university level, which allow for large-scale online participation and operate via the creation of networks. (39)	Expert report views MOOCs as new technological environment that can facilitate new education models. It does not speak to the relationahsip of the built world to physical and cognitive well being, nor the empowerment of individuals and communities through designed interaction spaces.	
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies,		Alignment = none	Alignment = 0

• the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society			
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level		Alignment = none	Alignment = 0
Evolving food culture in growing cities Research should investigate the following aspects:		Alignment = none	Alignment = 0

- Comparative study of food supply chains and their social, ecological and economic impact - Studies on the role of food as an enabler for social inclusion and cohesion in cities - Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. - Historical research of nutrition flows during periods of migration - All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: - Policy tools for management of mixed food cultures in cities, - Sustainable non-indigenous local growing techniques, - Intervention options into diverse and multicultural food consumption practices, - Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). - Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.			
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the		Alignment = none	Alignment = 0

relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.			
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.		Alignment = none	Alignment = 0
Topics mentioned only in the expert based study			

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy communities" in	For instance, it is estimated that smart grids and smart buildings can generate about €50 billion in annual energy savings in the EU by 2020. (40) Relative price changes and policy measures are likely to underpin an ever-increasing share of renewables in world primary energy demand, which is projected to grow from 13% in 2010 to almost 17% in 2030 (IEA, 2012; New Policies Scenario)...The trend towards renewables will also have an impact on the demand for metals, especially for high-tech metals that are crucial for EU high-tech and eco-industries in energy...(47) More generally it appears that the capital intensity of the future low-carbon sources of energy (and energy savings) will be high. This suggests that the state of capital markets, which determine the availability and the cost of capital, will play an increasingly important role. (55) The latest IPCC report estimates that the global 'carbon budget' is one thousand pentagrams (GT C). About one half of this budget has already been used. This implies that the amount that can still be emitted corresponds to about 1,350 to 1,985 billion tonnes of CO2. However, the known recoverable reserves today of fossils fuels correspond to over 2,500 tonnes of CO2. This implies that a considerable part of the reserves of fossil fuels must be left in the ground. (56-7)	Alignment = low The econocentric analysis of 'smart cities' and related technologis and policies provides execllent data regarding sustainable urban system design. CIMULACT calls for greater inclusivity and participation in the production and governance of energy within the smart system perspective. Both reports recgnize the role of capital in future energy system designs. CIMULACt calls for experiments in prosumerism and 'energy comunities.'	Alignment = low

which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
Food Water Energy Nexus	Technology advances will be required to accommodate the increasing demand for resources owing to global population growth and economic advances in still under-developed countries. Such advances can affect the food, water and energy nexus by improving agricultural productivity through a broad range of technologies encompassing precision farming and genetically modified (GM) crops for food and fuel.	Alignment = none Expert group mentions a convergence of thopics that is only implied in CIMULACt.	Alignment = none
Shale Gas	Securing competitive gas supplies for the EU could therefore become an issue for policy-makers because investors both inside and outside the EU might not be willing to take the risk of making sufficient investments in gas supplies and infrastructures, especially as natural gas market outlooks for virtually every other part of the world are more promising. (51)	Alignment = none Too specific, and arguably unsustainable, for CIMULACT.	Alignment = none

Nuclear Energy	With regards to nuclear energy, it is apparent that important member states have taken diametric approaches. In Germany and some other countries, nuclear energy is being phased out, whereas it is being retained, or possibly even expanded, in other member states such as France and the UK. These differences will lead to different national energy market structures (and mixes) which will make it more difficult to achieve a common energy policy and to complete the internal market in energy.(96)	Alignment = none Too specific and arguably unsustainable, for CIMULACT.	Alignment = none

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by “local” and what is meant by “communities that are organized locally” as this is not necessarily the same as “rural”. However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is “What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the “rural”), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the “local” with the “urban” and the idea of “self-sustainability” of local communities.		Alignment = none	Alignment = 0

This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by “digitalisation”) for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	The idea of a fixed physical workplace will change as new technologies allow remote working with realistic experiences. (39)	Alignment = low Expert report only implies transportation changes within the context of greater virtual or remote working opportunities.	Alignment = low
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).		Alignment = none	Alignment = 0

Topics mentioned only in the expert based study			
Arctic Trade Routes	Some estimates suggest that the North Sea Route would reduce shipping time from northeast Asia (i.e. Japan, South Korea, China and Taiwan) to northwest Europe by as much as 20-25%, resulting in a potentially large increase in trade flows. Within the EU, the northwest member states with ports would of course gain more relative to the continental and southern ones (100)	Alignment = none Too specific for CIMULACT, though it has huge potential implications for certain types of transport systems (and their efficiency).	

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	Increasing European production of these critical resources, better waste management, recycling and substitution with more common materials can help to secure supplies and keep prices down.. (43)	Alignment = low Expert report view resource use efficiency and waste management as components of larger economic goals of market stabilitiy and securing access to resources. It does not mention sustainability as a concern, nor a s a guiding factor in decision making or policy craft.	Alignment = low
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.	The key issue for the long-term future is not so much how to use the reserves already known, but whether the rate of discovery of new reserves will continue to increase at a similar pace as in the past.(44) All in all, material consumption is a function of three variables – population growth, prosperity and technology – the first two	Alignment = low Expert report simply explains the primary factors of resource consumption,	Alignment = low

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	of which tend to increase the use of resources and the latter with an ambiguous effect. Between now and 2030, because of rapid output growth, resources consumption is likely to increase and to converge towards current European levels (around 20 tonnes per capita). (46)	and notes that trends therein point otwards greater resource consumption globally. CIMULACt is focused on raising awareness about consumption, and production practices, in order to examine through expeirment how to shape societies with consumer behavior that reflects more sustainable, less resource intense, participation.	
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full	Additive manufacturing also could lead to large numbers of micro-factories akin to pre-Industrial Revolution-era craft guilds, but with modern manufacturing capabilities. Such local micro-factories could manufacture significant amounts of products, especially those for which transportation costs are traditionally high or delivery times are long, and in the process shorten and simplify supply chains. (40) The key challenge for the EU and the rest of the world will therefore not be the availability of natural resources, but their price and the negative environmental effects associated with their extraction, use and emissions. (43)	Alignment = low CIMULACT focuses on creating a new production paradigm that is more environmentally firendly (less waste, fewer resource needs, etc), and incentivizing product designs that are cradle-	Alignment = low

cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.		to-cradle (circular economic model). Expert report focuses on possible shift in production due to additive manufacturing (technocentric point of view), an dresource availability as a key indicator for future monitoring.	
Topics mentioned only in the expert based study			
Natural Resource: Metals (Rare Earths)	In dealing with these risks, the EU is best advised to follow a multi-pronged strategy, which includes energy and resource efficiency, increasing domestic production of critical resources where possible, better waste management and recycling, as well as the substitution of these resources with more common materials. This requires action from various policy areas and related DGs from the European Commission (47)	Alignment = none Too specific for CIMULACT.	Alignment = none
Water Availability	Access to fresh water in sufficient quantity and quality is becoming a major challenge almost everywhere, as a result of population growth, urbanisation, wasteful consumption, pollution and climate change... Ensuring a reliable supply for agriculture requires huge public-sector investments, which today are rarely in place... (48) The source, i.e. water, is normally not priced at all (throughout the EU and globally). Even in the EU, water use for agriculture is often not even measured, let alone priced...The agricultural sector thus suffers from poor infrastructure, waste and overconsumption (Egenhofer et al., 2012). The appropriate policy response would be adequate metering and pricing.(49)	Alignment = none CIMULACT rarely addresses water as a resour ce, nor how it can be more sustainabaly managed...	Alignment = none

Carbon Budget	The latest IPCC report estimates that the global ‘carbon budget’ is one thousand pentagrams (GT C). About one half of this budget has already been used. This implies that the amount that can still be emitted corresponds to about 1,350 to 1,985 billion tonnes of CO2. However, the known recov-erable reserves today of fossils fuels correspond to over 2,500 tonnes of CO2. This implies that a considerable part of the reserves of fossil fuels must be left in the ground. (56-7) The trend is at present away from explicit carbon prices to impose caps on specific sectors. By 2030, a large part of the economies of the G-3 (EU, US and China) will probably operate under such caps to achieve the planned reductions in emissions, but explicit carbon prices might either be absent or remain low.(57)	Alignment = none Too specific for CIMULACt though it could be beneficial to a number of CIMULACT stated aims at incentivzing sustainable societies.	Alignment = none
UNFCC	The challenge is to find a way to include all key countries in a structure that brings about meaningful emissions reduction on an appropriate timetable and at acceptable cost, while recognising the different circumstances of countries in a way that is more subtle, more sophisticated and – most importantly – more effective than the dichotomous distinction of past years. (98)	Alignment = none Too specific for CIMULACT, though potentially important to include towards defining sustainability.	Alignment = none
EU Emissions Trading System	The centrepiece of the EU’s climate policy remains its emission trading system (ETS), which is today in disarray as prices have fallen so low that they are no longer materially relevant for investment decisions.(98) The oversupply of allowances which led to the collapse of the EU ETS is due partially to the economic crisis, which has reduced power demand to below expectations. This might be only a temporary phenomenon. Another important reason, however, is that European policy-makers were – and still are – not willing to solely rely on the ETS to steer the transition to a	Alignment = none Not mentioned directly in CIMULACt, but certainly falsl into an incentivzation scheme for changing the business as	Alignment = none

	low-carbon economy in Europe. Instead, they have adopted additional measures, most notably on renewables and energy efficiency. Whereas these complementary measures also aim to drive decarbonisation, they are interacting in sometimes undesirable ways, undermining the visible price signal provided by the EU ETS.(98) ...as stipulated by the EU Directive on the promotion of the use of energy from renewable sources, individual EU member states have implemented national support schemes for renewables. Each national support scheme effectively leads to a different implicit CO2 price, varying by member state and renewable technology (98)	usual perspective.	

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	The peri-urban or 'rurban' areas will grow faster than city centres as such areas provide cheaper land for housing and manufacturing.(13)	Alignment = low Expet report see greater growth in rural areas, but does not address advantages of planned co-development of urban and rural areas. CIMULACT further points to resarch that can be conducted to make such co-development more effective and tailored to specific communities.	Alignment = low
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area:	Amongst several other ways to create value, big data can be used also to improve the efficiency of infrastructures in the context of smart cities and wider geographical scopes. (39) For instance, it is estimated that smart grids and smart buildings can generate about €50 billion in annual energy savings in the EU by 2020. (40)	Alignment = low Expert report looks to data and smart cities to increase resource efficiency of cities. CIMULACt adds a great deal of social innovation, inclusive and participatory policy research, and empha-	Alignment = low

The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.		sizes on sustainable systems and environmental concerns.	
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.		Alignment = none	Alignment = 0
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions		Alignment = none	Alignment = 0

Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	Social networks are also being used in civic contexts to support citizen's e-Participation, and within public administration and business ecosystems to improve knowledge-sharing and to streamline decision processes, as well as to foster co-creation of value and improve productivity.(39)	Alignment = low Expert report mentions technological development (social networks) as mode of increasing participatioin, knowlege sharing, and fostering co-creation. CIMULACT calls for research that seek to demonstrate the impact of such technologies, how their impact might be improved, and more importantly, how non-technical methods can be useful in generating communities within spaces and between shared interests in a non-digital contex.t	Alignment = low

Topics mentioned only in the expert based study			
Labour Migration Policy	The future needs for skilled labour in EU countries require EU and SEMC policy-makers to modernise EU migration policies to encompass new admission rules and regulations, and labour migration programmes that better manage the flow of labour migration from SEMCs to EU *and back to home countries*.(103)	Alignment = none CIMULACT only implies that labor Migration is important thorugh its calls for empowered diversity.	

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	Social networks are also being used in civic contexts to support citizen's e-Participation, and within public administration and business ecosystems to improve knowledge-sharing and to streamline decision processes, as well as to foster co-creation of value and improve productivity.(39)	Alignment = low Expert report points to one partial technologyt that can address political participatioin, but it does not call for increased reserach into how such technologies change the nature of participation, nor does it mention the co-development of such technologies. CIMULACT further outlines research on research within social innovations and participatory methods that do not	Alignment = low

		hinge on technology, and yet are effectively empowering for governance issues.	
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.		Alignment = none	Alignment = 0
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.		Alignment = none	Alignment = 0
The transparency toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also		Alignment = none	Alignment = 0

examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.			
Topics mentioned only in the expert based study			
Undemocratization of Economies	the [Global Freedom House Indicator] has deteriorated to about 1.8 in 2000 and then to about 2.2 in 2010, indicating that that on average the economy is still mostly 'free', but no longer with the highest standard of political rights. Looking forward, we use the projections of the model to calculate the 2030 indicator, which deteriorates to about 3.2, indicating that the centre of gravity of the global economy will shift to countries that are no longer judged to be free. Using GDP at PPP leads to a similar conclusion. With PPP weights, the pace of change is somewhat slower, but the eventual outcome (a global average of 3.35) is even worse. (103)	Alignment = none CIMULACT research is generally concerned with re-defining democracy and its relationship to economics.	Alignment = none

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: - Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base - Dissemination to and engagement of all relevant stakeholders in co-creation activities - Integrating and adapting models for regional / local context - Developing strategies for policy implementation		Alignment = none	Alignment = 0
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.		Alignment = none	Alignment = 0
Basic universal income so nobody is left behind		Alignment = none	Alignment = 0

Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects			
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.		Alignment = none	Alignment = 0
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted.		Alignment = none	Alignment = 0

To develop a green system for an effective interaction between the lender and borrowers.			
Topics mentioned only in the expert based study			
Baumol Cost Disease	According to Baumol (2012) it is possible to turn the cost disease into an opportunity for future development of modern economies beyond the conventional GDP-based growth model. The key is to make sure that the unprecedented productivity growth continues at the global level in the future, for this will ensure that both wages and per capita income will continue to rise, making most products and services cheaper relative to consumers' buying power. (42)	Alignment = none Too specific for CIMULACT, but possibly useful in regards to understanding and changing alternative economics.	Alignment = none
Remaining in the G3	At present, European representation in the international financial institutions is subject to a double dynamic: on the one hand, the pressure to give more room to the voices of rising economic powers and, on the other hand, the case for shifting the intra-European representational roles from member states to the euro area or the EU. Taken together, these two dynamics are a source of dual pressure on individual member states to cede space in favour of a single European representation as well as in favour of other countries.(90)	Alignment = none This is not a priorty for CIMULACT, whereas improving quality of life for EU citizens are valued and emphasized.	Alignment = none
Military Spending	The relative decline of the individual member states of the EU continues, of course. A hypothetical entity comprised of the EU's larger states would today still account for 15% of the G20 total and thus be placed second [in global military spending]. By 2030, even a combined EU would be placed third, behind China (which spends only a slightly larger percentage of GDP on the military, but which would by then have a higher GDP). (91)	Alignment = none CIMULACt does not mention this topic outright, despite its huge impact on Eu and global economics.	Alignment = none
Defined Contribution	... between now and 2030, major world economies will be in demographic transition simultaneously and during this phase excess savings might arise. ... the EU (but not exclusively) is unlikely to find comparable opportunities for invest-	Alignment = none This is a critical factor in future aging societies.	Alignment = none

	ment abroad – either in terms of magnitude or return. Europe's future retiree generation will thus have to be maintained with the region's own productive resources. Defined contribution, rather than defined benefits, will have to become the norm. (92)		
Inward Directed Foreign Direct Investment	The share of international FDI flows originating in emerging economies is thus set to explode. This implies that FDI from non-EU countries will increase greatly in absolute terms as well as in relative terms vis-à-vis FDI of EU origin. Member countries might thus be increasingly tempted to compete against each other to attract FDI from the savings-rich emerging economies (China, for example). (95)	Alignment = none CIMULACt might want to consider experimental research into this factor for long-term planning and thinking.	Alignment = none
Financial Fragmentation	Despite the measures undertaken by the ECB, the interbank market remains segmented, suggesting that single market mechanisms are not functioning properly... The banking union is expected to play a key role in overcoming such dynamics, but for the moment integration seems unlikely to return by itself.(95)	Alignment = none This is not mentioned in CIMULACt but may help define aspects of its research agenda.	Alignment = none
Sovereign Debt	...debt could indeed slowly decline under the assumption of an inflation rate above the 2% target. Another option is of course debt restructuring. While during the crisis the dominant line has been in the direction of avoiding default, some sporadic episodes, including Greek and Cypriot private sector involvement, suggest that this option may not be completely off the table. A third option, less drastic than default, would consist of converting debt in hybrid forms of equity-debt.(96)	Alignment = none This does not play a role in CIMULACT research topics, though it could become a major influencer.	Alignment = none

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = none	Alignment = 0
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations.		Alignment = none	Alignment = 0

Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development		Alignment = none	Alignment = 0
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	**Work organisation and new forms of learning.** A wide range of educational innovations will occur, linked to the uptake of new learning platforms, such as mixed reality, pervasive mobile computing, adaptive learning platforms and gamification. A very promising development is the advent of massive open online courses (MOOCs) at the university level, which allow for large-scale online participation and operate via the creation of networks. (39)	**Alignment = low** **Expert report discusses possibility of digital learning spaces and similar technologies as impactful on education systems. CIMULACT proposes assessment**	Alignment = low

		and experimentation with such technologies, alongside a regime of contextually sensitive, co-development to ensure technlogies are deployed in modes reflective of local cultures, values, etc.	
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.	Work organisation and new forms of learning. A wide range of educational innovations will occur, linked to the uptake of new learning platforms, such as mixed reality, pervasive mobile computing, adaptive learning platforms and gamification.(39)	Alignment = low Expert report implies that changes will take place within the greater social ecology that will create opportunities for educational technology. CIMULACT recognizes needed educational change, but requires more pedagolgical change rather than technical.	Alignment = low

Topics mentioned only in the expert based study			
Automation of Knowledge Work	The automation of knowledge work could bring great societal benefits – such as improved quality of health care and faster drug discovery – but it may also spark complex societal challenges, particularly in employment and the education and retraining of workers.(41)	Alignment = none CIMULACT does not metnioni thsi potential trend explicitly, but implies it in its statements about the ened for new job skills and training.	Alignment = low

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.		Alignment = none	Alignment = 0
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		Alignment = none	Alignment = 0
Transforming technologies for planet and people	Amongst several other ways to create value, big data can be used also to improve the efficiency of infrastructures in	Alignment = low	Alignment = low

In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	the context of smart cities and wider geographical scopes. (39)	Expert report highlights few technologies that fall into this category, though it does discuss numerous technologies and their expected impact under the current economic system. This is not to imply that expert report states technical impacts will lead to great distribution of wealth or decreased overall inequity.	
Topics mentioned only in the expert based study			
Internet of Things	The spread of sensors (motion and temperature detectors, level indicators, smart meters, etc.) enable the gathering of huge amounts of data about the real world and the sharing of this data through the cloud. Services around the data value chain are expected to proliferate in the coming decades, generating new waves of productivity growth and consumer surplus. (39)	Alignment = none Too specific for CIMULACt, though perhaps implied in soe of its statemens concerning smart or intelligent systems.	Alignment = none

Biosca, Oriol/ Nati Franco/ Efrain Larrera et.al. (2014): Making Europe Open and Polycentric. Vision and Scenarios for the European Territory towards 2050, Luxembourg: ESPON monitoring committee

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.		Alignment = none	Alignment = none
Rethinking (the new) job market needs • Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability • Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being		Alignment = none	Alignment = none

<table>
<tr><td>**Personal and organizational choice management**
Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations."
Citizens have defined objectives and solutions on different topics:
• Daring to be different
• The education system
• Re-definition of values
• Re-definition of welfare
• The level of well-being</td><td></td><td>Alignment = none</td><td>Alignment = none</td></tr>
<tr><td colspan="4">Topics mentioned only in the expert based study</td></tr>
<tr><td></td><td></td><td></td><td></td></tr>
</table>

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.		Alignment = none	Alignment = none
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other.		Alignment = none	Alignment = none

• For the citizens to be trained on health and digital literacy.			
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	Access to services of general interest is essential to improve social capital and economic development opportunities, as well as good enough welfare conditions for all Europeans. In sparsely populated and less developed rural regions it is also a precondition to maintain a certain number of inhabitants as critical mass and for good stewardship of the land. Innovative management strategies need to be adopted to make the provision for services of general interest which are financially sustainable everywhere. (p.15)	Alignment = med Expert report takes a broader scope than CIMULACT topic by regarding services in general, and not only healthcare and aligns very well with the intention of the CIMUALCT topic in terms of urging the need for equal service provision. It does not mention starting points for solutions other than innovative management strategies, whil the CIMULACT topic emphasizes on setting indicators, comparative analyses and also understanding and developing local knowledge.	Alignment = low

Health empowerment through “Everyone’s science” An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of “classical topics” in favour of courses on how to efficiently communicate with the patients.		Alignment = none	Alignment = none
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	The ageing will result in transformation of demands for provision of social services, such as health and long term care, for which demand may grow substantially. The silver economy will be absorbed into mainstream economic activities.(4)	Alignment = low Expert report mentions ageing society and connected economic developments. CIMULACT topic, however, aims at identifying and understanding the biological and social driving forces behing ageing for promoting a better societal handling of ageing societies.	Alignment = low
Topics mentioned only in the expert based study			

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignment = none	Alignment = none
Balanced work-life model Research should rethink the definition of “work” and develop approaches that permit to recognize and reward as “work” all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-		Alignment = none	Alignment = none

life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money	Transport demand in urban areas will not likely grow as fast as economic growth. European cities will be involved in more or less ambitious programmes to implement sustainable mobility. (p.6)	Alignment = none	Alignment = low
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.		Alignment = none	Alignment = none

(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of ‘free time’ in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers’ time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society	More jobs could be created in Europe everywhere if the actual trend towards lower salaries and temporary employment continues for the next decade. In this sense, even with low growth, employment will be created. (p.6)	Alignment = none This is not a representation and there is no alignment. CIMULACT topic deals with experimenting and investigating models for a better work-life balance, while expert report states that lower salaries and temporary employment can sustain economic growth.	Alignment = low
Topics mentioned only in the expert based study			
		Alignment =	

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level		Alignment = none	Alignment = none
Evolving food culture in growing cities Research should investigate the following aspects:		Alignment = none	Alignment = none

- Comparative study of food supply chains and their social, ecological and economic impact - Studies on the role of food as an enabler for social inclusion and cohesion in cities - Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. - Historical research of nutrition flows during periods of migration - All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: - Policy tools for management of mixed food cultures in cities, - Sustainable non-indigenous local growing techniques, - Intervention options into diverse and multicultural food consumption practices, - Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). - Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.			
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc.		Alignment = none	Alignment = none

Implementation of educational programmes can create awareness and promote the use of new food at schools.			
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	***Avoiding suburban sprawl and improving all neighbourhoods matters most for larger cities.*** The main threat of large metropolitan regions is associated to the higher environmental impacts associated to urban sprawl (which can be avoided only by strict land-use regulation), as well as neighbourhoods facing social conflicts (always requiring strong public intervention and public participation). (11) Co-development strategies will combine the market dimension and R&D capabilities of Europe with the energy, land availability and labour assets of the south shore of the Mediterranean, as well as Eastern Neighbourhood. (14) European cities have to grow avoiding urban sprawl by favouring higher density urban development in strategic nodes and along public transport lines. Land is a scarce resource in many parts of Europe. There is a need to protect land to become urbanised for ecological but also for strategic reasons, to induce more compact urban settlements, to create buffer zones separating urbanised zones and to provide areas for recreation. The valorisation of the urban and rural cultural heritage and the quality of landscapes, including aesthetics, are essential economic assets to make towns in rural territories more attractive for people to live and work. Beyond that, more ambitious renaturalisation policies to	Alignment = high Expert report mentions all major issues in the CIMULACT topic.	***Alignment* = *med***

	renew cities, including ecologic agriculture and food production. (18)		
Topics mentioned only in the expert based study			

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the	An intelligent grid covering Europe north-south, integrating renewal sources, wind in the north and solar in the south, together with other conventional sources such as hydroelectric, will reduce European energy dependency and increase economic efficiency. Intelligent energy networks will provide for more decentralised production and consumption, and will facilitate an increasing diversification of sources as well as cost reduction and price harmonisation across Europe. (13) Co-development strategies will combine the market dimension and R&D capabilities of Europe with the energy, land availability and labour assets of the south shore of the Mediterranean, as well as Eastern Neighbourhood. (14)	Alignment = med Expert reportdescribes smart grids and decentralized production and consumption, but it does not mention the participatory governance aspect that CIMULACT topic emphasizes on.	Alignment = high

future need for “energy communities” in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders’ interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
		Alignment =	

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities.	It is important that the European territory offers a choice of different places as preferences and needs of people are diverse, and change over time. The choice of place of location stretches from some seeing more rural settings giving the highest satisfaction, to others being firm in wanting an urban life style. Ensuring that Europe in the long term offers a multitude of territories with social and environmental quality, capable of meeting different needs, is of utmost importance for the overall well-being of European citizens. (p.1) Transport demand in urban areas will not likely grow as fast as economic growth. European cities will be involved in more or less ambitious programmes to implement sustainable mobility.(p.6) *Ecosystems are enhanced by promoting small and medium-size cities and rural areas.* The main benefit of promoting small and medium-size cities in rural areas, in both more and less developed regions, is the ability to maintain and protect valuable ecosystems and enhance a vibrant areas around cities and towns. Good stewardship of the land and cohesion can be promoted through stimulating less favoured areas. The main threat linked to policies promoting the very large number of small and medium-size cities that exist in most European regions, would be an increasing	Alignment = high Expert report aligns with CIMULACT topic on the issues of protecting the diversity of territory and the corresponding need for sustainable transport.	Alignment = med

This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.	fragmentation of the landscape due to less dense and more diffused land development throughout Europe. (p.11) The full integration of information and communication networks, facilitated by the electrification of transport systems will enhance networks interoperability and efficiency. (13)		
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	*Decoupling of transport and economic growth at local and regional scale.* Transport demand in urban areas will not likely grow as fast as economic growth. European cities will be involved in more or less ambitious programmes to implement sustainable mobility.(p.6) Access to services of general interest is essential to improve social capital and economic development opportunities, as well as good enough welfare conditions for all Europeans. In sparsely populated and less developed rural regions it is also a precondition to maintain a certain number of inhabitants as critical mass and for good stewardship of the land. Innovative management strategies need to be adopted to make the provision for services of general interest which are financially sustainable everywhere. (p.15)	Alignment = high Expert report align eith CIMULACT topic on the isuses of providing sustainable transport solutions between urban and rural areas as well as fostering equal access to sevices in general.	*Alignment = med*
Moving together (more collective transport options)		Alignment = none	Alignment = none

Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).			
Topics mentioned only in the expert based study			
Europe as Global Hub	Links between European and neighbouring regions in the form of transport, telecommunication and energy services and infrastructures need to be further developed. Global gateways already emerge in some neighbouring regions, both intercontinental airports and ports. Trade and traffic across de Mediterranean, Middle East and Eastern countries will continue to grow if neighbouring countries become successful emerging economies. Beyond infrastructure provision, markets for network industries should also be gradually integrated in the framework of free trade agreements, closer association and/or European Union's full membership. (14)	Alignment = none	Alignment = none

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	European cities have to grow avoiding urban sprawl by favouring higher density urban development in strategic nodes and along public transport lines. Land is a scarce resource in many parts of Europe. There is a need to protect land to become urbanised for ecological but also for strategic reasons, to induce more compact urban settlements, to create buffer zones separating urbanised zones and to provide areas for recreation. The valorisation of the urban and rural cultural heritage and the quality of landscapes, including aesthetics, are essential economic assets to make towns in rural territories more attractive for people to live and work. Beyond that, more ambitious renaturalisation policies to renew cities, including ecologic agriculture and food production. (18) Sustainable and more efficient resource management practices must be promoted throughout all this divers territories. At European scale, a green infrastructure network should be further extended from Nature 2000 to more urbanised	Alignment = med Expert report focusses on managing urban sprawl sustainably and providing better land-use policies as well as green infrastructure on governmental scale. CIMUALCT topic aims at investigating the basis for and promoting of sustainable lifestyles on societal but also on individual level.	Alignment = med

	environments, stimulating biodiversity and ecosystem services, and increasing resilience to Climate Change. (18)		
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).		Alignment = none	Alignment = none
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development.		Alignment = none	Alignment = none

Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.			
Topics mentioned only in the expert based study			

5.2 Urban and Rural development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	Scenario A and Scenario B are depicting a future completely opposite to this CIMULACT RT (see p. 8), Scenario c is a pretty good match: **Local and European initiativespromoting small cities and less developed regions (Scenario C).** Urban and ruralterritories form a mosaic of divers identities supported by local and regional governments.This scenario involves a paradigm-shiftand responds to the challenges of energyscarcity and climate change expressedin the Territorial Agenda 2020 (2011) bypromoting small and medium-sized cities ascentres of economically resilient regions withmore sustainable comsumption patterns, yet taking account of the necessary economies of scale of services of general interest and the prospects of an ageing society. Policies are focused on reinforcing the social and economic balance of Europe at the regional level in a strong place-based approach, promoting endogenous development and empowering regional institutions. Moreover, the assumptions include increasing budgets for EU policies, except for long-distance transport, more strict environmental policies and decentralised energy networks based on renewal energy. (p.9)	Alignment = high Expert report mentions al main issues of the CIMULACT topic and furthermore goes into much more detail with context, developmental options and impact.	Alignment = high

	Social and environmental challenges would be more manageable in second tier cities. The promotion of second tier cities will make land-use change more manageable, as well as social inclusion. Cities are expected to fulfil an important interaction with their hinterland and thus provide a balanced landscape in which both urban and rural areas can thrive and build partnership.(p.11) *Ecosystems are enhanced by promoting small and medium-size cities and rural areas.* The main benefit of promoting small and medium-size cities in rural areas, in both more and less developed regions, is the ability to maintain and protect valuable ecosystems and enhance a vibrant areas around cities and towns. Good stewardship of the land and cohesion can be promoted through stimulating less favoured areas. The main threat linked to policies promoting the very large number of small and medium-size cities that exist in most European regions, would be an increasing fragmentation of the landscape due to less dense and more diffused land development throughout Europe. (p.11) *Main policy steps* to achieve this goal includes, together with the improvement of regional infrastructure endowments and the provision of an adequate level of services of general economic interest, the improving of local and regional governance and the implementation of innovative management strategies, especially in sparsely populated and less accessible areas. (p.16) **Integration of functional urban regions.** The growing interdependency of urban and ru-		

	ral and the emergence of hybrid or fuzzy middle landscapes create new functional territories where new opportunities for joining forces, harvesting synergies and achieving a higher critical mass should be explored. Working together as polycentric cities in rural–urban partnerships and in cross-border zones need the implementation of new territorial governance settings so that economic complementarities can be unleashed. Territorial cooperation arrangements and more advanced institutional cooperation mechanisms need to be developed to make an enhanced territorial integration feasible, especially in and around large metropolitan areas and larger cities with, in many cases, challenging historical administrative boundaries. (17) European cities have to grow avoiding urban sprawl by favouring higher density urban development in strategic nodes and along public transport lines. Land is a scarce resource in many parts of Europe. There is a need to protect land to become urbanised for ecological but also for strategic reasons, to induce more compact urban settlements, to create buffer zones separating urbanised zones and to provide areas for recreation. The valorisation of the urban and rural cultural heritage and the quality of landscapes, including aesthetics, are essential economic assets to make towns in rural territories more attractive for people to live and work. Beyond that, more ambitious		

	renaturalisation policies to renew cities, including ecologic agriculture and food production. (18)		
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of “promising/good” practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	**Scenario B:** The scenario assumes that Cohesion and Structural Investment funds investments are mostly targeted to cities, including urban renewal and re-urbanisation, R&D investments, and promotion of regional and inter-regional transport networks. (p.8) **Local and European initiativespromoting small cities and less developed regions (Scenario C).** Urban and ruralterritories form a mosaic of divers identities supported by local and regional governments.This scenario involves a paradigm-shiftand responds to the challenges of energyscarcity and climate change expressedin the Territorial Agenda 2020 (2011) bypromoting small and medium-sized cities ascentres of economically resilient regions withmore sustainable comsumption patterns, yet taking account of the necessary economies of scale of services of general interest and the prospects of an ageing society. Policies are focused on reinforcing the social and economic balance of Europe at the regional level in a strong place-based approach, promoting endogenous development and empowering regional institutions. Moreover, the assumptions include increasing budgets for EU policies, except for long-distance transport, more strict environmental	Alignment = high Expert report mentions most issue in the CIMULACT topic, such as urban renewal respecting the mixed urban fabric of European cities,fostering sustainable innovation and practices and transportation. It does not connec tthese issues with citizen participation.	**Alignment** = **high**

	policies and decentralised energy networks based on renewal energy. (p.9) The main threat of large metropolitan regions is associated to the higher environmental impacts associated to urban sprawl (which can be avoided only by strict land-use regulation), as well as neighbourhoods facing social conflicts (always requiring strong public intervention and public participation). (p.11) More European second tier cities must become places of global attraction, innovation and engines of economic growth, with a high degree of social cohesion, platforms for democracy and cultural diversity and with limited diseconomies from congestion. To enhance their global relevance, European cities have to adopt growth strategies based on wider market outlook, renewal and networking. (16) European cities are complex and have heavy historical inertias, making change and regeneration slow and difficult. Investing in new urban designs, public spaces and public facilities, including housing, is critical, as well as implementing smart systems for urban mobility, energy, water and waste management. Even if new technologies will facilitate improving the quality of cities, more responsible social behaviour and better governance remains indispensable to make cities better places to live and work. (p.17)		
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	...the maintenance and smart renewal of the traditional model of the European city and region, avoiding specialised, exclusive and segregated zones. Openness for new urban designs and solutions, improving public spaces and public facilities, including housing, promoting inclusive neigh-bourhoods and implementing more efficient and sustainable urban systems enhanced by new technologies are necessary steps ahead. (17)	Alignment = low Expert report mentions diversity only with regard to spatial planning. CIMULACT topic is much broader stating the need for investigating how diversity can be harnessed to improve society.	Alignment = med
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions	**Smart and inclusive revitalisation of cities and neighborhoods.** The quality of European cities lies in promoting inclusive neighbourhoods and mixed land-uses, avoiding excessive spatial specialisation and segregation, and protecting cultural heritage. European cities are complex and have heavy historical inertias, making change and regeneration slow and difficult. Investing in new urban designs, public spaces and public facilities, including	Alignment = low Expert report mentions evidence based urban planning and necessary steps for urban renewal. CIMUALCT topic is broader, applying the concept of evidence-based policy making to communities in general and marries	**Alignment = med**

	housing, is critical, as well as implementing smart systems for urban mobility, energy, water and waste management. Even if new technologies will facilitate improving the quality of cities, more responsible social behaviour and better governance remains indispensable to make cities better places to live and work. (17)	this with empowering citizens through information access and participatory governance.	
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	**Smart and inclusive revitalisation of cities and neighborhoods.** The quality of European cities lies in promoting inclusive neighbourhoods and mixed land-uses, avoiding excessive spatial specialisation and segregation, and protecting cultural heritage. European cities are complex and have heavy historical inertias, making change and regeneration slow and difficult. Investing in new urban designs, public spaces and public facilities, including housing, is critical, as well as implementing smart systems for urban mobility, energy, water and waste management. Even if new technologies will facilitate improving	Alignment = low CIMULACT focuses on participatory community building, while expert report focusses on infrastructure renewal.	**Alignment = med**

	the quality of cities, more responsible social behaviour and better governance remains indispensable to make cities bet-ter places to live and work. (17)		
Topics mentioned only in the expert based study			
Functional Urban Regions	**Integration of functional urban regions.** The growing interdependency of urban and rural and the emergence of hybrid or fuzzy middle landscapes create new functional territories where new opportunities for joining forces, harvesting synergies and achieving a higher critical mass should be explored. Working together as polycentric cities in rural–urban partnerships and in cross-border zones need the implementation of new territorial governance settings so that economic complementarities can be unleashed. Territorial cooperation arrangements and more advanced institutional cooperation mechanisms need to be developed to make an enhanced territorial integration feasible, especially in and around large metropolitan areas and larger	Alignment = low	**Alignment = none**

	cities with, in many cases, challenging historical administrative boundaries. (17)		

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.		Alignment = none	Alignment = none
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	...the maintenance and smart renewal of the traditional model of the European city and region, avoiding specialised, exclusive and segregated zones. Openness for new urban designs and solutions, improving public spaces and public facilities, including housing, promoting inclusive neighbourhoods and implementing more efficient and sustainable urban systems enhanced by new technologies are necessary steps ahead. (17)	Alignment = low Expert report mentions some of the issues the CIMULACT topic raises, but only with regard to urban planning, not as blueprint for evaluating and prioritizing research in general.	Alignment = med
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments		Alignment = none	Alignment = none

linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.			
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation		Alignment = none	Alignment = none
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.		Alignment = none	Alignment = none
Basic universal income so nobody is left behind		Alignment = none	Alignment = none

Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects			
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.		Alignment = none	Alignment = none
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted.		Alignment = none	Alignment = none

To develop a green system for an effective interaction between the lender and borrowers.			
Topics mentioned only in the expert based study			

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = none	Alignment = none
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations.		Alignment = none	Alignment = none

Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development		Alignment = none	Alignment = none
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.		Alignment = none	Alignment = none

Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			
		Alignment = none	

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.		Alignment = none	Alignment = none
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		Alignment = none	Alignment = none
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects:	***The aim*** is providing advanced transport, energy and telecommunication networks to European cities and regions in order to make possible for them to valorise their own assets at European and at	Alignment = low Expert report mentions the example of how connecting european transport infrastructure	*Alignment low=*

• Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	global scale, becoming important players in the world economy. It will support better links between European infrastructure to world-wide networks, and a geographical spread of European intercontinental gateways bringing polycentricity at European level. By connecting Europe globally, the European economy becomes more open, and the European society more cosmopolitan. (12)	to a global one may benefit economy.CIMULACT topic explores a participatora governance scheme in order to make technologies more sustainable.	
Topics mentioned only in the expert based study			

Studie: Strategic Foresight: Towards the 3rd Strategic Programme of Horizon 2020 (2015), Hg. European Commission. Brüssel: RTD publications.

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.	Individual aspiration and empowerment: Education, science and technology are empowering people, and new cognitive frameworks are emerging... There is rethinking on the meaning of happiness / well-being / prosperity / liveability / quality of life. New business models will emerge as changing aspirations are reflected in new value chains. (12)	Alignment = med Expert report briefly mentions some of the main issues of CIMLACT topic: empowerment of people through education, yet it remains descriptive of emerging trends and does not describe directions for research.	Alignment = med
Rethinking (the new) job market needs • Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability • Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	- Waves of migrants and refugees will bring predominantly young people eager to work. This can compensate the current trends towards demographic ageing in Europe. (5) - volatility in job markets is expected to spread, and skills shortages may become significant. In terms of competencies needed, one could think of bio-designers – skilled bio-engineers will need to understand risk and ethical issues. (10)	Alignment = low Expert report mentions volatility of labour market and migants being eager to work, but does not connect to investigating and fostering educational change,	Alignment = med

		sustainable growth, inclusion or wel being.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	-While global inequality between countries is decreasing, within the countries of the developed world inequality is increasing, as governments find it increasingly difficult to levy taxes from mobile wealthy individuals and corporations, and precarious employment is spreading (11)	Alignment = low Expert report mentions challenges such as tax evasion or precarious employment, but does not align with direction and objectives for research as in CIMULACT topic, such as redefining values and welfare or promoting life long learning	Alignment = low
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	- Demographic trends (ageing, migration), climate change and natural disasters, anti-microbial resistance, higher expectations for health in a context of increasing health costs per se will put high pressure on health systems. (5) -To make positive use of the increasing diversity of European populations in order to benefit from advancing globalisation is a challenge for Europe, requiring new technologies and social innovation for education and health care, as well as governance, and social learning and integration.(5) -The acceleration of biotechnology innovation will lengthen human lifespan and improve health, in particular through prevention via genetic testing and treatments. (6)	Alignment = low Expert report and CIMULACT toipc align on the matter of challenge description. Expert report briefly mentions the need for advancing innovation in healthcare, but does not draw conclusions in terms of recommending directions, objectives and topics for research and innovation.CIMUALT topic is mainly about translating existing research results to improve current healthcare systems on local and European level.	Alignment = med
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR5, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other.	- Through diffusion of data and hyper connectivity, the resulting citizen empowerment will radically change the nature of demand for healthcare (5) - Big Data and bio-informatics are crucial to the next generation of medical breakthroughs based on the genome and personalised medicine. (12) Widespread use of big datasets will drive innovation across many areas (such as food, healthcare, skills, cities, governance, energy and transport).(23) Through diffusion of data and hyper connectivity, the resulting citizen empowerment will radically change the nature of demand for healthcare. (30)	Alignment = high Expert report mentions all main issues of CIMULACT topic with regard to personalized data driven health services. Except the resulting need for educating health professionals and citizens in data literacy is not mentioned.	Alignment = high

• For the citizens to be trained on health and digital literacy.	There will be earlier and faster diagnosis and predictive diagnosis, based on the use of genetics. There will be more personalised and effective treatments, based on biotech and genetech, and potentially also human enhancement and organ replacement rather than transplant.(30) Biotechnology will revolutionise nearly all aspects of healthcare, with the prospect of personalised medicine...(39) For example, in healthcare, expert systems will not only drive biotechnology-based innovations, but will also change many aspects of the doctor-patient interface and will mine big datasets for new insights in medical science. (23) Making medical data available to research is seen as a key exploitation of the potential of Big Data. In addition, following the success of the human genome project, “open science” wants to build on rapid communication of findings to support management and prevention, as well as (personalised) diagnosis and treatment. (32)		
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution	-Challenges to be met relate to health inequalities, ethics, risks and liabilities. (5) -A growing and **ageing population** will fuel demand for health and social care, and will financially challenge existing social models of welfare and pensions. (12) - Advances in medical treatment such as synthetic biology, regenerative and tissue engineering, prosthetic implants and human enhancements, combined with rising expectations, will increase the cost	Alignment = low Expert report aligns with CIMULACT topic with regard to identifying challenges for an equal distribution of health services, but does not go into detail	Alignment = med

with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	of health care. The role of the wealthy in leading the demand for bio enhancements and treatments will increase (12) ...there are challenges to be met. Some are related to health inequalities which are likely to become increasingly controversial.(30)	about directions for research to find solutions.	
Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	- Through diffusion of data and hyper connectivity, the resulting citizen empowerment will radically change the nature of demand for healthcare (5) Widespread use of big datasets will drive innovation across many areas (such as food, healthcare, skills, cities, governance, energy and transport).(23) The new developments – in particular the use of technology to closely monitor people's health, and personalised medicine – will change the relationship between clinicians and patients. Medicine will more and more be something that is done by and with the patients, not to them. (30) "open science" wants to build on rapid communication of findings to support management and prevention, as well as (personalised) diagnosis and treatment.(32)	Alignment = med While expert topic aligns well with regard to identifying upcoming and existing developments and challenges, such as citizen health empowerment, the changing relationships between doctors and patients and personalized medicine, it does not mention the resulting need for changing communication and education, nor how to do it.	Alignment = high
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships	-A growing and **ageing population** will fuel demand for health and social care, and will financially challenge existing social models of welfare and pensions. (12)	Alignment = low While expert report predominantely mentions ageing in connection with the related socio-economic challenges,the CMUALCT topic directs research at identifying bio-	Alignment = low

• the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change		logical and social foundations of ageing, to find solutions for these challenges.	
Topics mentioned only in the expert based study			
Biotechnology	Biotech will lengthen human lifespan and improve health, through genetic testing and treatments. It will affect industrial processes, biofuels, agriculture and animal breeding, and transform the food chain... A key driver for the advance of biotechnology is the demand for health related products and services, be they diagnostics or treatments. (38) Biotechnology will revolutionise nearly all aspects of healthcare, with the prospect of personalised medicine...(39)	Alignment = low	Alignment = low

1.3 Work-life balance and wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.		Alignment = none	Alignment = none
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for	-There is rethinking on the meaning of happiness / well-being / prosperity / liveability / quality of life. New business models will emerge as changing aspirations are reflected in new value chains. (12)	Alignment = low Expert report briefly mentions changing attitudes towards quality of life and well-being, but does not mention CIMULACT topic's main aims of redefining the concept of 'work' and investigating those changes can benefit both workers and employers.	Alignment = med

a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money	Individual aspiration and empowerment: Education, science and technology are empowering people, and new cognitive frameworks are emerging... There is rethinking on the meaning of happiness / well-being / prosperity / liveability / quality of life. New business models will emerge as changing aspirations are reflected in new value chains. (12)	Alignment = low Expert report briefly mentions changing attitudes towards quality of life and well-being, but does not mention CIMULACT topic’s main aims of investigating how better workenvironments can be created for workers.	Alignment = low
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various	All this will be in a context in which healthy environments and lifestyles will be demanded by informed individuals (30)	Alignment = low Expert report briefly mentions changing attitudes towards quality of life and	Alignment = low

activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.		well-being, but does not mention CIMULACT topic's main aims of investigating how better different levels organizing daily lifes can be improved to promote well-being.	
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. - integration of 'free time' in the work place - new ways of employment where employees are more like volunteers / freelancers - [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** - the impact of work-life balance policies, - the impact of different business models on workers' time autonomy and quality of life - the psychological acceptance of new forms of work, both individually and by society	-There is rethinking on the meaning of happiness / well-being / prosperity / liveability / quality of life. New business models will emerge as changing aspirations are reflected in new value chains. (12)	Alignment = none	Alignment = med
Topics mentioned only in the expert based study			
Post-work society	-As biology becomes DIY and the bio-economy becomes automated, the question of a post-work bio-	Alignment = low	Alignment = none

	economy e.g. oriented towards happiness, becomes important. (12) - A question for the post-work society – who will work and why? There will be opportunities for better and more efficient services, for greater empowerment of individuals, but also threats to patterns of employment, and a greater security risk of major cyber-crime or cyber-terrorism. Niches will flourish, e.g. creative jobs, eco-jobs, crafts etc.(12) - The drive for happiness and well-being could fuel migration and become central in a post-work society. (12)		

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	- Climate change is a threat multiplier: it exacerbates poverty and water scarcity; it compounds food and nutrition insecurity.(11)	Alignment = low Expert report very briefly mentions risks for food security, but does not mention CIMULACT topic's main aim of investigating how to provide society with a equal distribution of high quality food.	Alignment = low

Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.	The challenge will be to channel the creativity of the melting-pot cities of Europe towards socially beneficial business rather than socially destructive crime. (28)	Alignment = low Expert report abstractly mentions one aspect of CIMULACT topic, framed as a challenge: how to use creativity in cities to promote socially beneficial business.However this is not connected to food habits or practices.	Alignment = low
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology)	-Biotechnology (and preference for certain patterns of diets) will affect industrial processes, biofuels, agriculture and animal breeding, and transform the food chain, waste treatment and environmental remediation. Abounding with radical opportunities, biotechnology is	Alignment = low Expert report mentions innovation in biotechnology as	Alignment = low

on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	very likely to form the new wave of disruptive technologies (6) Widespread use of big datasets will drive innovation across many areas (such as food, healthcare, skills, cities, governance, energy and transport).(23) ...there is a need to reconcile local food with healthy and affordable diets, and with radically reducing food waste. In this environment biotechnology serves existing practices in health care and agriculture,(39)	answer to the challenges of maintaining food security and providing healthy food. It also mentions evidence–based policy making. However it does not align in the same direction than the CIMULACT topic, which aims at driving research to first assess impacts of new food paradigms such as biotechnology on several levels of society, to than make informed decisions on whether these technologies are beneficial or not.	
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	-Satellites also help better agriculture and land use, closer monitoring of climate and other environmental issues, including oceanology. (5) The primary sectors and their rural-urban landscapes, city-scapes and ecological assets are the physical basis for Europe’s future. This is about not only food and farming, but also fisheries, forestry, minerals and aggregates, waste management and the whole physical circular economy.(36)	Alignment = med Expert topic mentions a technological solution for better land-use monitoring and governance (satellites), and mentions the urgency of protecting land as the physical basis of society. It does not mention multi-level	Alignment = med

		governance or sustainable production processes.	
Topics mentioned only in the expert based study			

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy communities" in	-Environmental resource systems also change so that energy, water, food, light manufacturing etc. may be distributed and self-organizing, thus changing the mental models and policy models to deal with them.(12) Widespread use of big datasets will drive innovation across many areas (such as food, healthcare, skills, cities, governance, energy and transport).(23) Renewable energy is an important component of the efforts to mitigate climate change. Abundant renewable energy may push innovation in new areas, such as waste management and recycling, and de-pollution of the environment.(25) In ***Big Mother***, effective local collection, generation and distribution of energy was envisaged, and a more collective management of usage – for example community heating. Again there is emphasis on the development of storage technology for renewable energy and automatic, cheap transport. Transitions may be slowed down by a combination of strong incumbent interests and centralised management of information. (25) In addition, the decentralisation of energy production and supply – through technology and infrastructure to allow a significant move to renewable energy – will enable better (and more secure) generation, more local self-sufficiency and more resilient energy systems for all. (25)	Alignment = med Expert report mention several of CIMULACT topics's mian issues, such as collective management of energy systems and renewables,yet it does not detail directions for research to proceed in this way.	Alignment = high

which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			
ICT advances	Innovation is needed that helps use fossil fuels more sparingly and to offset their effects through for example carbon capture and storage. Energy management and energy efficiency is pushed by ICT advances but is curtailed by the abundance of renewable energy. Battery technology innovation is a key component to the transition to a state of abundant renewable energy, which is likely to fuel innovation in all other areas. (25)	Alignment = low	Alignment = none

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and	In transport, expert systems will combine with automation (autonomous vehicles continuously communicating with other vehicles and the infrastructure) and big-data techniques, to optimise not only traffic flows but also the design of transport systems, and infrastructure investment and management. (23) Smart Cities and Smart Countryside approaches need to promote resilient design principles, including energy supply based on local as well as "grid" sources, and resilient transport infrastructures and services.(42) In transport, the move towards automatic vehicles, non-carbon fuels and materials, and smarter logistics will all lead to major changes in the transport infrastructure. Demand for goods and mobility will continue, so innovation will focus to a great extent on ways of meeting demand, whilst ensuring cleaner and more efficient systems. (24)	Alignment = high Expert report mentions most main issues of the CIMULACT topic: the need for designing sustainable transport solutons for both urban and rural areas.	Alignment = med

manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	Energy and transport considerations drive urbanisation processes. While off-the-grid living becomes possible through renewable energy18, urbanisation trends are likely to be supported by innovations in transport and in the provision of environmental services. (26) There are new kinds of settlement-landscape patterns emerging in extended peri-urban areas, and also in the greening of the cities and the urbanization of the countryside.(36)health	Alignment = med Expert report aligns with regard to describing new developments in settlement modes and changing demand for infrastructure provision, it does not detail directions for research.	Alignment = med
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).	In transport, expert systems will combine with automation (autonomous vehicles continuously communicating with other vehicles and the infrastructure) and big-data techniques, to optimise not only traffic flows but also the design of transport systems, and infrastructure investment and management. (23)	Alignment = low Expert report mentions issues in the CIMULACT topic on an abstract level, but does not explicitly detail direction for re-	Alignment = low

		search to proceed into exploring collective forms of transport.	
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	There are new kinds of settlement-landscape patterns emerging in extended peri-urban areas, and also in the greening of the cities and the urbanization of the countryside.(36)	Alignment = low Expert report mentions an issue in the CIMULACT topic on an abstract level (new settlement modes), but does not detail direction for research to proceed into exploring new systems of policy and planning to promote behavioral change, education and innovation for fostering sustainable lifestyles.	Alignment = low
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.	-Understanding individual aspirations is crucial for the issue of sustainable consumption, and for 'bending the trends' of environmental impact, in a context of population growth and economic development. (12) The global commons will be perceived differently by the Internet generation coming of age, compared to baby	Alignment = med Expert report mentions sustainable consumption regarding the nexus	Alignment = med

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	boomers raised in less environment-conscious world. Demand for products which are both 'smart and green' from cradle to grave will increase.(34)	with individual behavior, but describes changing consumtion attitudes as given under certain circumstances.CIMULACT topic emphasizes on the need to investigate hoew such a change can be promoted.	
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	-Solar and wind energy are becoming competitive with fossil fuels, even though current prices for the latter are low. A drastic reduction in the price and environmental costs of energy will activate a myriad of improvements which seemed out-of-reach, like water production from the seas on a large scale. Fossil fuels may well become cheaper, as demand falls in developed countries, and as new sources emerge – for example shale oil and gas. A tipping point is approaching where powerful battery technology could precipitate rapid diffusion of renewable energy technologies. (5) In addition to bio-energy supplies, bio-technology opens the prospect for more energy efficient industrial processes.(25) Demand for products which are both 'smart and green' from cradle to grave will increase.(34) In both energy and transport, Europe, and the rest of the world, is rapidly approaching radical	Alignment = med Expert report mentions all main issues of the CIMULACT topic regarding clean production technologies, but does not mention banning unsustainable practices or directions for research to investigate how a shift can be fostered.	Alignment = med

	change. Opportunities lie with combining cleaner energy, better conservation, offsets of carbon emitting energy, better storage of renewable energy, and smarter generation and distribution. (24)		
Topics mentioned only in the expert based study			
Climate change/ Global warming/Environmental threats	-Satellites also help better agriculture and land use, closer monitoring of climate and other environmental issues, including oceanology. (5) -Marine ecosystems offer huge opportunities but international cooperation is fundamental so that threats like ocean warming and increasing acidity do not result typically in the collapse of the ocean food chains. The enormous implications of rising sea levels, diminishing ice cover also require research on mitigation and adaptation strategies taking advantage of Big Data collection and sense-making capacity. (5) -Economic and political instability combine with an accumulation of problems related to climate change, desertification, and severe perturbations of the water/energy/food nexus to produce rising migration and social unrest, potentially including in the EU. As the link between climate change and conflicts will compound this systemic instability, the preparedness of society to face crisis has to be increased, and technologies and institutions have to strengthen resilience, which becomes a prominent concern (6) -Population growth and current models of economic growth are driving the world towards greater environmental dangers. (12) -The pressure of population growth (10-12 billion by the end of the next century) will challenge the ability to sustain the biosphere. (12)	Alignment = low	Alignment = low

	-Climate change is a threat multiplier: it exacerbates poverty and water; it compounds food and nutrition insecurity.(11)		
Resource scarcity	-Global population pressures (sheer numbers and lifestyles) will put a focus on ways of changing resource limits – through harvesting space or the marine environment, or by using bio processes to generate energy. (12) -The pressure of population growth (10-12 billion by the end of the next century) will challenge the ability to sustain the biosphere. (12) - Ecological resources are still largely monetised without externalities and extracted without proper acknowledgement of social and environmental costs. (11) -High population growth outside Europe – Asia, Africa, South America – will intensify competition for resources, and may spark greater migration, and innovation through harvesting space or the marine environment, or by using bio processes to generate energy. New technologies could change the limits and boundaries of production and consumption: nano, bio, material science etc. Bio processes could change the affordability of desalination. A number of new technologies – solar power, new techniques for managing gas – could revolutionise energy security and prices in Europe. Sustainability limits would need to be re-thought. There are new scientific frontiers in understanding complex inter-connected systems, with global / local thresholds or boundaries, together with the material cycles of carbon, nitrogen, phosphorus and other elements. Advances in agricultural science, precision agriculture, aquaculture and innovations in food could revolutionise the capability to provide food. (11)	Alignment = none	Alignment = low

Governance of Global Commons (Space, Oceans, Climate)	The climate, the oceans and space are global commons which can give rise to pacifying / unifying projects for humanity as a whole. (33) Satellites help agriculture and land use, closer monitoring of climate and other environmental issues, including oceanology. The offshore economy can bring new opportunities for health, energy and food security. At the more radical edge, space may become an alternative source of materials, energy, and an important environment for health research... Environmental sustainability and resource concerns are driving the perceptions of climate, oceans and space as "commons". (33) The use of data plays a fundamental role in defining sustainability transitions and managing them. Sustainability is one of the first areas of application of big data. By allowing for example, tracking ofwaste, Big Data is helping to meet the planet's growing demand for energy and food as the worldpopulation reaches near nine billion and climate change will be major disruptions in food productionpatterns. Another powerful use of Big Data is its ability to help assess environmental risks, both in real time and in the future. Breakthroughs in sense-making of Big Data are expected to visibly contribute to resolving environmental issues. Hyper-connectivity in 'smart cities' and 'smartcountryside' will enable sustainability to be managed and monitored. (23)	Alignment = low	Alignment = none
Resiliency	Essential hyper-connectivity should be resilient to system breakages. Infrastructures need to withstand challenges from shocks including cyber-crime and warfare, and should ensure appropriate levels of data privacy and security. Smart Cities and Smart Countryside approaches need to promote resilient design principles, including energy supply based on local as well as "grid"	Alignment = none	Alignment = none

	sources, and resilient transport infrastructures and services.(42)		

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	-The primary sectors and their rural-urban landscapes, cityscapes and ecological assets are the physical basis for Europe's future. (6) -'Smart-countryside' can offer an alternative perspective to the organization of primary sectors across Europe, making them more sustainable and resilient. (6) Energy and transport considerations drive urbanisation processes. While off-the-grid living becomes possible through renewable energy18, urbanisation trends are likely to be supported by innovations in transport and in the provision of environmental services. (26) The primary sectors and their rural-urban landscapes, cityscapes and ecological assets are the physical basis for Europe's future. This is about not only food and farming, but also fisheries, forestry, minerals and aggregates, waste management and the whole physical circular economy.(36) There are new kinds of settlement-landscape patterns emerging in extended peri-urban areas, and also in the greening of the cities and the urbanization of the countryside.(36) These could involve transformations of the rural landscapes (e.g. "smart countryside" models), but also the increasing transfer of primary sectors to cities and periurban areas (e.g. urban and sub-urban farming models) bringing new kinds of health risks and benefits to the city. (36)	Alignment = high Expert report mentions all main issues of CIMULACT topic.	Alignment = high
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability	-In both energy and transport, smart cities will involve cleaner and more sustainable services.(5) -Migrants will seek to move to cities, the ethnic and social mix of which will change substantially. (11)	Alignment = high	Alignment = high

of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	- Sustaining larger cities will require environmental innovations and technological progress (smart cities). The ethnic mix of cities will become more diverse as a result of migration. There is a risk of rising inequity within cities which could fuel unrest. The 'melting pot' of innovation and co-evolution in economic development, focused on digital, creative, professional, consumer services, often leads to a localised 'creative quarter' in cities, with critical mass of start-ups, freelancers, crowd-sourcing, network type firms and consortiums, and integrated supply-demand chains etc. In coming decades the majority of the economy could be in service/dematerialized cultural-creative type industries, and in distributed co-production with applications to sustainable systems of recycling, eco-efficiency and new patterns of sustainable consumption. (11) The use of data plays a fundamental role in defining sustainability transitions and managing them. Sustainability is one of the first areas of application of big data.(23) The primary sectors and their rural-urban landscapes, cityscapes and ecological assets are the physical basis for Europe's future. This is about not only food and farming, but also fisheries, forestry, minerals and aggregates, waste management and the whole physical circular economy.(36) These could involve transformations of the rural landscapes (e.g. "smart countryside" models), but also the increasing transfer of primary sectors to cities and periurban areas (e.g. urban and sub-urban farming models) bringing new kinds of health risks and benefits to the city. (36)	Expert report mentions all main issues of CIMULACT topic.	
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	-To make positive use of the increasing diversity of European populations in order to benefit from advancing globalisation is a challenge for Europe, requiring new technologies and social innovation for education and health care, as well as governance, and social learning and integration. (5) -Economic and political instability combine with an accumulation of problems related to climate change, desertification, and severe perturbations of the water/energy/food nexus to produce rising migration and social unrest, potentially including in the EU. As the link between climate change and conflicts will compound this systemic instability, the preparedness of society to face crisis has to be increased, and technologies and institutions have to strengthen resilience, which becomes a prominent concern. Organising principles that improve resilience include subsidiarity, decentralisation and ecosystem design. These apply both to institutions and to systems of institutions. Coping with diversity (of funding, of opinions, of cultures) will be a challenge. (6) -Happiness and well-being is a major driver for individuals, leading to migration, which is also fuelled by high birth rates in poor countries, by political instability and environmental challenges (12) -Migrants will seek to move to cities, the ethnic and social mix of which will change substantially. (11) - Sustaining larger cities will require environmental innovations and technological progress (smart cities). The ethnic mix of cities will become more diverse as a result of migration. There is a risk	Alignment = high Expert report mentions all main issues of CIMULACT topic.	Alignment = high

	of rising inequity within cities which could fuel unrest. The 'melting pot' of innovation and co-evolution in economic development, focused on digital, creative, professional, consumer services, often leads to a localised 'creative quarter' in cities, with critical mass of start-ups, freelancers, crowd-sourcing, network type firms and consortiums, and integrated supply-demand chains etc. In coming decades the majority of the economy could be in service/dematerialized cultural-creative type industries, and in distributed co-production with applications to sustainable systems of recycling, eco-efficiency and new patterns of sustainable consumption. (11) - The drive for happiness and well-being could fuel migration and become central in a post-work society. (12) The health, education and social needs profile of immigrant populations will bring new challenges and opportunities for innovation, in cities and countries, in diagnostics as well as in interventions.(28) There is likely to be a need for a great deal of social learning and for exchange of information and practice on policies: what works and what does not, how to reduce social conflict and develop new models of participatory governance in cities.(28)		
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking	-Economic and political instability combine with an accumulation of problems related to climate change, desertification, and severe perturbations of the water/energy/food nexus to produce rising migration and social unrest, potentially including in the EU. As the link between climate change and conflicts will compound this systemic instability, the preparedness of society to face crisis has to be increased, and technologies and institutions have to strengthen resilience, which becomes a prominent concern. Organising principles that improve resilience include subsidiarity, decentralisation and ecosystem design. These apply both to institutions and to systems of institutions. Coping with diversity (of funding, of opinions, of cultures) will be a challenge. (6)	Alignment = low Expert report mentions all main issues of CIMULACT topic, even though in other words and sometimes on a more abstract level.	Alignment = low

Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions			
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	There is likely to be a need for a great deal of social learning and for exchange of information and practice on policies: what works and what does not, how to reduce social conflict and develop new models of participatory governance in cities.(28) Organising principles that improve resilience include subsidiarity, decentralisation and ecosystem design. These apply both to institutions and to systems of institutions. Coping with diversity (of funding, of opinions, of cultures) will be a challenge.(41) ...greater local autonomy, and greater participation in politics at the most local levels. There is an issue about what should be devolved, and what needs to be done at regional, national or supra-national level, but the underlying assumption is that local is best, and this in turn means that there is a greater sense that politicians are accountable for what they do.(42)	Alignment = med Expert report mentions all main issues of CIMULACT topic, even though in other words and sometimes on a more abstract level, but it does not detail directions for research to explore these issues.	Alignment = high
Topics mentioned only in the expert based study			
State of Instability as New Norm	Economic and political instability combine with an accumulation of problems related to climate change, desertification, and se-	Alignment = none	Alignment = none

	vere perturbations of the water/energy/food nexus to produce rising migration and social unrest, potentially including in the EU. As the link between climate change and conflicts will compound this systemic instability, the preparedness of society to face crisis has to be increased,..(41)		

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	There is likely to be a need for a great deal of social learning and for exchange of information and practice on policies: what works and what does not, how to reduce social conflict and develop new models of participatory governance in cities.(28)	Alignment = med Expert report mentions main issues of CIMULACT topic, on a more abstract level, but it does not detail directions for research to explore these issues.	Alignment = low
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.		Alignment = none	Alignment = none
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include	-There must be congruence between the different policies involved - e.g. between research in transport, energy, environment, health etc. – but also with the key economic policies of the European Union in trade, competition, common market and monetary policy. (6)	Alignment = med Expert report mentions some of the main issues of CIMULACT topic,	Alignment = med

transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	- The innovation system and corporations operate at a global scale. Complexity, knowledge and data will fuel the spread of new models of political organisation, representing a challenge to the mainstream. There is a changing awareness of global/local ecological assets and risks. (12) -Global Governance of commons and management of risk is essential – related to rising inequity, new economic or military powers, new technology particularly in the bio sphere, conflict, environmental problems, in space and the marine environment. The innovation system and corporations operate at a global scale. Complexity, knowledge and data will fuel the spread of new models of political organisation, representing a challenge to the mainstream. (12) - Growing awareness of the world beyond people's own borders, more access to travel and the growth of trafficking as an economic activity, all increase the risk of conflict and decrease the ability of international agencies to cope with problems. (11) - Citizen science will need to be focused and managed to avoid bio-hazards from new stains of organism that "escape". (12)	but not in an interconnected way and not formulated as direction for research and innovation.	
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	...greater local autonomy, and greater participation in politics at the most local levels. There is an issue about what should be devolved, and what needs to be done at regional, national or supra-national level, but the underlying assumption is that local is best, and this in turn means that there is a greater sense that politicians are accountable for what they do.(42)	Alignment = med Expert report mentions transparency but mainly in connection to local decision making. CIMULACT topic renders research	Alignment = low

		into promoting transparency not only in decisionmaking but also in other contexts.	
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	-There must be a strong economic base in Europe that can capture benefits from the capacity to address global problems. (6)	Alignment = none Expert report does not mention an of the issues addressed within the CIMULACT topic, it merely states the need for a strong economic basis, which could be interpreted in many ways. CIMULACT topic aims at constructing a dialougue on alternative economic models.	Alignment = low
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.	-A growing and **ageing population** will fuel demand for health and social care, and will financially challenge existing social models of welfare and pensions. (12) -While global inequality between countries is decreasing, within the countries of the developed world inequality is increasing, as governments find it increasingly difficult to levy taxes from mobile wealthy individuals and corporations, and precarious employment is spreading (11)	Alignment = low Expert report somewhat aligns with CIMULACT topic with regard to describing arising challenges, but does not conclude with directions for research and innovation.	Alignment = low

Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects		Alignment = none	Alignment = none
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.	- As biology becomes DIY and the bio-economy becomes automated, the question of a post-work bio-economy e.g. oriented towards happiness, becomes important. (12) - A question for the post-work society – who will work and why? There will be opportunities for better and more efficient services, for greater empowerment of individuals, but also threats to patterns of employment, and a greater security risk of major cyber-crime or cyber-terrorism. Niches will flourish, e.g. creative jobs, eco-jobs, crafts etc. (12) -There is rethinking on the meaning of happiness / well-being / prosperity / liveability / quality of life. New business models will emerge as changing aspirations are reflected in new value chains. (12) The primary sectors are core for sustainability concerns. They have important direct effects on the environment, and they are directly responsible for the use (and misuse) of natural resources - they are important users of energy and they generate major parts of CO2 emissions. The primary sectors are at the forefront of the development of circular economy models and they are the targets of a	Alignment = med Expert report somewhat aligns with CIMULACT topic with regard to describing arising challenges, and mentions the possibility of a new form of economy, but does not state which steps research should take.	Alignment = med

	great deal of technological innovation associated with the pursuit of sustainability. (37)		
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	Migration is likely to increase diversity and creativity and to speed up the pace of introduction of innovations. Increased diversity in demand will contribute to this. New forms of health and educational innovations (and skills enhancements) are likely to take shape. (28)	Alignment = low While CIMULACT topic aims at investigating how reshaping the education system could benefit co-creation, social innovation and local development, expert report mentions increased an innovation rate driven by increasing diversity in the population.	Alignment = low
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations.		Alignment = none	Alignment = none

Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.			
Learning for society Research should explore the following aspects: - Educational leverages to the sense of community and common good/progress - Promoting collective intelligence (working together, consultation and co-creation) - Facilitate the transformation of "education into action" and development of a new civic sense - Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities - Ways to acknowledge the community's problems and understanding the community/ies culture/s - Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	The health, education and social needs profile of immigrant populations will bring new challenges and opportunities for innovation, in cities and countries, in diagnostics as well as in interventions.(28)	Alignment = low/none While CIMULACT topic aims at investigating how reshaping the education system could benefit the common good, expert report mentions challenges and opportunities for innovation arising from migration.	Alignment = low
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	-Whether 'digital citizens' will be empowered or constrained by the systems they use, and who owns or controls their data, are key institutional questions that have profound implications for the research and innovation agenda. (5) -Technological advances will change the way people live, work, conduct daily transactions, and travel. There will be opportunities for better and more efficient services, for greater empowerment of individuals. Threats to patterns of employment, and a greater security risk of major cyber-crime or cyber-terrorism, are destabilising. The system of digital surveillance is seen as a contributor to this, in that global digital corporations work closely with governments towards universal monitoring and potentially negation of liberty or privacy. (11)	Alignment = med Expert report abstractly mentions impacts of new technologies on society and the challenge of if digitization will empower or constrain citizens, but it does not detail any directioins for research such as spelled out in the CIMULACT topic, for instance harnessing new technologies for education.	Alignment = low

Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	-Whether 'digital citizens' will be empowered or constrained by the systems they use, and who owns or controls their data, are key institutional questions that have profound implications for the research and innovation agenda. (5) -The prospect of resilient Big Data and hyper-connectivity depends on satellite infrastructures (5) -Research will also contribute to building capacity for collective international decision-making, on a global scale, on fundamental issues for the future of mankind. (6) -Our dependence on ICT systems combined with our desire for privacy (hence encryption) leaves us open to cyber warfare and terrorism.(11) Widespread use of big datasets will drive innovation across many areas (such as food, healthcare, skills, cities, governance, energy and transport).(23) For example, in healthcare, expert systems will not only drive biotechnology-based innovations, but will also change many aspects of the doctor-patient interface and will mine big datasets for new insights in medical science. (23)	Alignment = med Expert report mentions some of the main issues within CIMULACT topic, predominantely on the challenge basis: i.e. data security, big dat usage in various contexts, collective decision making. It dooes not mention the need for educating citizens as well as expert in use and interpretation of big data sets.	Alignment = med
Here, there and everywhere	- People and objects increasingly have a complete, accurate digital image in virtual space, which will be more and more integrated functionally into the physical space. The interpenetration between the virtual and the physical world will be facilitated massively by advances in materials and biological sciences and the diffusion of 3D and 4D printers (11)	Alignment = med Expert report mentions some of the main issues of CIMULACT topic	Alignment = med

Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.	...greater local autonomy, and greater participation in politics at the most local levels. There is an issue about what should be devolved, and what needs to be done at regional, national or supranational level, but the underlying assumption is that local is best, and this in turn means that there is a greater sense that politicians are accountable for what they do.(42)	such as: virtual representation and mobility. It does not state the need for investigating risks and benefits of increasing virtual and physical mobility for citizens.	
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	-There is a need for a strong European science, technology and innovation in a society that is fully engaged with science, technology and innovation. (6) - Enabling technologies including geo-engineering could be used to influence climate, but there would be a need for surveillance to support governance of such potentially high impact means of action. (11) -High population growth outside Europe – Asia, Africa, South America – will intensify competition for resources, and may spark greater migration, and innovation through harvesting space or the marine environment, or by using bio processes to generate energy. New technologies could change the limits and boundaries of production and consumption: nano, bio, material science etc. Bio processes could change the affordability of desalination. A number of new technologies – solar power, new techniques for managing gas – could revolutionise energy security and prices in Europe. Sustainability limits would need to be re-thought. There are new scientific frontiers in understanding complex inter-connected systems, with global / local thresholds or boundaries, together with the material cycles of carbon, nitrogen, phosphorus and other elements. Advances in agricultural science, precision agriculture, aquaculture and innovations in food could revolutionise the capability to provide food. (11) -Technological advances will change the way people live, work, conduct daily transactions, and travel. There will be opportunities for better and more efficient services, for greater	Alignment = med Expert report and CIMULACT topic align on the issue technology has potential to benefit society in terms of securing the sustainable use of resources. Yet, they differ in the direction they are setting: expert report is techno-optimistic, stating the various opportunities and benefits that new technologies can entail. CIMULACT topic however aims at imposing a scheme that would ensure that all technology being developed and going into use	Alignment = med

	empowerment of individuals. Threats to patterns of employment, and a greater security risk of major cyber-crime or cyberterrorism, are destabilising. The system of digital surveillance is seen as a contributor to this, in that global digital corporations work closely with governments towards universal monitoring and potentially negation of liberty or privacy. (11) The use of data plays a fundamental role in defining sustainability transitions and managing them. Sustainability is one of the first areas of application of big data.(23)	are beneficial for society in terms of adhering to sustainability principles.	
Topics mentioned only in the expert based study			
Biotechnology	-Biotechnology (and preference for certain patterns of diets) will affect industrial processes, biofuels, agriculture and animal breeding, and transform the food chain, waste treatment and environmental remediation. Abounding with radi-cal opportunities, biotechnology is very likely to form the new wave of disruptive technologies. (6)	Alignment = low	Alignment = none

Studie: European Value Changes Signals, Drivers, and Impact on EU Research and Innovation Policies, (2016) Erdmann, Lorenz/ Kerstin Cuhls/ Bruno Gransche et.al. …

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.	Value domain: Human dignity (21) Value domain: Freedoms (21-4) Weak Signal 4: Increased focus to mental disorders (33) The trends of pathologisation of daily life, self-optimisation and human bio-selection could plausibly have repercussions on social expectations with regard to conformity of the individual. (45) Individual helplessness in an increasingly complex world may lead to both efforts to improve individual navigation competence in uncertain times and attempts to delegate responsibility from the individual to the public (47)	Alignment = high Expert report mentions key issues of the CIMULACT topic, including mental health issues and empowering people to take better decisions.Yet it does not formulate directions for research and innovation.	Alignment = high
Rethinking (the new) job market needs • Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability	Value Domain: Citizens Rights and Justice (25-7) Weak Signal 10: Eroding Sense of Progress (37) Progress itself can be seen as an ambiguous project depending on the perspectives of the winners and losers in any changing society. The societal narratives in Europe and some of its Member States are currently being contested and redesigned. (47)	Alignment = low Expert report mentions the challenges for citizens arising from new job market demands,	Alignment = low

- Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being		but does not formulate aligning directions for research to proceed.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: - Daring to be different - The education system - Re-definition of values - Re-definition of welfare - The level of well-being	Value domain: Freedoms (21-4) Weak Signal 1: Delegation of actions from humans to technology (31) Weak Signal 15: Fragmentation of trust in public institutions (39) In pursuit of security, efficiency, comfort, information, entertainment and wealth, the losses of liberty and of privacy may be increasingly accepted by individuals and society as a whole or lead to intensified conflicts. (44) The responsiveness of political institutions and of public services to citizens' needs is key to citizens trusting them. Individual helplessness in an increasingly complex world may lead to both efforts to improve individual navigation competence in uncertain times and attempts to delegate responsibility from the individual to the public. (47-8)	Alignment = low Expert report mentions aneed for improving individual ability to take good decisions, but does not translate this issue to other levels of organization.	Alignment = med
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	Value Domain: Citizens Rights and Justice (25-7)	Alignment = low Expert report mentions the need for improving healthcare systems, but does not go into detail of how to approach this and does not sketch detailed directions for research and innovation in this area.	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to:	Weak Signal 5: Self-Optimisation (33) Today, self-optimisation is still perceived as a distinction between people living in abundance as opposed to those living with unmet basic needs or who are just normal. People not willing to be enhanced or not able to cope with it are likely to treat optimised people with suspicion and fear. Such contrasting positions could lead to controversies	Alignment = med Expert report and CIMULACT topic align regarding describingthe field of	Alignment = low

- For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. - For the citizens to be trained on health and digital literacy.	between the different affected social groups as well as between individual and social interests. (45)	developing datafication and personalization of the health sector, but do not align in the resulting directions for research and innovation. CIMULACT topic mainly sees need in education doctors and patients in data literacy while expert report focusses on a possible zone of conflict.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply:	Value Domain: Citizens Rights and Justice (25-7) Weak Signal 4: Increased focus to mental disorders (33)	Alignment = low Expert report aligns in terms of describing	Alignment = med

1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	Weak Signal 8: Changing attitudes towards care (35) The trends of pathologisation of daily life, self-optimisation and human bio-selection could plausibly have repercussions on social expectations with regard to conformity of the individual. (45) In a globalised and interconnected world, value system changes at societal level are often event driven. Examples are...natural and technical disasters leading to prioritisation of environment and health values (over economy and wealth values)... As the probability and actual occurrence of such events and their impacts are unpredictable, related abrupt value system changes can hardly be anticipated 46) Discussion lines include migrants living together with domestic residents, the sandwich generation having to care for both children and older people while functioning under conditions of modern work requirements, and choosing animals as partners for everyday living. The actual ability to decide on	challenges for citizens, but does not detail directions for research to explore how an equal distribution of health services could be approached.	

	living together is bound to symbolic distinction options, financial resources and real estate market supply (46)		
Health empowerment through “Everyone’s science” An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of “classical topics” in favour of courses on how to efficiently communicate with the patients.	Weak Signal 5: Self-Optimisation (33) Today, self-optimisation is still perceived as a distinction between people living in abundance as opposed to those living with unmet basic needs or who are just normal. People not willing to be enhanced or not able to cope with it are likely to treat optimised people with suspicion and fear. Such contrasting positions could lead to controversies between the different affected social groups as well as between individual and social interests. (45)	Alignment = low Expert report focuses on a possible zone of conflict arising from a trend towards self-optimization, but does not detail specific directions for research to explore how this trend and technological development can be harnessed to improve citizens health.	Alignment = low

Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	Weak Signal 8: Changing attitudes towards care (35) In a globalised and interconnected world, value system changes at societal level are often event driven. Examples are...natural and technical disasters leading to prioritisation of environment and health values (over economy and wealth values)... As the probability and actual occurrence of such events and their impacts are unpredictable, related abrupt value system changes can hardly be anticipated 46) Discussion lines include migrants living together with domestic residents, the sandwich generation having to care for both children and older people while functioning under conditions of modern work requirements, and choosing animals as partners for everyday living. The actual ability to decide on living together is bound to symbolic distinction options, financial resources and real estate market supply (46)	Alignment = low Expert report mention a changing attitude towards care, but does not detail specific directions for research to investigate biologica and social underpinnings for ageing and strategies to deal with it on a societal level.	Alignment = low
Topics mentioned only in the expert based study			

Human Bio-Selection	Weak Signal 6: Human Bio-selection (34) The technical manipulation of the human condition represents a spreading value change at odds with the view of human nature as untouchable. This development is largely influenced by the diffusing perception of the right of self-determination, also by aspects of human life related to the beginning of life, the end of life, and the treatment and care of diseases.(45)	Alignment = 0	Alignment = none

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	Value domain: Human dignity (21) Weak Signal 1: Delegation of actions from humans to technology (31) Weak Signal 3: New societal value negotiation channels through digital media (32) With regard to automation technology, accountability and responsibility tend to shift from the user to the technology provision scheme. The knowledge about users gained, stored and exploited by the technology providers may exceed the individual's own knowledge about herself or himself. (44) Thus, societal value negotiations and potential controversies might subside in view of the fact that such socio-technological practices are gaining an ever-larger share in people's daily time allotments. (45)	Alignment = med Expert report mentions some of the issues in CIMULACT topic such as technological change in the workplace and promoting technological literacy. It does not detail specific directions for research to investigate impacts and solutions in this domain.	Alignment = med

Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.	Value domain: Human dignity (21) Weak Signal 10: Eroding Sense of Progress (37) Post-material values emerge with an increasing emphasis on self-expression, well-being and happiness in some European societies (47)	Alignment = low Expert report mentions a value change towards post-materialistic value such as well being. It does not detail specific directions for research to investigate impacts and solutions in this domain.	Alignment = low
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments	Value domain: Human dignity (21) Weak Signal 5: Self-Optimisation (33) In addition, new trends in psychological self-conditioning have made an appearance, such as relaxation through self-hypnosis,using scientific indings as well as classical methods like meditation. Self-optimisation often builds upon the nontherapeutic use of therapeutic	Alignment = med Expert report describes value changes in the area of self optimization, but it does not detail	Alignment = low

• digitalisation of many of the "analog" activities overcoming the notion that time is money	techniques for enhancement instead of curing.(33) Weak Signal 10: Eroding Sense of Progress (37) The changing perceptions of being sick, normal and enhanced raise questions about which traits to optimise (45). Post-material values emerge with an increasing emphasis on self-expression, well-being and happiness in some European societies (47)	specific directions for research to investigate impacts and solutions in this and interconnected areas the CIMULACT topic mentions.	
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.	Value domain: Human dignity (21)	Alignment = low Expert report describes some of the new developments described in CIMULACT topic, but does not detail specific directions for research to investigate impacts and	Alignment = low

		solutions in this area.	
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. - integration of 'free time' in the work place - new ways of employment where employees are more like volunteers / freelancers - [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** - the impact of work-life balance policies, - the impact of different business models on workers' time autonomy and quality of life - the psychological acceptance of new forms of work, both individually and by society	Weak Signal 10: Eroding Sense of Progress (37) Post-material values emerge with an increasing emphasis on self-expression, well-being and happiness in some European societies (47)	Alignment = low Expert report describes some of the challenges described in CIMULACT topic, but does not detail specific directions for research to investigate impacts and solutions in this area.	Alignment = low
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	Value domain: Human dignity (21) Value Domain: Citizens Rights and Justice (25-7)	Alignment = low Expert report sparsely descrbes value changes with regard to food, but does not provide detailed directions for research regarding investigating food access, poverty, inequalities etc.	Alignment = low

Evolving food culture in growing cities Research should investigate the following aspects: - Comparative study of food supply chains and their social, ecological and economic impact - Studies on the role of food as an enabler for social inclusion and cohesion in cities - Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. - Historical research of nutrition flows during periods of migration - All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: - Policy tools for management of mixed food cultures in cities, - Sustainable non-indigenous local growing techniques, - Intervention options into diverse and multicultural food consumption practices, - Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). - Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.	Weak Signal 9: Renegotiation of human-animal relationships (Vegetarianism across cultures) (35) The balance shifting from self-transcendence to self-expression values is accompanied by struggles for attention and resources which are making living together more difficult. (46)	Alignment = low Expert report sparsely descrbes value changes with regard to food (e.g. invitro-meat), but does not provide detailed directions for research regarding investigating food supply chainds for cities, the role of food as driver for inclusion.	Alignment = low
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health,	Weak Signal 14: Repeated flare-ups of specific STI controversies (38)	Alignment = low	Alignment = low

economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	The politicisation of science may lead to controversies not limited to conflict over different stakes in science. Also, the integrity of the research itself might be questioned. According to some observers, the freedom of the sciences will be jeopardised if science becomes subjected to power struggles and severely restricting management practices (47)	Expert report descrbes issue mentioned in CIMULACT topic on a meta-level (technology controversies), but does not provide detailed directions for research regarding investigating impacts of new food paradigms.	
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.		Alignment = none	Alignment = none

Topics mentioned only in the expert based study			

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the	Value domain: Freedoms (21-4) Weak Signal 2: Society pushed by big data practices (31) The new socio-technological practices enabled by big data, for example, entail unbalanced power relations between those managing the new knowledge and those facing the real-world consequences. (44)	Alignment = none Expert report mentions energy only in connection to efficiency and shift to renewables, it does not mention participatory governance of a decentralized energy system.	Alignment = low

future need for "energy communities" in which citizens locally support each other in participatory processes to implement the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities.	Value domain: Freedoms (21-4) Weak Signal 1: Delegation of actions from humans to technology (31) With regard to automation technology, accountability and responsibility tend to shift from the user to the technology provision scheme. The knowledge about users gained, stored and exploited by the technology providers may exceed the individual's own knowledge about herself or himself. (44)	Alignment = low Expert report mentions some of the challenges the CIMULACT topic is concerned with on a metalevel. It does not detail specific directions for research to investigate sustainable transport practices and technologies for rural areas.	Alignment = low

This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by “digitalisation”) for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	Value domain: Freedoms (21-4)	Alignment = low Expert report mentions expectations citizens have regarding developments in the transport sector, but it does not detail specific directions for research to investigate sustainable transport practices and technologies for rural areas.	Alignment = med
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports);		Alignment = none	Alignment = none

based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).			
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	Value Domain: Citizens Rights and Justice (25-7) Weak Signal 9: Renegotiation of human-animal relationships (35) It has been argued that value relativism is a value on its own, which means that everyone should be allowed to live his or her life under his or her own values. In such a reading, the Western world would not stand for single values, but rather for the principle of enlightenment and the rule of law that allows individuals with different traditions and commitments to pursue their own values... Discussion lines include...choosing animals as partners for everyday living. (46)	Alignment = low Expert report mentions some of the challenges the CIMULACT topic is concerned with on a metalevel. It does not detail specific directions for research to investigate and foster a shift towards sustainable lifestyles.	Alignment = low
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.		Alignment = none	Alignment = none

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).			
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	Weak Signal 9: Renegotiation of human-animal relationships (Non-Animal Testing Products) (35) Unaddressed needs (e.g. of people living below the poverty line, people in need of care and animals) raise issues of equality and solidarity... Discussion lines include...choosing animals as partners for everyday living. (46) Citizens are also concerned about the effects on the environment and the use of science for destructive purposes. This concerns the development of new materials, new devices and new processes, as well as the — possibly unexplored — issues of new materials used for human-related applications, such as nanotechnological pharmaceuticals.(43)	Alignment = low Expert report mentions a change in values regarding the use of animal testing in product development and concerns about harmful new materials. It does not detail specific directions for research to investigate and foster a shift towards sustainable production technologies.	Alignment = low
Topics mentioned only in the expert based study			

5.2 Urban and Rural development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts		Alignment = none	Alignment = none
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs.		Alignment = none	Alignment = none

Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of “promising/good” practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.			
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	Value domain: Human dignity (21) Weak Signal 11: Diversification of Belief Systems (37) Beyond this, social cohesion may be seen as both a prerequisite for and an aim of societal progress. A principal impediment to social cohesion is the diversification of belief systems, because a far-reaching shaping of society by single religions or the STI paradigm is no longer possible. (47)	Alignment = med Exoert report aligns with CIMULACT topic in describing a shift towards valueing diversity in society. It does not detail specific directions for research to investigate models of fostering diversity.	Alignment = med
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and	Value Domain: Solidarity (24-5) Value Domain: Citizens Rights and Justice (25-7) Weak Signal 3: New societal value negotiation channels through digital media (32)	Alignment = med Expert report aligns with CIMULACT topic regarding	Alignment = med

environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions	Weak Signal 14: Repeated flare-ups of specific STI controversies (38) Thus, societal value negotiations and potential controversies might subside in view of the fact that such socio-technological practices are gaining an ever-larger share in people's daily time allotments. (45) The responsiveness of political institutions and of public services to citizens' needs is key to citizens trusting them. Individual helplessness in an increasingly complex world may lead to both efforts to improve individual navigation competence in uncertain times and attempts to delegate responsibility from the individual to the public. (47-8)	describing a change towards an increased attention towards community cohesion, but does not detail specific directions for research to investigate fostering new evidence based practices for community building.	
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making	Value Domain: Solidarity (24-5) Weak Signal 3: New societal value negotiation channels through digital media (32) Weak Signal 7: Increasing awareness of human rights (35) Weak Signal 11: Diversification of Belief Systems (37)	Alignment = high Expert report aligns with CIMULACT topic regarding describing an	Alignment = med

Community spaces: Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	Thus, societal value negotiations and potential controversies might subside in view of the fact that such socio-technological practices are gaining an ever-larger share in people's daily time allotments. (45) Once-stable value systems are increasingly disconnected as the ties between generations in the Western world become weaker, once-stable value systems in transition countries are de-aligned (34), and value relativism between cultures and between species abounds. (46) Beyond this, social cohesion may be seen as both a prerequisite for and an aim of societal progress. A principal impediment to social cohesion is the diversification of belief systems, because a far-reaching shaping of society by single religions or the STI paradigm is no longer possible. (47)	increased attention towards community building, but does not detail specific directions for research to investigate fostering new infrastructures and practices for community building.	
Topics mentioned only in the expert based study			
New Catholic Leadership	Weak Signal 12: New leadership of the Catholic Church (37) A principal impediment to social cohesion is the diversification of belief systems, because a far-reaching shaping of society by single religions or the STI	Alignment = none	Alignment = none

	paradigm is no longer possible. The relationship between belief and the fast-changing world is expressed differently amongst individuals and also amongst religions. (47)		
Islam and Post-enlightenment Value Systems.	Weak Signal 13: Co-development of Islam and (post)enlightenment value systems (37) Irreconcilable value systems may lead to a disconnected melange of societal fragments that is not conducive to societal progress as a whole. (47)	Alignment = low	Alignment = none
Rise of Far-Right	Weak Signal 16: Popularity of far-right movements and parties (39) Anti-science activities may hinder the creation of knowledge by STI and the opportunities of new applications developed by innovators... According to some observers, the freedom of the sciences will be jeopardised if science becomes subjected to power struggles and severely restricting management practices.(47)	Alignment = none	Alignment = none

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	Value domain: Human dignity (21) Weak Signal 7: Increasing awareness of human rights (35) Weak Signal 15: Fragmentation of trust in public institutions (39) The ongoing fragmentation of trust and the complexity of governance pose challenges to the transparency and legitimacy of decision-making, which are again key determinants for trust in political institutions. All in all, there is a growing gap between perceived governance needs and what is effectively governed. (39) Weak Signal 17: Informal sector (40) The intermittent social value system vacuum may be filled by a large variety of voices expressing different individual and group values. Current R&I policy in Europe may have to function in such a time of intensified societal value system renegotiation. (46)	Alignment = med Expert report highly aligns with CIMULACT topic regarding challenge and driver description but does not detail specific directions for research and innovation.	Alignment = med

	The responsiveness of political institutions and of public services to citizens' needs is key to citizens trusting them. Individual helplessness in an increasingly complex world may lead to both efforts to improve individual navigation competence in uncertain times and attempts to delegate responsibility from the individual to the public. (47-8) There is ambiguity with regard to the freedom of expression of those wishing to restrict the rights of others (i.e. diversity, non-discrimination and equality)... If criminal or radical groups step in powerfully, citizen-government relations could be at severe risk in the long term. (48) From a government perspective, an expansion of the informal sector would mean the loss of control over a significant part of society, and also, for example, over tax evasion...If criminal or radical groups step in powerfully, citizen-government relations could be at severe risk in the long term. (48)		
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research.	Value Domain: Solidarity (24-5) Value Domain: Citizens Rights and Justice (25-7)	Alignment = high Expert report highly aligns with CIMUALCT topic	Alignment = med

Ways of building on open access and open science.	There is ambiguity with regard to the freedom of expression of those wishing to restrict the rights of others (i.e. diversity, non-discrimination and equality). (47) A clear evaluation framework should be provided for environmental sustainability aspects and more generally, for user and stakeholder requirements and values embedding. It is not given that each and every R&I project should embed values, but the proposal should specify if values are concerned, and how the design and implementation will take account of them. (44) The production of STI output is controlled, to a certain extent, by the governance determined through R&I programming, for example by ethical reviews in the proposal phase, ethical councils steering the R&I project or ethical requirements to communicate R&I results. In times of increasing interaction of the R&I system with society, the integrity of R&I is gaining in importance (49) The values, ethics and links to user needs and stakeholder expectations have to be consistentlyembedded in the entire process of R&I programming (agenda-setting, prioritisation, funding,ethical assessment, negotiation arena and stakeholders); (57)	regarding the described challenges, scope and directions for research and innovation to become more responsive to societies needs.	

Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.		Alignment = none	Alignment = none
The transparency toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	Value Domain: Citizens Rights and Justice (25-7) Weak Signal 1: Delegation of actions from humans to technology (31) Weak Signal 2: Society pushed by big data practices (31) Weak Signal 3: New societal value negotiation channels through digital media (32) Weak Signal 15: Fragmentation of trust in public institutions (39) The standardisation and pre-structuring of actions by the technology provision regime (design, implementation, supply, etc.) is opposed to the values of freedom and diversity.(44)	Alignment = high Expert report highly aligns with CIMUALCT topic regarding the described challenges, scope and directions for research and innovation to foster transparent decision making.	Alignment = high

	The new socio-technological practices enabled by big data, for example, entail unbalanced power relations between those managing the new knowledge and those facing the real-world consequences. (44) The unmastered complexity of some sociotechnological practices, such as digitisation, could lead to people taking it for granted that those practices cannot be influenced, resulting in the de-politicisation of the status quo rather than challenging it.(45) Citizens' and civil society organisations often lobby for their own individual and small group interests respectively (such as access to certain social or economic services), with less advocacy for common interests, like industry in Europe's R&I policy (47)		
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	Weak Signal 17: Informal sector (Open and Collaborative Maker Culture) (40) From a government perspective, an expansion of the informal sector would mean the loss of control over a significant part of society, and also, for example, over tax evasion...If criminal or radical groups step in powerfully, citizen-government relations could be at severe risk in the long term. (48) At the same time, there is an ongoing debate in policy, NGO and academic circles on he need to replace GDP as the key measure of societal progress, for example with well-being, happiness or quality of life. The prosperity concepts under discussion are 'post-growth', 'de-growth', 'neo-growth' and 'green growth', all of which account for several dimensions of sustainability, albeit with different emphases and priorities. (37)	Alignment = med Expert report highly aligns with CIMULACT topic regarding challenge and driver description but does not detail specific directions for research and innovation.	Alignment = med
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current	Weak Signal 8: Changing attitudes towards care (Care Economy) (35) In a globalised and interconnected world, value system changes at societal level are often event driven. Examples are...natural and technical disasters leading to prioritisation of environment and health values (over economy and wealth values)... As the probability and actual occurrence	Alignment = high Expert report highly aligns with CIMUALCT topic regarding the described challenges, scope and di-	Alignment = low

economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.	of such events and their impacts are unpredictable, related abrupt value system changes can hardly be anticipated 46)	rections for research and innovation to become more responsive to societies needs.	
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects		Alignment = none	Alignment = none
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.	Weak Signal 10: Eroding Sense of Progress (37) These two major value change tracks (and others) appear to be insufficiently integrated, balanced and reconciled in a single common model for Europe's prosperity, and thus have controversy potential.(47) At the same time, there is an ongoing debate in policy, NGO and academic circles on he need to replace GDP as the key measure of societal progress, for example with well-being, happiness or quality of life. The prosperity concepts under discussion are 'post-growth', 'de-growth', 'neo-growth' and 'green growth', all of which account for several dimensions of sustainability, albeit with different emphases and priorities. (37)	Alignment = high Expert report highly aligns with CIMUALCT topic regarding the described challenges, scope and directions for research and innovation to foster transparent decision making.	Alignment = med

From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.			Alignment = none
Topics mentioned only in the expert based study			
Care Economy	Weak Signal 8: Changing attitudes towards care (35) In a globalised and interconnected world, value system changes at societal level are often event driven. Examples are...natural and technical disasters leading to prioritisation of environment and health values (over economy and wealth values)... As the probability and actual occurrence of such events and their impacts are unpredictable, related abrupt value system changes can hardly be anticipated 46)	Alignment = none	Alignment = low
Informal Sector	Weak Signal 17: Informal sector (40) From a government perspective, an expansion of the informal sector would mean the loss of control over a significant part of society, and also, for	Alignment = low	Alignment = low

	example, over tax evasion...If criminal or radical groups step in powerfully, citizen-government relations could be at severe risk in the long term. (48)		

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.		Alignment = none	Alignment = none
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.		Alignment = none	Alignment = none

Learning for society Research should explore the following aspects: - Educational leverages to the sense of community and common good/progress - Promoting collective intelligence (working together, consultation and co-creation) - Facilitate the transformation of "education into action" and development of a new civic sense - Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities - Ways to acknowledge the community's problems and understanding the community/ies culture/s - Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	Value Domain: Solidarity (24-5) Weak Signal 14: Repeated flare-ups of specific STI controversies (38) According to some observers, the freedom of the sciences will be jeopardised if science becomes subjected to power struggles and severely restricting management practices. (47)	Alignment = low Expert report mentions a shift towards solidarity values but does not offer detailed directions for research in this domain. It diverges with CIMULACT topic by describing a possible challenge for science, when being subject to restricting governance principles.	Alignment = low
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education.	Weak Signal 1: Delegation of actions from humans to technology (31) The standardisation and pre-structuring of actions by the technology provision regime (design, implementation, supply, etc.) is opposed to the values of freedom and diversity.(44)	Alignment = low Expert report mentions the challenge that current innovation regimes hinder integrating	Alignment = low

The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.		certain societal values. It does not detail specific directions for research.	
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	Weak Signal 2: Society pushed by big data practices (31) This asymmetry enables sourcing from technology users and barely noticeable forms of discrimination of technology users on the one hand, and on the other hand, enormous capitalisation benefiting technology providers.(44) ..the majority of EU citizens agree that at present, the seriousness of data protection issues is underestimated (75 %), and that data protection should be a priority for the EU (79 %). (22)	Alignment = high Expert report mentions main issues of CIMULACT topic and aligns well as the topic mainly mentions challenges to be delt with.	Alignment = med
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.		Alignment = None	**Alignment = none**

Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	Value domain: Human dignity (21) Value Domain: Citizens Rights and Justice (25-7) Weak Signal 1: Delegation of actions from humans to technology (31) The standardisation and pre-structuring of actions by the technology provision regime (design, implementation, supply, etc.) is opposed to the values of freedom and diversity.(44) A clear evaluation framework should be provided for environmental sustainability aspects and more generally, for user and stakeholder requirements and values embedding. It is not given that each and every R&I project should embed values, but the proposal should specify if values are concerned, and how the design and implementation will take account of them. (42) The values, ethics and links to user needs and stakeholder expectations have to be consistentlyembedded in the entire process of R&I programming (agenda-setting, prioritisation, funding,ethical assessment, negotiation arena and stakeholders); (57)	Alignment = high Expert report mentions the main issues of CIMULACT topic with regard ro identified challenges and also metnions specific direction for research governance in order to foster sustainable technologies.	Alignment = med

Topics mentioned only in the expert based study			

Study: OBSERVE FET Proactive Topic Generation - Workshop Background Document (36 Topics) & Final List of 17 Proposed Topics, Warnke, P. Schirrmeister, E., Rosa, A. 2017

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.	17 Topics: None 36 Clusters: Beyond, Within and Into the Brain The findings from the OBSERVE screening include several topics related to the brain. On the one hand research on understanding the human brain and brain related innovation are fast advancing. At the same time several societal questions such as the co-evolution of the brain and the digital society and the way to deal with mental illness and are emerging.	Alignment = low Expert report mentions the emergence of questions relating to dealing with mental illnesses and the advancement of brain science in general. It does not detail specific directions for research and innovation as mentioned in CIMULACT topic.	Alignment = low
Rethinking (the new) job market needs • Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability	17 Topics: None 36 Clusters: None	Alignment = none	Alignment = none

- Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being			
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: - Daring to be different - The education system - Re-definition of values - Re-definition of welfare - The level of well-being	17 Topics: None 4 Unlocking opportunities by embracing complexity **Key Idea** This is a longstanding topic but dominated by physics and still we understand very little. Need to integrate other perspectives e.g. mathematics and sociology. **Major Breakthroughs:** Introducing self-organisation into real life networks (mathematical technology!) Understanding uncertainty, accepting uncertainty in prediction	Alignment = high Expert report mentions self-organization and learning to deal with uncertainties on the organisational level (networks), it does not mention this to be translated to individual level. It also mentions value change.	Alignment = med

	Phase transitions to understand the dynamics of change in particular in the presence of uncertainty Online adaptation, self-organisation and intelligent control in networks Unifying models to incorporate different spatial and temporal scales Complexity perception as a socio-political and psychological phenomenon 14 Massively parallel multi-scale polylogue on civilisational transformation pathways **Key idea** In order to unlock opportunities and avert threats to civilisations we need to experiment multiple, alternative transformation pathways across cultural contexts, value systems as well as temporal and spatial scales. Research could develop a supporting infrastructure for such a multi-scale polylogue (concepts, technologies e.g. fro decision making).		

	Aspects: Transformation of value systems (by consequence and necessity) Technologies that allow us to address scales levels that are intertwined (local and global scale) when making decisions Concepts for bridging: time, space, cultural context, values bring that closer How can you make transformation mechanisms based on opportunities rather than only threat based? Beyond simplicistic solutions, Inspire and encourage parallel experimentation of alternatives e.g. through simulations, multiply diversity and pluralism, instead of 36 Clusters: None		
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	17 Topics: None 36 Clusters: Revolutionary Healthcare Diagnostics In the field of diagnostics disruptive advances maybe upcoming through a combination of several developments. On the one hand diagnostic technology is able to analyse ever more parameters with ever lighter and cheaper equipment and less time. At the same time more diseases can be detected through analysis of fluids especially blood due to advances in life sciences. Novel/unconventional Therapeutic Approaches The following items of the OBSERVE findings refer to novel or unconventional therapies. – Prevent/repair heart attack N&S1 – Nano needles in regenerative medicine N&S5 – New methods for drug delivery inside the body N&S9	Alignment = med Expert report identifies several innovative technologies in the healthcare sector and an overall improvement of diagnostic technologies. It does not mention, how to harness these developments to improve health systems on local level while taking into account local knowledge.	Alignment = low

	– Spontaneous regression N&S11 – Treating phantom pain with a mirror SP&S2 – Rising interest in traditional medicine C5 – Self-tracking pill N&T19 – Self-Propelled particles for treating severe bleeding T12 – Emerging research front: Control and treatment of schistosomiasis in Africa using the drug praziquantel N&S13 – Research front: Newly emerging psychoactive substances (new designer drugs) N&S17		
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to: • For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other.	17 Topics p.5: **Rationale** Healthcare diagnostics will undergo major changes in the next decades. Research should be focused on the exploration of new disruptive technologies for diagnosis of personalised human wellbeing (e.g. cancer, HIV, psychological conditions, nutrition etc.). The costs for national healthcare systems need to be reduced.	Alignment = med Expert report mentions advances in diagnostic technologies and their potential to reduce costs in healthcare systems, it dies not mentions the interconnected	Alignment = low

- For the citizens to be trained on health and digital literacy.	**Key Idea** Develop personalised diagnostic environments that enable fast and real time detection of diseases including rare ones and abnormalities. Environments to be considered are domestic applications, the medical doctor, and machine components.	need to train citzens as well as healthcare professionals in digital literacy and psychology.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	17 Topics: None 36 Clusters: None	Alignment = none	Alignment = none

Health empowerment through "Everyone's science" An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	17 Topics: None 36 Clusters: None	Alignment = none	Alignment = none
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	17 Topics: None 36 Clusters: Cluster 5: Beyond within and into the brain The findings from the OBSERVE screening include several topics related to the brain. On the one hand, research on understanding the human brain and brain related innovation are fast advancing. At the same time several societal questions such as the co-evolution of the brain and the digital society and the way to deal with mental illness and are emerging.	Alignment = low Expert report mentions some specific issues discussed in the CIMULACT topic, such brain research with regard to aging or causes of degenerative disease. It does not put this into context of a research direction of "deconstructing	Alignment = low

	The following individual aspects were emerging in the OBSERVE analysis • Brain understanding The webmining revealed a number of research insights on the way the brain works emerging in 2015. A particular focus was on memory but also on spatial mapping, timing, vision, decision making, emotional experience assignment, social prediction, hearing, tinnitus, pattern recognition and aging. • Particle pollution may be the main cause for brain degenerative diseases (Cluster 7)	age”, which considers several other factors and implications of ageing.	
Topics mentioned only in the expert based study			
Bacteria Management Strategies	Observe 36 Several of the OBSERVE findings relate to the way humanity deals with bacteria. One of the most prominent aspects is the rise of antibiotic resistance which poses a severe threat to many established practices of today’s societies. All the	Alignment =	Alignment = Low

	more relevant seem other ways of dealing with bacteria such as antibacterial shields but also better understanding of the role of bacteria for human life (microbiome) and ways to influence bacteria e.g. through genome editing. At the same time bacteria are increasingly being used for processes.		

1.3 Work-life balance and wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	OBSERVE 17 Topics 5 Human AI Negotiation Processes **Key Idea** Humans move within a cloud of potentially supportive AI artefacts (robotic resources). The artefacts follow different kinds of goals: some explicit goals preset by factory (e.g. safety, economy) some learned goals from the key client some explicitly set by the key client some level of autonomy improvisation In order to get something done humans give only general rules (e.g. I want to see my kids more often) and the system improvises to realise the. Thus humans and machine enter into a continuous negotiation process on different levels. Value conflicts become appar-	Alignment = high Expert report mentions all main issues as drafted in CIMULACT topic.	Alignment = med

	ent (e.g. between individuals values and actual actions, between individuals and environments (e.g. house, city). If the system provides a solution humans may question it. The breakthrough that is required to realise this vision is to develop the adequate language for the goal setting process. Systems cannot only be based on learning from history like in deep learning. We need an explicit process to interact. Such a language could be similar like for strategic games. 10 Understanding potentials and limits of human machine co-evolution interfaces **Key Idea** Develop a framework for assessing who benefits and who is impacted in co-evolving systems of humans, technology and nature of any scale. Thereby enabling ex-ante value-sensitive design paradigm on (non-)symbiotic interfaces. Make interfaces transparent so explicit decisions can be taken.		

	Develop technologies to enhance the beneficial feedback loops between societies of living systems. **Community** Sociologists, economists, ethnologists, anthropologists/ natural scientists, engineers. Applying the formers' tools to the latter's subject area? 16 Privacy Providing Systems **Aspects** Develop a refined definition of privacy based on human rights and integrity Establish regulation which generates protected spaces according to this definition reaching out across key societal domains (work, health, public space ...) Develop technologies supporting such spaces such as self data destroying technologies		

	Concepts like “blacklists” as prisons of the future (people not on the blacklists are protected in the privacy spaces) OBSERVE 36 Clusters (p. 11) Understanding Beneficial Human Machine Symbiosis New forms of machine-human-symbiosis emerge on all levels and across types of activities. Aspects range from automation in all spheres of human activities to augmentation of intimate functions within the human body. In spite of frantic research in many of the aspects many argue that there is still little progress in understanding human machine interaction patterns that truly benefit our societies. The OBSERVE Screening brought up the following elements: Algorithm responsibilities H18 Modelling the human SP&T2		

	Automation H14 Technological Singularity H16 Human enhancement H1 Robot reasoning H26 Virtual Personal Assistant Bots T1 Fully autonomous production organism T17 Rise of the drones T2 Cognitive overburden through perpetual evaluation SP6 The human brain in the digital society C6 Researchers reflect on the question how the digitalisation of society affects the human brain. As an example some speculate that autistic behaviour patterns may be becoming more prevalent in the digital society Implants that store and transfer data SP&T5 Optical implants N&T14 Automated indoor farming T11		

	Brain interfaces and implants T18 Robots will become more human-like as their vocabulary comes closer to that of real humans T25 Insights from cognition research and biology may enable better Ambient Intelligence (AmI) systems T27		
Balanced work-life model Research should rethink the definition of “work” and develop approaches that permit to recognize and reward as “work” all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long	OBSERVE 17 Topics 6 Time **Key Aspects** How can we manipulate the time something takes? Change the perception of time: More time for good experiences, more valuable spending of time Pain pattern: Concentrate on nicer moments	Alignment = med Expert report mentions many issues from CIMULACT topic in bullet point fashion, but does not explicate a research topic where the use of time and the term work is reevaluated as in the CIIMUALCT topic.	Alignment = low

time, there is a need that the research that has been done is put into practice.	Synchronise different perceptions of time Different cultural readings of time (circular, static) Influx of information in condensed time Optimisation of speed of human development Time as a currency- value and uses (shifting time from one place to another) Learning applications (human organism) Changing use of time Working time (the social uses of time) Time (management) and mental health 11 The Internet as a crucial site for production of society **Vision** The internet is a crucial additional site of production of society by transforming the social temporality of our interactions as well as chal-		

	lenging social structures as implemented today in social institutions (universities, hospitals, families ...) **Aspects:** Beyond the online/offline divide, new re-combinations Connected environments that allow freedom/liquid groups and multiple identities that challenge traditional authorities and enable new forms of trust Former physical institutions are replaced by new clouds of interactions Open innovation and participatory extended peer communities OBSERVE 36 Clusters None		
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be:	OBSERVE 17 Topics 6 Time	Alignment = med Expert report mentions many issues from CIMULACT	Alignment = med

- reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals - better transport options including alternative ways to travel such as teleportation and space travel for saving time - ensuring more accessible environments - digitalisation of many of the "analog" activities overcoming the notion that time is money	**Key Aspects** How can we manipulate the time something takes? Change the perception of time: More time for good experiences, more valuable spending of time Pain pattern: Concentrate on nicer moments Synchronise different perceptions of time Different cultural readings of time (circular, static) Influx of information in condensed time Optimisation of speed of human development Time as a currency- value and uses (shifting time from one place to another) Learning applications (human organism) Changing use of time Working time (the social uses of time) Time (management) and mental health	topic in bullet point fashion, but in a way that indicates high alignment with the direction of the topic.	

	11 The Internet as a crucial site for production of society **Vision** The internet is a crucial additional site of production of society by transforming the social temporality of our interactions as well as challenging social structures as implemented today in social institutions (universities, hospitals, families ...) **Aspects:** Beyond the online/offline divide, new re-combinations Connected environments that allow freedom/liquid groups and multiple identities that challenge traditional authorities and enable new forms of trust Former physical institutions are replaced by new clouds of interactions Open innovation and participatory extended peer communities		

	OBSERVE 36 Clusters None		
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.	OBSERVE 17 Clusters 11 The Internet as a crucial site for production of society **Vision** The internet is a crucial additional site of production of society by transforming the social temporality of our interactions as well as challenging social structures as implemented today in social institutions (universities, hospitals, families ...) **Aspects:** Beyond the online/offline divide, new re-combinations Connected environments that allow freedom/liquid groups and multiple identities that challenge traditional authorities and enable new forms of trust	Alignment = med Expert report mentions many issues from CIMULACT topic in bullet point fashion, but on a higher aggregated level. It does not metion the individual perspective CIMULACT topic describes.	Alignment = low

	Former physical institutions are replaced by new clouds of interactions Open innovation and participatory extended peer communities		
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. - integration of 'free time' in the work place - new ways of employment where employees are more like volunteers / freelancers - [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** - the impact of work-life balance policies, - the impact of different business models on workers' time autonomy and quality of life - the psychological acceptance of new forms of work, both individually and by society	OBSERVE 17 Topics None OBSERVE 36 Topics None	Alignment = none	Alignment = none
Topics mentioned only in the expert based study for the whole Challenge			
Molecular Microbial Machinery (Re-engineering Life)	**Key Idea** Molecular Machinery delivered via a microbe-like designed scaffold. Design of synthetic communities	Alignment = none	Alignment = none

	Control and regulation of such communities Making this technology globally accessible **Aspects** Designing artificial microbes such that they can reliably execute a function in context Designing artificial collectives of multiple types of such microbes to achieve more complex effects Designing ways to regulate and communicate with these communities in situ (e.g. light, magnetism, ultrasound) e.g. in medical technologies Resolving ethics aspects, fair access, Storage and delivery for global usage		
Revolutionary Healthcare	Rationale Healthcare diagnostics will undergo major changes in the next decades. Research should be focused on the exploration of new disruptive technologies for diagnosis	Alignment = none	Alignment = none

	of personalised human wellbeing (e.g. cancer, HIV, psychological conditions, nutrition etc.). The costs for national healthcare systems need to be reduced. Key Idea Develop personalised diagnostic environments that enable fast and real time detection of diseases including rare ones and abnormalities. Environments to be considered are domestic applications, the medical doctor, and machine components.		
Human AI Negotiation Processes	Key Idea Humans move within a cloud of potentially supportive AI artefacts (robotic resources). The artefacts follow different kinds of goals: some explicit goals preset by factory (e.g. safety, economy) some learned goals from the key client some explicitly set by the key client some level of autonomy improvisation	Alignment = none	Alignment = none

	In order to get something done humans give only general rules (e.g. I want to see my kids more often) and the system improvises to realise the. Thus humans and machine enter into a continuous negotiation process on different levels. Value conflicts become apparent (e.g. between individuals values and actual actions, between individuals and environments (e.g. house, city). If the system provides a solution humans may question it. The breakthrough that is required to realise this vision is to develop the adequate language for the goal setting process. Systems cannot only be based on learning from history like in deep learning. We need an explicit process to interact. Such a language could be similar like for strategic games.		
Time	Key Aspects How can we manipulate the time something takes? Change the perception of time: More time for good experiences, more valuable spending of time Pain pattern: Concentrate on nicer moments Synchronise different perceptions of time Different cultural readings of time (circular, static)	Alignment = low	Alignment = none

	Influx of information in condensed time Optimisation of speed of human development Time as a currency- value and uses (shifting time from one place to another) Learning applications (human organism) Changing use of time Working time (the social uses of time) Time (management) and mental health		
Wearable and implantable intelligent devices	Key idea Develop wearable and implantable devices that restore damaged functions (e.g. mobility, organs) but also in the long term enhance human capacities in several respects: Additional senses Cognitive augmentation e.g. memory Vastly increased bandwidth (I/O) Personalised medicine (diagnostics)	Alignment = low	Alignment = none

	Key required breakthroughs: Getting information across for controlling the devices in a minimal invasive way. Energy provision. Tackle ethical aspects. Additional aspects Link with bacteria management, antibiotics Evolutionary devices, intergenerational devices		

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: - Map the food access in rural and urban areas, - Calculate and assess food poverty in the EU, - look at supply regulation and issues connected to distribution and prices (transnational level), - investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), - analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: - Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, - The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	OBSERVE 36 Groundbreaking Food Supply Systems Feeding the world without transgressing the earth's carrying capacity is one of the key challenges of the future that is also deeply related to other challenges such as water, energy, housing and health. In the near future we have to produce 70% more food than today without harming the environment. Meanwhile, the decrease in variety in plant and animal based food (eg rice/apples) is making food systems more susceptible to pests and diseases. Globally dependency on grain imports is on the rise. Production of meat and fish is rising steeply. At the same time ever more people advocate fundamental changes in human animal relationships. Technical approaches to food production such as smart	Alignment = low Expert report mentions recent developments in the food sector and provides an outlook on challenges ahead. It does not address the issues of equal distribution of good quality food, CIMULACT topic's main intention.	**Alignment = low**

	floating farms, high-tech urban farming (e.g. vertical aquaponic growing system), fully automated and artificial food abound. Another angle is the reduction of food waste. Finally, there is a growing threat from foodborne diseases. Research addressing infection or intoxication caused by pathogenic factors entering into human bodies through food is one of the most dynamic fields in agricultural, plant and animal sciences.		
Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as:	OBSERVE 17 Topics None OBSERVE 36 Topics None	Alignment = none	Alignment = none

• Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community collaboration and social cohesion via a more sustainable food production and consumption.			
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	36 Groundbreaking Food Supply Systems Feeding the world without transgressing the earth's carrying capacity is one of the key challenges of the future that is also deeply related to other challenges such as water, energy, housing and health. In the near future we have to produce 70% more food than today without harming the environment. Meanwhile, the decrease in variety in plant and animal based food (eg rice/apples) is making food systems more susceptible to pests and diseases. Globally dependency on grain imports is on the rise. Production of meat and	Alignment = low Expert report mentions recent developments in the food sector and provides an outlook on challenges ahead. It does not address the issue of knowledge transfer from research to politics and citizens, as well the need for assessing multiple	Alignment = med

	fish is rising steeply. At the same time ever more people advocate fundamental changes in human animal relationships. Technical approaches to food production such as smart floating farms, high-tech urban farming (e.g. vertical aquaponic growing system), fully automated and artificial food abound. Another angle is the reduction of food waste. Finally, there is a growing threat from foodborne diseases. Research addressing infection or intoxication caused by pathogenic factors entering into human bodies through food is one of the most dynamic fields in agricultural, plant and animal sciences.	impacts of new food systems.	
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through soil-land-water research and through responsible research and innovation.	OBSERVE 17 Topics None OBSERVE 36 Topics None	Alignment = none	Alignment = none

Topics mentioned only in the expert based study for the whole challenge			
Molecular Microbial Machinery (Re-engineering Life)	• OBSERVE 17 • • **Key Idea** • Molecular Machinery delivered via a microbe-like designed scaffold. • Design of synthetic communities • Control and regulation of such communities • Making this technology globally accessible • **Aspects** • Designing artificial microbes such that they can reliably execute a function in context • Designing artificial collectives of multiple types of such microbes to achieve more complex effects • Designing ways to regulate and communicate with these communities in situ (e.g. light, magnetism, ultrasound) e.g. in medical technologies • Resolving ethics aspects, fair access, • Storage and delivery for global usage	Alignment = none	Alignment = none

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3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy communities" in which citizens locally support each other in participatory processes to implement	OBSERVE 17 9 Technologies for decentralised consensus generation **Key idea** Through the internet we now share information – this may allow us to share consensus. Technologies like blockchain provide the possibility for people to jointly agree on the next chapter. This is now used for financial transactions (bitcoin) but it can be leveraged to carry out all sorts of interactions among individuals in a trusted, secure, privacy conserving way that keeps track of the full history of contributions.	Alignment = med Expert report mentions technologies that could be used to facilitate a collective smart energy governance as described in CIMULACT. However it does not mention them jointly for the providing collective distributed energy supply.	Alignment = high

the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation	We suggest developing this into a decentralised consensus building mechanism. The system is very complex system, there are many open problems and no theory for this at the moment. **Applications/Implications** Political and economic participation (including voting) Rethinking and upgrading financial and banking institutions Land registering and bankability (emerging countries) IPR system 11 The Internet as a crucial site for production of society **Vision**		

	The internet is a crucial additional site of production of society by transforming the social temporality of our interactions as well as challenging social structures as implemented today in social institutions (universities, hospitals, families ...) **Aspects:** Beyond the online/offline divide, new re-combinations Connected environments that allow freedom/liquid groups and multiple identities that challenge traditional authorities and enable new forms of trust Former physical institutions are replaced by new clouds of interactions Open innovation and participatory extended peer communities 12 From efficient cities to responsive cities		

	Key Idea Facilitate all aspects of human life both on individual and collective level. Integrate citizens in the development of cities move beyond maximisation of efficiency. Understand human practices or even better generate technologies/infrastructures that can deal with unexpected behaviours and disruptions through improvisation in a responsive manner. 14 Massively parallel multi-scale polylogue on civilisational transformation pathways **Key idea** In order to unlock opportunities and avert threats to civilisations we need to experiment multiple, alternative transformation pathways across cultural contexts, value systems as well as temporal and spatial scales. Research could develop a supporting infrastructure for such a multi-scale polylogue (concepts, technologies e.g. fro decision making).		

	Aspects: Transformation of value systems (by consequence and necessity) Technologies that allow us to address scales levels that are intertwined (local and global scale) when making decisions Concepts for bridging: time, space, cultural context, values bring that closer How can you make transformation mechanisms based on opportunities rather than only threat based? Beyond simplicistic solutions, Inspire and encourage parallel experimentation of alternatives e.g. through simulations, multiply diversity and pluralism, instead of Observe 36 Diverse Unconventional Energy Supply Solutions		

	Meeting global energy demand in a sustainable manner is one of the most discussed global challenges. In parallel to the mainstream lines of research for new energy technologies and concepts more unconventional approaches are followed by several research and innovation teams. In line with the diversification of energy technologies, innovations in grids and overall system designs are key topics of the debate on energy futures. A particular focus is on the decentralisation of energy supply. The following specific aspects were emerging: Global Challenge: Energy demand N2 Unconventional energy sources N&T15 Local energy production will power the smart grid SI1 Decentralisation of energy supply N&T2 Wireless transfer of electricity T9 Energy Harvesting T4		

	Energy from oxidation in human bodies N&T4		
Topics mentioned only in the expert based study for the whole challenge			

Minimising Energy Dissipation	OBSERVE 17 **Key Idea** In today's energy system most energy is lost for human use through dissipation (transformed into heat). It is generally overlooked that dissipation loss is now a severe barrier for internet of things, local energy production, smart sensors, high performance computing etc. The goal of this research is to substantially minimise this loss in: Energy transformation processes Energy transport Energy conversion and use Energy storage through new materials, processes and transformations.	Alignment = none	Alignment = none

	Communities Electronic engineers, material scientists, transport companies, power plants, IT		
Next Generation Energy Storage (Beyond Lithium)	Observe 36 Research and innovation in energy storage is highly dynamic driven by the rise of decentralised and renewable energy solutions. Important aspects are energy conversion efficiency, speed of storage, cost effectiveness; use of materials with low environmental and social impact. The field includes several potentially disruptive developments that go beyond today's lithium battery based solutions.	Alignment = none	Alignment = none

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to	**OBSERVE 17 Topics** None **OBSERVE 36 Topics** none	Alignment = none	**Alignment = none**

the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).	OBSERVE 17 Topics 17 Future Living Spaces Rethink connection of urban and rural spaces (not necessarily by road) Distribution of services and infrastructure Optimal city size Scaling Freedom of choice for living space (basic income)	Alignment = med Expert report describes several emerging technologies and socio-technological developments regarding to connecting urban and rural spaces. It does not mention the issue of assessing equal access to serices.	Alignment = med

	OBSERVE 36 Topics Future Living Spaces Several emerging topics relate to sustainable living spaces both in urban and rural areas. A particular focus could be on the question of how to dwell in a networked world. As highlighted by one contribution to the FET Proactive consultation there is an urgent need to rethink our approaches to the “built environment” and realise the high potential of cross-disciplinary research on adaptation of spaces to human needs: Related OBSERVE topics: **H 19 Mobility futures** There is plenty of discussion on disruptive changes in human mobility. The most discussed development is the self-driving vehicle and ist interaction with the human. Other emerging concepts are		

	improved solar-powered vehicles, personal balance-vehicles (like segways), vacuum hyperloop-tube for transport and hypersonic-flights. For ships the old approach of wind powering is explored afresh. Source: Several Impact Level: Widespread **T 2 Rise of the drones** Science fiction novels envision a world where drones of all shapes and sizes will take over a vast diversity of functions such as monitoring, scanning, surveying, transport and spying. Smarter and smaller		

	drones with more functions are one of the most popular areas on Kickstarter. Source: Science Fiction Novel: Drohneland Impact Level: Widespread **SP 1 Cycling Futures** The bicycle is emerging as a central component of urban and avantgarde lifestyles. Several of the most advanced concepts in city planning and mobility are centering on the bicycle. Highly interdisciplinary research is exploring ways to establish cycling centred city transport systems. Source:		

	Monocle Impact Level: Mid Range		
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).	OBSERVE 17 Topics None OBSERVE 36 Topics None	Alignment = none	Alignment = none
Topics mentioned only in the expert based study for the whole Challenge			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	OBSEVE 36&17 Unlocking Opportunities by Embracing Complexity Complexity is increasingly recognised both as a challenge and an opportunity in a wide range of science and practice domains. In the very rich and often controversial debate three aspects could be distinguished: Recognising and observing complex processes, decision making in the face of uncertainty, and approaches to embracing and even governing complexity. A central crosscutting aspect is the exploration of human thinking, decision making and behaviour as such.	Alignment = low Expert report metnions some issues described in CIMULACT topic, but rather on meta-level. It does not mention investigating and promoting more sustainabl lifestyles, the main aim of the CIMUALCT topic.	Alignment = low

	The following individual elements that emerged in the OBSERVE screening gave rise to the suggestion of this topic: Understanding and influencing human behaviour H23: Several researchers across disciplines are investigating ways to understand and influence human thinking and behaviour; The field is highly interdisciplinary ranging from AI, NPL, data analytics, game design and neuroscience to sociology, pedagogics and economics. Computational neuroscience in particular aims for a better understanding of the human brain and cognition. OBSERVE 36 Shifting Understanding of Life and its Boundaries Our perception of what it means to be human and what characterises other species is shifting. Boundaries between humans and animals on the one hand and humans animals and machines on the		

	other are blurring. Also plants are increasingly viewed in a new perspective e.g. as active communicators. New research methods transform the way we analyse species evolution.		
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments. To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).	OBSERVE 17 Topics 5 Human AI Negotiation Processes **Key Idea** Humans move within a cloud of potentially supportive AI artefacts (robotic resources). The artefacts follow different kinds of goals: some explicit goals preset by factory (e.g. safety, economy) some learned goals from the key client some explicitly set by the key client some level of autonomy improvisation In order to get something done humans give only general rules (e.g. I want to see	Alignment = med Expert report mentions circular economy and sustainable production technologies, but does not detail a research topic to investigate and promote a shift towards long-term thinking and from material wealth to wellbeing, the main aim of the CIMULACT topic.	Alignment = high

	my kids more often) and the system improvises to realise the. Thus humans and machine enter into a continuous negotiation process on different levels. Value conflicts become apparent (e.g. between individuals values and actual actions, between individuals and environments (e.g. house, city). If the system provides a solution humans may question it. The breakthrough that is required to realise this vision is to develop the adequate language for the goal setting process. Systems cannot only be based on learning from history like in deep learning. We need an explicit process to interact. Such a language could be similar like for strategic games. OBSERVE 36 topics Waste Zero Technologies Approaches towards a sustainable and circular cradle2cradle economy feature		

	prominently in the debate among scientists, innovators, actors from civil society and policy makers. Establishing fully circular resource flows is however extremely demanding both for design and production. Circular solutions are bound to disrupt established patterns of science and engineering on the one hand and production and consumption on the other. The following topics emerged in the analysis of recent discourses: Circular material flows H5 Wooden material on the rise SP&T1 Carbon nanofibres made from CO2 in the air N&T7 Global Enabling Infrastructures for New Economic Patterns A number of items captured in the OBSERVE radar reflect on emerging new modes of production and consumption and the related societal and technical transformations:		

	Time as money SP2 Postcapitalist economy H10 Global Challenge: Transnational organized crime N3 One aspect often stressed is the emergence of a new type of distributed infrastructures for the newly emerging patterns: Distributed collaboration platforms (eg blockchain) (OBSERVE) H9 How much is a bitcoin worth, and why? (FET Proactive Consultation) Unlocking Opportunities by Embracing Complexity Complexity is increasingly recognised both as a challenge and an opportunity in a wide range of science and practice domains. In the very rich and often controversial debate three aspects could be distinguished: Recognising and observing complex processes, decision making		

	in the face of uncertainty, and approaches to embracing and even governing complexity. A central crosscutting aspect is the exploration of human thinking, decision making and behaviour as such. The following individual elements that emerged in the OBSERVE screening gave rise to the suggestion of this topic: Rise of complexity science H7 Multi-disciplinary simulation research C2 Data vs. Intuition? N7 Freakthinking SP&S3 Making human impact visible N&T18 Global ethics N1 Global foresight/decision making N5 New kinds of sensors and their smart connection will give us a new level of control over our surroundings T16		

	Hyperconnected sustainable planet N&T6 Intelligent combination of sensor-data replaces traditional technologies for authorization, monitoring and observation T10 Brain understanding S19 Understanding and influencing human behaviour H23 Faster computers and newly available massive data hold the key for problems deemed too difficult to solve in the past T35		
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development.	OBSERVE 17 none OBSERVE 36 Waste Zero Technologies Approaches towards a sustainable and circular cradle2cradle economy feature	Alignment = high Expert report most main issues of CIMULACT topic, such as clean production technologies or	Alignment = high

Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	prominently in the debate among scientists, innovators, actors from civil society and policy makers. Establishing fully circular resource flows is however extremely demanding both for design and production. Circular solutions are bound to disrupt established patterns of science and engineering on the one hand and production and consumption on the other. The following topics emerged in the analysis of recent discourses: Circular material flows H5 Wooden material on the rise SP&T1 Carbon nanofibres made from CO2 in the air N&T7 15 Low Footprint Chemical Processes Already in 1998 scientists developed 12 principles of “green chemistry” underpinning more environmentally benign chemical processes with e.g. less waste, higher efficiency and toxicity to human health and the environment. Several	cradle to cradle approach.	

	findings of the OBSERVE analysis relate to these principles indicating that this domain is still a highly active and future relevant domain for research and innovation with room for disruptive and foundational approaches with substantial sustainability benefit. The following aspects of OBSERVE findings relate to this domain: Emerging research front: Metal organic materials with optimal adsorption thermodynamics and kinetics for CO2 separation S14 Emerging research front: Magnetically retrievable nanocatalysts S16 Research front: Functional metal organic frameworks N&S20 Emerging research front: Synthesis of copolymers by direct arylation polycondensation S15 Emerging research front: Enhanced Visible Light photocatalysts N&S23		

	Research front: Synthesis of pillar [5/6] arenes & their host guest chemistry S9 Emerging research front: Photoinitiated polymerization and Photoinitiators S17		
Topics mentioned only in the expert based study			

Understanding potentials and limits of human machine co-evolution interfaces	Observe 17 **Key Idea** Develop a framework for assessing who benefits and who is impacted in co-evolving systems of humans, technology and nature of any scale. Thereby enabling ex-ante value-sensitive design paradigm on (non-)symbiotic interfaces. Make interfaces transparent so explicit decisions can be taken. Develop technologies to enhance the beneficial feedback loops between societies of living systems.	Alignment = none	Alignment = none

Climate change	Observe 36 2.12 Dormant Effects of Climate Change The dynamics and effects of climate change are subject to intense research in many disciplines. Researchers from all-over the world point to the increasing likelihood of yet unknown catastrophic events as well as severe health risks and urge acting now. While some aspects are widely researched and discussed, the OBSERVE screening brought up also less explored aspects such as the rise of wildfires, possible emergence of superstorms and effects on soil bacteria. In addition the following current research fronts emerged in this context (N&S24): Regional climate models (required to investigate regional dynamics that may substantially differ from global patterns) Model analysis of non-CO2 greenhouse gases	Alignment = low	Alignment = none

Resource scarcity	Observe 36 Water Challenge Water and especially clean water is becoming a scarce resource in ever more areas as climate change threatens water security. We need global strategies to prevent this or deal with. Implementation of existing strategies such as the European Water Framework Directive (WFD) requires suitable tools and methods. Water was one of the most addressed topics in 2015 science related tweets. Topics were water: -generation, -cleaning,-recycling,-pollution, -splitting, -based energy generation, - saving and -quality monitoring as well as measures dealing with droughts. Ways of measuring the quality of oceans, coastal and transitional waters is becoming an important research front in ecology. Another strand of debate is focussing on the future of oceans.	Alignment = low	Alignment = none

	Research on the impact of ocean acidification on marine ecosystems is growing fast. Artists such as Maarten Vanden Eynde (plastic reef) point towards the rise of plastic debris in the ocean - a topic that is also much discussed in science publications and media in general.		

5.2 Urban and Rural Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	OBSERVE 17 12 From efficient cities to responsive cities **Key Idea** Facilitate all aspects of human life both on individual and collective level. Integrate citizens in the development of cities move beyond maximisation of efficiency. Understand human practices or even better generate technologies/infrastructures that can deal with unexpected behaviours and disruptions through improvisation in a responsive manner. 17 Future Living Spaces Rethink connection of urban and rural spaces (not necessarily by road) Distribution of services and infrastructure	Alignment = med Expert report some main issues of CIMULACT topic, such as improving urban-rural links and environments and participatory planning.	Alignment = low

	Optimal city size Scaling Freedom of choice for living space (basic income) OBSERVE 36 Future Living Spaces 31 Several emerging topics relate to sustainable living spaces both in urban and rural areas. A particular focus could be on the question of how to dwell in a networked world. As highlighted by one contribution to the FET Proactive consultation there is an urgent need to rethink our approaches to the “built environment” and realise the high potential of cross-disciplinary research on adaptation of spaces to human needs: Related OBSERVE topics: Sustainable Housing H29		

	Urban catalysts C3 Urban system design H6 Cycling Futures SP1 Moss walls for air cleaning SI2 Bee highway SI6 Wooden material on the rise SP&T1 Personal Heating N&T13 Mobility futures H19 Rise of the drones T2 Contribution FET Proactive Consultation: home in a networked world; or rethinking architecture		
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in combination, not on their	OBSERVE 17 12 From efficient cities to responsive cities	Alignment = high Expert report most main issues of CIMULACT topic, such as finding answers to multi-scale challenges cities face, partici-	Alignment = med

own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of “promising/good” practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	**Key Idea** Facilitate all aspects of human life both on individual and collective level. Integrate citizens in the development of cities move beyond maximisation of efficiency. Understand human practices or even better generate technologies/infrastructures that can deal with unexpected behaviours and disruptions through improvisation in a responsive manner. 17 Future Living Spaces Rethink connection of urban and rural spaces (not necessarily by road) Distribution of services and infrastructure Optimal city size Scaling Freedom of choice for living space (basic income) OBSERVE 36	patory planning and fostering sustainable practices.	

	Future Living Spaces 31 Several emerging topics relate to sustainable living spaces both in urban and rural areas. A particular focus could be on the question of how to dwell in a networked world. As highlighted by one contribution to the FET Proactive consultation there is an urgent need to rethink our approaches to the "built environment" and realise the high potential of cross-disciplinary research on adaptation of spaces to human needs: Related OBSERVE topics: Sustainable Housing H29 Urban catalysts C3 Urban system design H6 Cycling Futures SP1 Moss walls for air cleaning SI2 Bee highway SI6 Wooden material on the rise SP&T1		

	Personal Heating N&T13 Mobility futures H19 Rise of the drones T2		
Topics mentioned only in the expert based study			
Bespoke material development	Key idea Today novel materials are developed and applications devised afterwards. In the envisaged future materials would be developed to meet the properties specified by designers up front in order to meet the requirements of a specific application.	Alignment = none	Alignment = None

6 GRAND CHALLENGE 6: Europe in a changing world - inclusive, innovative and reflective societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none
Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none

Specifying the relation between citizens' and experts' contributions			
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	OBSERVE 17 none 9 Technologies for decentralised consensus generation **Key idea** Through the internet we now share information – this may allow us to share consensus. Technologies like blockchain provide the possibility for people to jointly agree on the next chapter. This is now used for financial transactions (bitcoin) but it can be leveraged to carry out all sorts of interactions among individuals in a trusted, secure, privacy conserving way that keeps track of the full history of contributions.	Alignment = low Expert report mentions a technological development (blockchain) that could be used within the scope of the CIMULACT research topic, which is much wider than only decentralizing consensus generation, and draws from many directions to improve community development.	Alignment = low

	We suggest developing this into a decentralised consensus building mechanism. The system is very complex system, there are many open problems and no theory for this at the moment. **Applications/Implications** Political and economic participation (including voting) Rethinking and upgrading financial and banking institutions OBSERVE 36 none		
Topics mentioned only in the expert based study			

6.2 Participatory governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	Introducing Art in Research and Innovation Frameworks - STEAM **Key idea** Progress from STEM to STEAM (A=Arts) after H2020 and beyond. Integrate art with its own voice. Use approaches from arts in particular to:	Alignment = low Expert report mentions the inclusion of arts into innovation frameworks which can be seen as one aspect of the CIMULACT topic is aiming at. It does not mention that research should be evaluated	Alignment = low

	problematising the questions and problem definitions of science in the first place, introducing different perspectives boosting creativity in the researchers interpreting research results in new ways work across different disciplines as a distant early warning system DEW according to McLuhan. It is a kind of sensor able to detect very early trends in society challenge boundaries between subjectivity and objectivity both in art and science.	with regard to contribution to sustainable development and benefits for community.	
Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	OBSERVE 17 1 Beyond the Brain Aspects: Generate artificial consciousness	Alignment = high Expert report mentions the experimenting with transformation pathways and communication to avert challenges of society.	Alignment = med

	Enable direct communication of thoughts**, knowledge and emotions between human brains** 14 Massively parallel multi-scale polylogue on civilisational transformation pathways **Key idea** In order to unlock opportunities and avert threats to civilisations we need to experiment multiple, alternative transformation pathways across cultural contexts, value systems as well as temporal and spatial scales. Research could develop a supporting infrastructure for such a multi-scale polylogue (concepts, technologies e.g. for decision making). **Aspects:** Transformation of value systems (by consequence and necessity)		

	Technologies that allow us to address scales levels that are intertwined (local and global scale) when making decisions Concepts for bridging: time, space, cultural context, values bring that closer How can you make transformation mechanisms based on opportunities rather than only threat based? Beyond simplicistic solutions, Inspire and encourage parallel experimentation of alternatives e.g. through simulations, multiply diversity and pluralism, instead of OBSERVE 36 9 Technologies for decentralised consensus generation **Key idea**		

	Through the internet we now share information – this may allow us to share consensus. Technologies like blockchain provide the possibility for people to jointly agree on the next chapter. This is now used for financial transactions (bitcoin) but it can be leveraged to carry out all sorts of interactions among individuals in a trusted, secure, privacy conserving way that keeps track of the full history of contributions. We suggest developing this into a decentralised consensus building mechanism. The system is very complex system, there are many open problems and no theory for this at the moment. **Applications/Implications**		

	Political and economic participation (including voting) Rethinking and upgrading financial and banking institutions Land registering and bankability (emerging countries) IPR system		
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	None	Alignment = none	Alignment = none
Topics mentioned only in the expert based study			
Infrastructures for Communicating in New Dimensions	Observe 36 The OBSERVE screening revealed a diverse set of items related to the way we communicate:	Alignment = none	Alignment = none

	– Compressed conversations SP4 – Terahertz communication enables a new range of wireless applications in the future T14 – Spectrum overcrowding N11 – Active audiences H3 – Molecular communications S4		

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	OBSERVE 17 none OBSERVE 36 Global Enabling Infrastructures for New Economic Patterns A number of items captured in the OBSERVE radar reflect on emerging new modes of production and consumption and the related societal and technical transformations: – Time as money SP2 – Postcapitalist economy H10 – Global Challenge: Transnational organized crime N3 One aspect often stressed is the emergence of a new type of distributed infrastructures for the newly emerging patterns: – Distributed collaboration platforms (eg blockchain) (OBSERVE) H9	Alignment = low Expert report mentions emerging models, such as post-capitalist economy or digital currencies, but does not emphasize on fostering a Europe-wide dialogue on alternative economic models with the aim of building a knowledge base and strategies for implementation.	Alignment = low

	– How much is a bitcoin worth, and why? (FET Proactive Consultation)		
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.	Observe 36 Global Enabling Infrastructures for New Economic Patterns 11 A number of items captured in the OBSERVE radar reflect on emerging new modes of production and consumption and the related societal and technical transformations: Time as money SP2 Postcapitalist economy H10 Global Challenge: Transnational organized crime N3 One aspect often stressed is the emergence of a new type of distributed infrastructures for the newly emerging patterns:	Alignment = low Expert report mentions emerging models, such as post-capitalist economy or digital currencies, but does not emphasize on exploring economic models that are predominately directed towards social benefits and needs.	Alignment = med

	Distributed collaboration platforms (eg blockchain) (OBSERVE) H9 How much is a bitcoin worth, and why? (FET Proactive Consultation) More detail on these topics: https://ec.europa.eu/futurium/en/content/economy-futures		
Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative mod-	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none

els, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.			
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none
Topics mentioned only in the expert based study			

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations. Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none

Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of "education into action" and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and "out of the box" thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people "smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking:	OBSERVE 17 none OBSERVE 36 none	Alignment = none	Alignment = none

1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.			
Topics mentioned only in the expert based study for the whole Grand Challenge			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	OBSERVE 17 16 Privacy Providing Systems **Aspects** Develop a refined definition of privacy based on human rights and integrity Establish regulation which generates protected spaces according to this definition reaching out across key societal domains (work, health, public space ...) Develop technologies supporting such spaces such as self data destroying technologies	Alignment = high Expert report mentions all main issues in CIMULACT topic.	Alignment = med

	Concepts like “blacklists” as prisons of the future (people not on the blacklists are protected in the privacy spaces) 9 Technologies for decentralised consensus generation **Key idea** Through the internet we now share information – this may allow us to share consensus. Technologies like blockchain provide the possibility for people to jointly agree on the next chapter. This is now used for financial transactions (bitcoin) but it can be leveraged to carry out all sorts of interactions among individuals in a trusted, secure, privacy conserving way that keeps track of the full history of contributions. We suggest developing this into a decentralised consensus building mechanism.		

	The system is very complex system, there are many open problems and no theory for this at the moment. **Applications/Implications** Political and economic participation (including voting) Rethinking and upgrading financial and banking institutions Land registering and bankability (emerging countries) IPR system OBSERVE 36 Privacy Providing Systems Privacy issues are an important element in current future oriented debates especially in the context of the rising use of big data analytics, face recognition and concepts like		

	the internet of things or industry 4.0 on the one hand and concentration of user data in the hands of very few private companies on the other. Two elements from the OBSERVE screening highlight the type of disruptive pathways that may be emerging both in terms of privacy threats and privacy solutions: Extraordinary advances in facial recognition cause huge privacy issues N&T9 Privacy preserving technologies N&T12 More detail on these topics: https://ec.europa.eu/futurium/en/content/privacy-preserving Shifts in Research Practices The OBSERVE screening revealed debates around changes in research practices. Some are driven by societal demands such as gender equality, transparency, citizen participation and animal rights others stem from shifts in scientific approaches		

	such as increasing use of computational methods. Distributed collaboration platforms H9 Scientists share their embarrassing #field-workfail stories SP5 Gendering in research innovation H13 Human animal relationship H15 Bioinformatics S18 Research front: Human disease analysis using Genome Wide Association studies N&S18 Digital humanities C1 Multi-disciplinary simulation research C2 More detail on these topics: https://ec.europa.eu/futurium/en/content/future-research-practices One contribution from the FET Proactive consultation emphasises the high potential of art contributing to knowledge generation:		

	Fully integrating Arts in the S&T research and innovation agenda: the role of imagining and making in the creation of knowledge for innovation		
Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.	Observe 36 Mixed Realities for Extended Human Sensation Several sources argue that we are entering the age of multiple realities (H24, SPT4). Technologies and practices which allow us to experience augmented or virtual reality are extremely prominent in the current discourse: 360 degree videos, advanced vr-gaming, vr-therapy, a real time painting 3D-model translator, vr development tools for animations, paint applications for oculus rift and space experiences. Virtualization and wearable computing devices are expected to combine to create a new wave of social technology. The Oculus Rift already allows users to virtually explore real environments	Alignment = med Expert report mentions most of main issues in CIMULACT topic.	Alignment = low

	from the perspective of a child, and wearable recording devices are beginning to capture the details of everyday life. Developments like the personal headphones which can filter out unwanted noise point to a world where "reality will be in the eye (and ear) of the beholder". VR and augmented reality topics are one of the most popular areas on Kickstarter. Science fiction novels envisage nano-cells on the skin that simulate an environment for the body that can be felt, heard and seen. Some observers argue that long term visions for "virtual reality societies" are lacking and several challenges remain. More detail on these topics: https://ec.europa.eu/futurium/en/content/mixed-realities One contribution from the FET Proactive consultation highlights the need to advance the understanding of sound in mixed reality systems: Introducing sound in depth within interactive digital systems		

Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly • Reducing bureaucracy, speeding up the research and implementation of new initiatives	OBSERVE 17 10 Understanding potentials and limits of human machine co-evolution interfaces Key Idea Develop a framework for assessing who benefits and who is impacted in co-evolving systems of humans, technology and nature of any scale. Thereby enabling ex-ante value-sensitive design paradigm on (non-)symbiotic interfaces. Make interfaces transparent so explicit decisions can be taken. Develop technologies to enhance the beneficial feedback loops between societies of living systems. Community	Alignment = high Expert report mentions most of main issues in CIMULACT topic.	Alignment = med

	Sociologists, economists, ethnologists, anthropologists/ natural scientists, engineers. Applying the formers' tools to the latter's subject area? OBSERVE 36 2.15 Low Footprint Chemical Processes Already in 1998 scientists developed 12 principles of "green chemistry" underpinning more environmentally benign chemical processes with e.g. less waste, higher efficiency and toxicity to human health and the environment. Several findings of the OBSERVE analysis relate to these principles indicating that this domain is still a highly active and future relevant domain for research and innovation with room for disruptive and foundational approaches with substantial sustainability benefit.		
Topics mentioned only in the expert based study for the whole GC			

Emergency Preparedness	OBSERVE 17 none Observe 36: Several of the findings of the OBSERVE screening point to possible disruptive events that may lead to emergency situations for human societies. At the same time the findings include strategies to deal with and prepare for specific threats and for disruptive change in general.The following elements of the findings relate to this umbrella topic: Post antibiotics N&S12 Threat of “space weather” N9 Pandemics strategy N13 Big data supported crisis management N&T17 Disaster management H8 Decline in solar activity by 2030 N10 Universal software bug N8 3D printed emergency shelter N&T5	Alignment = none	Alignment = low

	Distributed collaboration platforms H9		
Biomimicry New Frontiers	Observe 36 A rapidly growing number of technologies are in-spired by biological functions and solutions. One driver of the new momentum for biomimicry is the advance in simulation and freeform manufacturing (3D printing). Current examples of cutting edge biomimicry innovations include smell-guided-navigation, jellyfish inspired locomotion, insect-inspired robot design (vision and movement) and research into animal system behaviour (e.g. ants) that could help us develop the internet – or even understand how cancer spreads. Furthermore, bio-logical principles and characteristics could be used for better computing. There are already many at-tempts to emulate	Alignment = none	Alignment = none

	biological systems in order to enhance computer chip performance or binary communication processes as well as bioinspired parallel and neuromorph computing. In the 2015 Lift China Conference there was a focus in biomimicry as the next generation sustainability concept.		

State of the Future: Glenn, Jerome C./ Theodore J. Gordon/ Elizabeth Florescu (2014): 2013-14, Washington, DC: The Millenium Project

Key concepts in 23 chosen topics

Key concepts in topics not chosen in final conf

Contents

1 GRAND CHALLENGE 1 – Health, demographic change and well-being

1.1 Personal Development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
I am empowered to lead my changes Research could focus on one or more of the following key aspects: • Better understanding the current situation especially consequences such as resignation, depression, polarization, social inclusions, exclusion. • Better understanding the labor market and its future changes through theories, models and foresight approaches. • New practices and tools to empower people to make good choices and orient themselves in order to be better prepared for possible future changes (sociology, educational theory, psychology) • Exploring possible roles of communities for enabling alternative life-job-education pathways.	-People will work longer and create many forms of tele-work, part-time work, and job rotation to reduce the economic burden on younger generations and to maintain living standards.(43) -We need to teach decisionmaking throughout our educational systems, fostering an awareness that the acceleration of change reduces the time from the recognition of the need to make a decision to the completion of all the reasonable steps to make a good decision. And we need to teach how global changes are increasingly affecting our local decisions. (62) -Fundamental rethinking will be required to ensure that people will be able to have reasonable faith in information. how to counter future forms of information warfare that otherwise could lead to the distrust of all forms of information in cyberspace (77) -The unprecedented acceleration in automation with improved software and robotics is a serious threat to future employment (77) -Over 2 billion people connected to the Internet provide a new kind of market for self-employment and SMEs to find markets rather than applying for jobs. New technologies and innovations are empowering people around the world, creating new forms of business with the potential to raise living standards and reduce income disparities.(84) -Continuous evaluation of individual learning processes designed to prevent people from growing unstable and/or becoming mentally ill, along with programs aimed at eliminating prejudice and hate, could bring about a more beautiful, loving world, which will	Alignment = med Expert report recognizes numerous elements thta are affecting the process and agency involved in making decisions (and change). It explicitly mentions individual empowerment with regard to entrepreneurial activities as enabled by the Internet. It faisl to connect individual empowerment to psychological health, and life-job-education pathways as found in CIMULACT.	Alignment = med

	become more necessary as increasingly destructive technologies become more available to individuals.(111) -Tiny cameras can be swallowed and steered by an MRI machine for more-precise diagnosis. Self-propelled devices can float through the blood stream to deliver drugs. With these advances, synthetic biology, nano-medicine, and various forms of computational science, it is reasonable to assume we will live longer, healthier lives than seem possible today. If so, the concept of retirement and financial planning will change.(163) -With future autonomous robotics, advanced 3D manufacturing, and globally connected artificial intelligence, job-less economic growth could become the new normal. The industrial age and much of the information age has produced more jobs than they eliminated, but the speed, capacity, synergies, scope, and global dynamics of the coming changes will be unprecedented. The sooner the world has serious and systematic conversations about these issues, the more likely it is that the acceleration of S&T can benefit humanity (164)		
Rethinking (the new) job market needs - Investigate models of resilient educational ecosystems capable of responding in a reasonable time to the ever-changing demands of the job market and foster the acquisition of an up-to-date knowledge, ethical skills/competences and social accountability - Develop models of sustainable growth that allow for upward social mobility (status, remuneration), inclusiveness, personal fulfilment and societal well-being	-People will work longer and create many forms of tele-work, part-time work, and job rotation to reduce the economic burden on younger generations and to maintain living standards.(43) -Europe’s low fertility rate and its aging and shrinking population will force changes in pension and social security systems, incentives for more children, and increases in immigrant labor, affecting international relations, culture, and the social fabric.(48) - Open source software and the Internet‘s non-ownership model may become a significant element in the next economic system. (74)	Alignment = low Expert report notes numerous sources of disruption to current employment conditions and definitions of good, effective 'work.' CIMULACT integrates need for ethical skills, social accontability, inclusivity, personal fulfillment, and social well-being as critical	Alignment = med

	-multitasking with smart phones may cost the world economy billions per year in lost productivity due to lack of concentration and interruptions (74) -The unprecedented acceleration in automation with improved software and robotics is a serious threat to future employment (77) -Over 2 billion people connected to the Internet provide a new kind of market for self-employment and SMEs to find markets rather than applying for jobs. New technologies and innovations are empowering people around the world, creating new forms of business with the potential to raise living standards and reduce income disparities.(84) -Meantime, many businesses lack qualified workers; hence, a better collaboration is needed among the private sector, civil society, government agencies, and educational institutions to create the human capital with the qualifications needed by today's and tomorrow's job markets. (87) -With future autonomous robotics, advanced 3D manufacturing, and globally connected artificial intelligence, job-less economic growth could become the new normal. The industrial age and much of the information age has produced more jobs than they eliminated, but the speed, capacity, synergies, scope, and global dynamics of the coming changes will be unprecedented. The sooner the world has serious and systematic conversations about these issues, the more likely it is that the acceleration of S&T can benefit humanity (164)	components of redefining work and job market.	
Personal and organizational choice management Promote life-long learning and choice management to increase organisations', communities' and individuals' abilities to cope	-We need to teach decisionmaking throughout our educational systems, fostering an awareness that the acceleration of change reduces the time from the recognition of the need to make a decision to the completion of all the reasonable steps to make a good decision. And we need to teach how global	Alignment = med Expert report calls for tighter integration of decision making skills with education sys-	Alignment = med

with an uncertain future. Citizens insisted "we need solutions that promote life-long learning on both an individual and organisational level. Solutions can be social, organisational as well as technological innovations." Citizens have defined objectives and solutions on different topics: • Daring to be different • The education system • Re-definition of values • Re-definition of welfare • The level of well-being	changes are increasingly affecting our local decisions. (62) -Using leading indicators instead of lagging ones can make analytics more useful to anticipate the need for decisions rather than reacting to surprises. An organization's strategic consciousness is becoming more important than static strategic plans, allowing for management by understanding instead of just setting fixed objectives. This can help an organization act more like a complex anticipatory adaptive system and reinforce the principle of subsidiarity—decisions made by the smallest number of people possible who are closest to the execution and impact of a decision. (62) -Decisionmaking will be increasingly augmented by the integration of sensors embedded in products, in buildings, and in living bodies, with a more intelligent Web and with institutional and personal collective intelligence software that helps us select experts and acquire information, along with decision support software to receive and respond to feedback for improving decisions. (63) -the consequences of incoherent policies are so serious today that new systems are urgently needed. (63) -Collective intelligence can be thought of as a continually emerging capability that we create by building synergies among people, software (including sophisticated analysis tools), and information (including massive "big data" banks) and that continually learns from feedback to produce just-in-time knowledge for better decisions than any one of these elements acting alone. (75)	tems. It also notes numerous technologies (embedded senseors, bigdata, etc) that are likely to impact organizational decision making and change mangement. CIMULACt also addresses need for participatory redefinition of guiding social values and social welfare, as key components of decision making going forward.	
Topics mentioned only in the expert based study			

1.2 Holistic Health

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Dissemination and continuous exploitation of research and innovation in the healthcare system A dissemination and support action should be conceived to spread and exploit results of research in the healthcare system at the national and local levels. This may imply working with local entities and grassroots organisations (organizations, associations, communities, national contact points and companies) to engage people and stakeholders in discussing, adopting and adapting ongoing research and innovation achievements. Local funding entities can facilitate the continuous implementation of research results. Best practices at the local level must be identified. The action needs to identify and then to map out the local entities that can be in charge of this exploitation and dissemination activities, in order to understand their responsibilities and capacities. Contextual and infrastructure factors must be also investigated in order to understand how they influence the exploitation.	-Investment and development of new antibiotics have not kept pace with current and potential antibiotic resistance around the world.(98) -Scientists say that collecting data on pathogens that may lurk in wildlife before they jump to humans could help officials detect and stem future outbreaks (101) -Although nanotechnology promises to make extraordinary gains in efficiencies needed for sustainable development, the environmental and health impacts of nanomaterials and nanoparticles are a concern. For example, do they bio-accumulate in certain parts of the body, causing health problems? (164)	Alignment = low Expert report acknoweldges only technical solutions to complex relationships between healthcare systems and the diverse communities (and scales thereof) that they are tasked with serving. It also does not address inequalities in healthcare very well (neithe rEU nor global inequalities).	Alignment = low
Evidence-based personalized healthcare Research should explore the conditions for evidence-based, personalised and humancentric services for health promotion, prevention, treatment and rehabilitation. Reliable user lifestyle profiling methods and technologies should be developed, in order to achieve personalised holistic data-based health services. For this purpose, large amounts of data provided by miniaturised, environmentally friendly (wearable or distributed) systems could be combined with existing data from other sources (e.g. EHR7, insurance data). This needs to go together with research on skill training programs for both doctors and citizens in order to:	Telemedicine and self·diagnosis via biochip sensors and online expert systems will be increasingly necessary. (96) Future uses of genetic data. software, and nanotechnology will eventually help delect and treat disease at the genetic or molecular level.(96)	Alignment = low Expert report notes some technologies that are likely to play an important role in personalized helathcare systems. However, CIMULACt calls for more holistic approach to medicine (coupled with local, contextually sen-	Alignment = low

- For doctors to complement the curriculum with social psychology (i.e empathy training) on one hand, and digital literacy and data mining on the other. - For the citizens to be trained on health and digital literacy.		sitive approach to individual). Furthermore, CIMULACT integrates suggests for alternate education paradigms for both doctors and citizens including data literacy and empathy training.	
Access to equal and holistic health services and resources for all citizens Research should define the state of the art of the healthcare system in the different European countries in order to promote an equal distribution of resources and knowledge with a Pan-European dimension. The action may imply: 1) Setting the indicators to carry out a comparative analysis of the good and bad practices in the different countries across Europe in the healthcare system, funding models, incentives and in the education/training system. This may lead to knowledge and data distribution with open access and guidelines agreed upon by all stakeholders to create a European health network and to harmonize medical care. 2) Understanding and developing the local knowledge about healthcare with regard to: a) local approaches and medicines that are complementary to the European standard approach; b) the specific situation and circumstances of the patient, in order to set more holistic, person-centred approaches. This may be reflected in the education courses for citizens and healthcare professionals to promote health awareness.	The aging population of Europe continues to pressure government medical services, while infant mortality under five has been cut in half since 1990 and maternal mortality has dropped by one-fourth. The European Health Report 2012: Charting the Way to Wellbeing by WHO gives country statistics for mortality, causes of death, risk factors and risky behaviors, and six goals for Europe by 2020 in premature mortality, life expectancy, inequities in health, wellbeing, universal health coverage, and national targets set by member states. WHO Europe (Health 2020) is changing its focus toward prevention amid a funding crisis due to the global recession. Hospitalborne infections affect 3 million Europeans per year. Ukraine has the highest prevalence of HIV in Europe, but this has been decreasing since 2006. TB deaths continue to increase in Europe after a 40-year decline. President Medvedev initiated obligatory drug tests in Russian schools and universities. (106)	Alignment = low Expert report lists numerous figures related to EU's aging population but does not combine that analysis with diversity of localized conditions across EU, not does it call for resarch into guidelines to harmonize healthcare with local knowledge and culture, or EU wide policy initiatives to address distribution of resources.	Alignment = low
Health empowerment through “Everyone’s science”	-Examples of other ways to help balance future populations and resources are: (…) Encourage telemedicine (including online self-diagnosis expert software) and mobile phone tele-education (…). (45)	Alignment = low Expert report acknowledges technical solutions that	Alignment = med

An open dialogue and communication (science - society dialogue) on health related research and innovation insights and activities should be explored and experimented, so as to empower citizens to look after their well-being themselves. **On the side of the recipient:** target-oriented communication methods should be developed, and science should be involved in the development of new apps (in order to ensure that data will not only be collected, but also correctly interpreted). **On the side of the sender:** the charge of disseminating the results should be taken also by the responsible of the research: in order for this to happen the medical curricula should be revised decreasing the weight of "classical topics" in favour of courses on how to efficiently communicate with the patients.	-Telemedicine and self-diagnosis via biochip sensors and online expert systems will be increasingly necessary because people are living longer, health care costs are rising, and the shortage of health workers is increasing.(98)	will play a role in personalized medical care, but doesn't make mention of open data, securing private data in open research settings, and a host of other issues critical to success. CIMULACt further calls for revised medical curricula, empowered citizens, and science-society dialogues.	
Deconstruction of age Research should strive to understand the following aspects: • neurobiological underpinnings of learning throughout lifetime to identify the key lifestyle factors promoting neuroplasticity and neurogenesis • fundamental biological and psychological processes involved in the ageing process • the conditions promoting intergenerational relationships • the societal and economical impact of the melting of sociocultural borders between different ages • the impact of the adoption of healthy life-styles and lifelong learning on employment, innovation and social change	-If fertility rates continue to fall, world population could actually shrink to 6.2 billion by 2100, creating an elderly world difficult to support. (42) -By 2050, there could be as many people over 65 as under 15, requiring new concepts of retirement. Countering this "retirement problem" is the potential for future scientific and medical breakthroughs that could give people longer and more productive lives than most would believe possible today.(42) -Examples of other ways to help balance future populations and resources are: (…) anticipate potential impacts of sythetic biology and other longevity technologies that could make aging healthier and more productive. (…) (45) -About 34% of the [EU] population will be 60 or older in 2050, and the number of workers supporting each pensioner will decrease from four to two. (48)	Alignment = low Expert report recognizes some challenges of aging society (global and EU specfic), through reports on demographic trends. Research is limited to creating harder working older citizens, and longevity medicine. CIMULACt calls for comprehensive social and scientific approach to addressing difficulties of aging society (including integenerational relationship building) , healthy lifestyle promotion, breaking down social-cultural borders,	Alignment = low

		and promoting neuroplasticity.	
Topics mentioned only in the expert based study			
Reacting to new health threats	- Antibiotic resistance, malnourishment, and obesity are increasing problems. (98) -Investment and development of new antibiotics have not kept pace with current and potential antibiotic resistance around the world. This could make major antibiotic classes (such as beta-lactams, carbapenems, fluoroquinolones, and aminoglycosides) useless and lead to the reemergence of TB, malaria, and HIV. It could also increase the likelihood of new "superbug" pandemics. (98) -Poverty, urbanization, travel, immigration, trade, increased encroachment on animal territories, and concentrated livestock production move infectious organisms to more people in less time than ever before and could trigger new pandemics (100-101)	Alignment = none CIMULACT does not concentrate efforts on specific new health threat possibilities, but is rather focused on holistic approaches to helathcare and communicty care.	

1.3 Work-Life Balance and Wellbeing

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Technology as a means of wellbeing Instead of being governed by technological devices, we want to govern them. Especially in the workplace, the aim is that final users (employees) play an active role in the development and process of introduction of new technologies, so that the development is end user centric. The promotion of a higher level of awareness in the use of technology will allow reaping the benefits it offers without suffering negative consequences such as screen addiction, shifting relationships from physical to virtual space, thinner boundaries between virtual and real actions and exploitation at the workplace.	-It is reasonable to assume that the majority of the world will experience ubiquitous computing and eventually spend much of its time in some form of technologically augmented reality (74) - multitasking with smart phones may cost the world economy billions per year in lost productivity due to lack of concentration and interruptions (74)	Alignment = low Expert report notes possible new forms of 'well-being' within virtual spaces, but also says that interconnectivity erodes productivity and attention. CIMULACT is focused on co-developing technologies that can improve comprehensive well-being (physical, psychological, etc), and in learning and promoting healthier behaviors regarding technology.	Alignment = low
Balanced work-life model Research should rethink the definition of "work" and develop approaches that permit to recognize and reward as "work" all different kinds of human activities including socially valuable daily life activities such as domestic work, childcare, caring for the elderly and social work. Research should help identify and define the different flexible forms of work. Studies could be carried out to analyse the sectors that would fit and not fit for different flexible forms of work, and identify/evaluate the barriers for introducing new forms of flexible work. Research should also pay a particular attention to the relation of negotiation between enterprises and employees (balanced and fair). However, research should also investigate different frameworks to assess the workload and/or it's accomplishment. It will intend to help people feeling satisfied (and healthy) with their tasks/work, as		Alignment = none	Alignment = 0

well as with their personal life as they experience a sufficient degree of flexibility. In this sense, research should help to create a setting where there is flexibility within boundaries and boundaries within flexibility. What is missing is performance research from the organisational perspective, in order to link it with the existing on personal life research. As work-life balance has been researched for a long time, there is a need that the research that has been done is put into practice.			
Finding a balance in a fast-paced life Research and innovation activities should explore ways to support citizens to manage their daily lives in a balanced way by valuing relationships, taking breaks and creating opportunities for recreation. Aspects could be: • reducing stress at the workplace, improving the quality of educational campaigns, achieving better efficiency at the workplace, teaching people how to set goals • better transport options including alternative ways to travel such as teleportation and space travel for saving time • ensuring more accessible environments • digitalisation of many of the “analog” activities overcoming the notion that time is money		Alignment = none	Alignment = 0
Promoting well-being through relating environments Research should be developed at different levels: **the working environment**: environments that promote teamwork, pleasant atmosphere, cooperativeness; spaces designed for people to relax and strengthen interpersonal relationships; Flexible work conditions, work in the virtual sphere. **the community level:** group counseling at a municipal level; well-designed spaces for various		Alignment = none	Alignment = 0

activities; mentorships and inter-generational programmes to foster relationships, transfer of skills. **the individual level**: empowering citizens through education, improving digital literacy, upgrading learning environments to motivate&facilitate learning. **the governmental levels**: transparency, accountability.			
(Business)Models for balancing time **Experimenting** with or setting up work-life balance pilot programmes e.g. • integration of 'free time' in the work place • new ways of employment where employees are more like volunteers / freelancers • [ways to] increase the use of technologies in companies to enable more flexible employment relations **Assessing** • the impact of work-life balance policies, • the impact of different business models on workers' time autonomy and quality of life • the psychological acceptance of new forms of work, both individually and by society		Alignment = none	Alignment = 0
Topics mentioned only in the expert based study			

2 GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy

2.1 Agriculture and Food Research

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Good quality food for all Both basic and applied research should be developed with an interdisciplinary approach to understand and assess the processes generating food inequalities and examine how this affects social and economic cohesion locally and globally. Research should focus on the following aspects: • Map the food access in rural and urban areas, • Calculate and assess food poverty in the EU, • look at supply regulation and issues connected to distribution and prices (transnational level), • investigate the socio-economic inequalities existing inside a country with regard to food and nutrition (national level), • analyse all questions surrounding sustainable nutrition: quality, health (use of pesticides), access to healthy food (local level). In addition, concrete approaches to addressing the issues could be explored such as: • Design and assess educational programmes to encourage healthy sustainable food habits in particular in primary education, • The universal basic income as a way to provide equal access to quality food. Transnational, national and local level	-FAO estimates that 30% (2 billion people) suffer from “hidden hunger.” This is a situation in which the intake of calories is sufficient but the amount of vitamins and minerals is not. Industrial agriculture can reduce the nutrient content of crops, thus escalating the risk of hidden hunger. (43) -There are enough food resources and varieties in the world to feed everyone, but their management and distribution are deficient, ending up with about 33% of the food produced for human consumption being wasted. (44) -FAO forecasts that food production should increase by 70% by 2050. Over the same period, food prices are likely to increase due to a combination of increasing forces.2 It is not clear that food nutrient density will keep pace with human needs. (181) - Food prices, driven by growing demand, climate change, and monopolization, rise, and landgrabbing increasingly threatens the livelihood of many poor people.(182) -A concentration of power gives the agricultural biotechnology companies a near monopoly over a large part of global food,undermining small farming and farmers’ rights and most probably driving up costs (182) Incorporate nutrition information into school curricula, especially at very young ages, and make nutrition an elective course in universities. Train more food and agricultural scientists who will work in their own countries. Make education mandatory for food developers	Alignment = med Expert report focuses on global scale factors of food supply and logistics. Impressive data that aligns with portion sof CIMULACT research susggestions. CIMULACT also notes that sustainability, comprehensive nutrition (and education), and UBI can play a role in addressing food challenges specific to EU and EU values.	Alignment = med

	and owners of the food industry. Develop mobile applications for interactive consulting on agronomy for small-scale farmers that will extend appropriate professional technical advisory services tied to accessible and dynamic local, regional, and global knowledge management systems. Fund research and testing plots that highlight the benefits of an integrated food production system. (190)		
Evolving food culture in growing cities Research should investigate the following aspects: • Comparative study of food supply chains and their social, ecological and economic impact • Studies on the role of food as an enabler for social inclusion and cohesion in cities • Sociological and behavioural research on food practices and habits taking into consideration aspects related to flavour, taste and emotions. • Historical research of nutrition flows during periods of migration • All stakeholders (including the actors of the food service economy, food providers in cities, producers, importers, etc.) and in particular citizens, should be included in the research on more sustainable food production, consumption and delivery Research should help developing and demonstrating practical solutions such as: • Policy tools for management of mixed food cultures in cities, • Sustainable non-indigenous local growing techniques, • Intervention options into diverse and multicultural food consumption practices, • Non-prescriptive tools to define the footprint (co2, water, land use) of food, -Scenarios and strategies for integrated local food production for different cities with different climates (dynamic modelling). • Urban planning, architecture and design should shape cities in order for them to facilitate and increase community	Improve food packaging, storage, and transport. Improve the level of technological innovation in the food industry chain. Improve local production and market systems. Convince food markets that sustainable development and green solutions are also good business.(189) Incorporate nutrition information into school curricula, especially at very young ages, and make nutrition an elective course in universities. Train more food and agricultural scientists who will work in their own countries. Make education mandatory for food developers and owners of the food industry. Develop mobile applications for interactive consulting on agronomy for small-scale farmers that will extend appropriate professional technical advisory services tied to accessible and dynamic local, regional, and global knowledge management systems. Fund research and testing plots that highlight the benefits of an integrated food production system. (190)	Alignment = low Expert report address technologies that can improve elements of the food industrial systems (including supply), and includes a call for experimental plots that can demonstrate beneifits of integrated food production (which can be useful for urban farming initiatives. CIMULACt focuses on cultural and contextual elements of urban food environments, and inclusive processes to better integrate communities and their diets.	Alignment = low

collaboration and social cohesion via a more sustainable food production and consumption.			
Good food research Research needs to explore ways to guarantee the provision of sustainable and nutritious food. Secondly we need to identify impacts of new research driven food paradigms (e.g. biotechnology) on health, economy, environment and sustainability in a comprehensive and systemic way. Applied research can provide the knowledge and information base. It is also important to ensure the relevant dissemination of outcomes or their use in respective regulations, policies etc. Implementation of educational programmes can create awareness and promote the use of new food at schools.	-FAO estimates that 30% (2 billion people) suffer from "hidden hunger." This is a situation in which the intake of calories is sufficient but the amount of vitamins and minerals is not. Industrial agriculture can reduce the nutrient content of crops, thus escalating the risk of hidden hunger. (43) -Conventional farming relying on expensive inputs is not very resilient to climatic change. Agricultural productivity could decline 9–21% in developing countries by 2050 as a result of global warming. (44) -New agricultural approaches are needed, such as producing pure meat without growing animals, better rain-fed agriculture and irrigation management, genetic engineering for higher-yielding and droughttolerant crops, reducing losses from farm to mouth, precision agriculture and aquaculture, planting sea grass to bring back wild fish populations, and saltwater agriculture (halophytes) on coastlines to produce food for human and animals, biofuels, and pulp for the paper industry as well as to absorb CO2, reduce the drain on freshwater agriculture and land, and increase employment.(44)	Alignment = med Expert report highlights components of food research for greater health and wellness of diverse populations (i.e. 'hidden hunger'). Expert report also calls for research into new agriculture approaches. CIMULACT also calls for comprhehensive and systemic research into food technologies and their impacts, along with dissemination and education programs.	Alignment = low
Responsible use of land We need to manage the confrontation between a growing demand for high quality food, and declining land space for agricultural production. Therefore research is needed to develop efficient systems for governing and utilizing land, and for using resources responsibly for sustainable agricultural production. Multilevel governance is required to solve resource use conflicts and produce synergies to ensure the sustainable management of soil, water and space, taking into account the growth of population. Understanding the climate change impact, and developing innovative sustainable production processes can be approached through	- Agriculture accounts for 70% of human usage of fresh water; the majority of that is used for livestock production. Such water demands will increase to feed growing populations with increasing incomes. Global demand for meat may increase by 50% by 2025 and double by 2050, further accelerating the demand for water per person (33) -To keep up with population and economic growth, food production should increase by 70% by 2050. (43)	Alignment = med Expert report cites land use among a number of other factors that play a major role in shaping global food production and distribution systems CIMULACT more specifically called for inclusive process through which local practices and multi-	Alignment = low

soil-land-water research and through responsible research and innovation.	-Conventional farming relying on expensive inputs is not very resilient to climatic change. Agricultural productivity could decline 9–21% in developing countries by 2050 as a result of global warming. (44) -Some researchers argue that industrial agriculture reduces the nutrient content of crops, thus escalating the risk of hidden hunger. (181) - Food prices, driven by growing demand, climate change, and monopolization, rise, and landgrabbing increasingly threatens the livelihood of many poor people.(182)	level governance can be coupled with land-use decision making.	
Topics mentioned only in the expert based study			
Need for changes in food-production and consumption	-It is estimated that growing pure meat without growing animals would generate 96% lower GHG emissions, use 45% less energy, reduce land use by 99%, and cut water use by 96% compared with growing animals for meat. These technologies have tob e supplemented by policies tat support carbon taxes, cap-and trade schemes, reduced deforestation, industrial effeciencies, cogeneration, conservation, recycling, and a switch of government subsidies from fossil fuels to renewable energy. (24) -Seriously addressing global warming will require better conservation, higher efficiencies, changes in food and energy production, methods to reduce the GHGs that are already in the atmosphere, and adaptations to climate changes already in motion for many years to come. (24) -Development planning should integrate the lessons learned from producing more food with less water via drip irrigation, seawater greenhouse and precision agriculture, improved rain water management and irrigation, watershed management, selective introduction of water pricing, and successful community-scale projects around the world. (33)	Alignment = low CIMULACT adds for need in changed production and consumption across all product fields, including food. However, this element of expert report lend further detail to arguments concrning more sutainable and environmentally friendly food production in EU.	Alignment = low

	-Conventional farming relying on expensive inputs is not very resilient to climatic change. Agricultural productivity could decline 9–21% in developing countries by 2050 as a result of global warming. (44) -New agricultural approaches are needed, such as producing pure meat without growing animals, better rain-fed agriculture and irrigation management, genetic engineering for higher-yielding and droughttolerant crops, reducing losses from farm to mouth, precision agriculture and aquaculture, planting sea grass to bring back wild fish populations, and saltwater agriculture (halophytes) on coastlines to produce food for human and animals, biofuels, and pulp for the paper industry as well as to absorb CO2, reduce the drain on freshwater agriculture and land, and increase employment.(44)		

3 GRAND CHALLENGE 3 – Secure, Clean, and Efficient Energy

3.1 Smart Energy Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Smart energy governance In order to reduce carbon emissions, combat pollution, nuclear failure and energy poverty, and reduce energy dependency it is urgent to find locally managed, decentralised, fair and democratic energy solutions. A decentralised energy supply system can, however, be severely hampered by even small tensions and lack of trust. Therefore it is important to find participatory modes of governance that balance all interests. Research should develop, test and make policy discourse about new governance models, which are able to mitigate the tensions around the economic, technical, social and democratic implications of smart energy systems. It should thereby create trust, fairness, justice, avoiding energy poverty, and facilitating democratic governance and public participation. The governance models must have a sector-coupling approach, so that i.e. costs and prices will be distributed fairly in an accountable manner between e.g. heat, power, fuels, and between sources, such as biomass and waste. Further, these models need to create a set of effective incentives including creating motivation for private investments, consumer behaviour, avoidance of rebound effects, and for collective ownership. Ownership structures should be part of the governance models and should be investigated for their ability to support the development towards broadly accepted smart energy systems. The mobilisation of prosumers and energy conscious consumers should be considered as an important aim for the governance models, as should the future need for "energy communities" in which citizens locally support each other in participatory processes to implement	- Shell forecasts global energy demand to triple by 2050 from 2000 levels, assuming that the major socioeconomic trends continue. This, they assert, will require "some combination of extraordinary demand moderation and extraordinary production acceleration."(153) -Collaborative systems, social networks, and collective intelligences are self-organizing into new forms of transnational democracies that address issues and opportunities. This is giving birth to unprecedented international conscience and action, augmenting conventional techniques for global improvement. New systems are being invented to address increasing complexity that has grown beyond hierarchical management. (74)	Alignment = low Expert report focuses energy information through lens of fossil fuels and traditional sources. CIMULACT calls for more decntralized, sutainalbly derived energy sources. CIMULACT calls techno-social governance of energy grids, which might be vaguely inferred from expert reports language referring to collaborative systems.	Alignment = low

the smart systems, which are the right ones for them and their context. Projects should, thus, provide a definition and validation of tools for transparent, participatory and multi-disciplinary energy governance, enabling multi-layered integration of stakeholders' interests and investigate barriers and success factors for such governance models. Specific attention should also be paid to aspects of security, data handling and privacy in a Big Data scenario to ensure trust among end-users. The research should map and engage the relevant actors, including consumers/prosumers/citizens, and should be highly active to create policy dialogues nationally and on a European scale, as several European members states should be engaged in the project facilitated discourse. The research is expected to be anticipatory, participatory and highly multi-disciplinary, involving tight collaboration between e.g. smart energy systems experts, system modellers, sociologists, legal expertise, organisational expertise and public education and participation expertise. The consortia will need to have skills regarding policyn discourse and implementation			
Topics mentioned only in the expert based study			

4 GRAND CHALLENGE 4 – Smart, Green and Integrated Transport

4.1 Transportation and Lifestyle

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Sustainable transport solutions that enable us to live where we choose Research and innovation should investigate how to enable distributed living that is economically feasible and sustainable for the environment. In this context there is a need to define what is understood by "local" and what is meant by "communities that are organized locally" as this is not necessarily the same as "rural". However, research should look also to the needs of the rural (poorer?) areas, e.g. low cost, small impact, and efficient infrastructure. Current transport strategies solutions should be identified, as well as the current and future transport needs in an (interactive) collaborative process including all users and other target groups (the people). One of the crucial questions is "What remains as transport needs - in and between – the local communities in the new societal contexts of life organization (change of lifestyle, chance of behaviour, social trends). In a localized organization of life, what would be the transport needs (frequency, distance covered, and reason to move) and what transport services would be needed to satisfy those needs (are walking and biking enough?). Furthermore there is a need for analysing which services have to remain in the city and which services can be provided on a local level (also in the "rural"), how to articulate and interlink them and how to guarantee access to everybody. Research should look to the most appropriate equilibrium (relationship) between the connectivity of the "local" with the "urban" and the idea of "self-sustainability" of local communities. This should be done by developing infrastructures, new/innovative business models and virtual tools of all kinds (provided by "digitalisation") for the provision of public and private services in remote areas. Research should also look into the ways to anticipate, handle and manage the changing transport needs created by new technologies and social		Alignment = none	Alignment = 0

media, in an ever changing world, where technological development is very quick, and alike quick are the changes in communication behaviour and transportation needs as a response to those changes The reduction of imbalance in transportation choices, and the promotion of a decrease of the isolation of people in distant rural areas are paramount in this context.			
Freedom to choose where to live In order to establish good connectivity between urban and non-urban areas research should investigate technological and organisational solutions for sustainable (low energy intensive/ less polluting) transport options that are adapted to the requirements of rural areas (low cost/ impact/infrastructure). To ensure that future changes work in practice, research should also analyse the actual current transport and explore innovative solutions and evaluate current users of public transport. Research should also look into the unequal access to medical and care services between urban and rural areas. Finally, research should also explore work models that could impact the transport needs (teleworking, jobs in rural areas rather than concentrated in cities).		Alignment = none	Alignment = 0
Moving together (more collective transport options) Applied research should be developed on transport systems: less based on infrastructures (and more flexible) or intensifying the use of existing infrastructures; less top-down organised and more community-based, self-organised (swarm intelligence); capable to enable socialisation (i.e. being together in collective transports); based on flexible units (i.e. individual units able to temporary aggregate and disaggregate, trains of units and local capillary distribution, …).		Alignment = none	Alignment = 0
Topics mentioned only in the expert based study			

5 GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

5.1 Sustainable Consumption

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
At one with nature Research should explore how to make a system of policy and planning frameworks, with legal structures and institutions that promote more affordable and accessible sustainability lifestyles. In forming smart consumer habits, while continuing to improve quality of life and sustainable development across the social spectrum, a specific focus could be on forms of integrating natural environments and contacts with nature into land use planning. Relevant research aspects may be: Exploring how attitudes and behaviors have an influence on consumer patterns and societal relationships with the natural environment, Researching the possibilities for establishing legal rights for ecological entities and systems (trees, water ways, fauna, etc.,) as a way to help support behavioral and attitude change, Targeting social innovation programs, education, incentive schema and awareness raising campaigns to explore and disseminate good practices for individuals, communities and cities, Studying the economic, social governance and legal environments underpinning the good practices and methods to remove barriers to an accessible, sustainable lifestyle.	-Without more intelligent human-nature symbioses, increased migrations, conflicts, and disease seem inevitable.(45) -Global ecosystem services that provide life support and economic foundations are valued from $16 trillion to $64 trillion. These are being depleted faster than nature can resupply them. Human activity dominates 43% of Earth's ice-free land surface and affects twice that area.(23) -The Group on Earth Observations Biodiversity Observation Network—GEO BON—was established to organize and improve biodiversity observations globally and make the outcomes more readily accessible to policymakers, experts, and other users. (23)	Alignment = low Expert report mentions the reliance of human systems on natural resources that are being depleted faster than they can regenerate. CIMULACT calls for social, technical, and political research that can alter consumer behavior, creating systems that better reflect shared (or redefined) social values.	Alignment = low
Consume smarter, increase wellbeing To shift our long-term thinking, re-evaluate our consumption and shift the emphasis from material wealth to healthy wellbeing are all essential for the development of proper values which are necessary for sustaining our social, economic and natural environments.	-Global waste has increased 10-fold in the last century, and it could double by 2025 from where it is today.(23)	Alignment = low Expert report metnions the problem of global waste, and someof the involved figures. CIMULACT	Alignment = low

To explore policy with explicit goals for conducting market and behaviour research in line with alternative economies (for example the service society, the sharing economy). Additional research can be directed to developing experiments with the contract terms, legal frameworks and consumer protection policies to explore and disseminate responsible consumption patterns. To gain knowledge on more responsible handling of the resources and co-responsibility of corporations, public actors and citizens, with a focus on promoting the circular economy. Examples of this include subsidies for recycling and renewable energies, technologies and applications for supporting responsible consumption, legislation and incentives for long-life goods and products, and resource recovery. To explore how to pilot experimental communities with legal frameworks and incentives that might promote good practices (i.e. through educational curricula, information campaigns).		calls for diverse research into the shaping elements of consumption (from industrial incentivzs to individual behvaiors), in efforts to redefine helathy society and its responsibitlies to natural environment.	
Production awareness Current models of production are unsustainable in respect to resource use. Innovation is required on two fronts: 1) To discourage the use of technologies, which are not environmentally friendly, and 2) To support the adoption of clean technologies, as well as their development. Old economic models for the production of goods that include unsustainable practices, such as planned obsolescence need to be contained and reversed. Research needs to be undertaken to take into account cradle-to-cradle approaches and their impact on current business. The full cost and gains of 160 implementing these novel approaches are complex and difficult to quantify, especially in monetary terms. Creative ways of visualizing these costs and gains needs to be developed for the full impact to be measured.	According to UNEP's Towards a Green Economy report, investing 2% of global GDP ($1.3 trillion per year) into 10 key sectors can kick-start a transition toward a low-carbon, resource-efficient green economy that would increase income per capita and reduce ecological footprint by nearly 50% by 2050 compared with business as usual. Meanwhile, the world spends 1–2% of global GDP on subsidies that often lead to unsustainable resource use. (23)	Alignment = low Expert report provides some data that could be useful to the overall research agenda of CIMULACT, but expert report does not provide suggestions for follow up research, production policies, or sustainabilitiy focused societies.	Alignment = low
Topics mentioned only in the expert based study			

Global warming/ climate change	- Seriously addressing global warming will require better conservation, higher efficiencies, changes in food and energy production, methods to reduce the GHGs that are already in the atmosphere, and adaptations to climate changes already in motion for many years to come. Scientists are studying how to create sunshades in space, build towers to suck CO2 from the air, sequester CO2 underground, spread iron powder in oceans to increase phytoplankton, and reuse carbon at power plants to produce cement and grow algae for biofuels. Large–scale geoengineering, such as spraying sulfate aerosols into the atmosphere to reflect some sunlight, may have problems in terms of depleting stratospheric ozone, reaching an international agreement, and making the daytime sky significantly brighter and whiter. Other suggestions include retrofitting coal plants to burn leaner and to capture and reuse carbon emissions, raising fuelmefficiency standards, and increasing vegetarianism (the livestock sectormemits more GHGs than transportation does). Others have suggested new taxes, such as on carbon, international financial transactions, urbanmcongestion, international travel, and environmental footprints. Such taxes could support international public/private funding mechanisms for highimpact technologies. Massive public educational efforts by professional networks (from scholarly associations to Rotary Cubs) should use social media, popular films, television, music, games, and contests to stress what we can do to better pressure political and other leaders. Without a global strategy to address climate change, the environmental movement may turn on the fossil fuel and livestock industries. The legal foundations are being laid to sue for damages caused by GHGs. Climate change adaptation and mitigation policies should be integrated into an overall sustainable development strategy. Without sustainable growth, billions more people will be condemned to poverty, and much of civilization could collapse, which is unnecessary since we know enough already to tackle climate change while increasing economic growth. Unfortunately, we do not have	Alignment = none Surprisingly, CIMULACt does not mention climate Change directly.	Alignment = none

	sufficient acceptance of universal ethical principles for successful implementation. (24-25) -Water should be central to development and climate change strategies. If climate change results in significant sea level rise, we may see 20% of the world's coastal fresh water become saline. (33) -Future effects of climate change could create up to 400 million migrants by 2050, which could further increase conditions for conflict.(120)		
Scarcity of resources	- Because of falling water tables around the world, climate change, various forms of water pollution, and an additional 2 billion people in just 36 years, some of the people with safe water today may not have it in the future unless significant changes are made. The faster the recommendations in this report are implemented, the less suffering, disease, and conflict will occur. But progress is not yet on the scale necessary to meet the water needs of humanity and nature. (32) - Agriculture accounts for 70% of human usage of fresh water; the majority of that is used for livestock production. Such water demands will increase to feed growing populations with increasing incomes. Global demand for meat may increase by 50% by 2025 and double by 2050, further accelerating the demand for water per person (33) -Breakthroughs in desalination, such as pressurization of seawater to produce vapor jets, filtration via carbon nanotubes, and reverse osmosis, are needed along with less costly pollution treatment and better water catchments. Future demand for fresh water could be reduced by saltwater agriculture on coastlines, hydroponics, aquaponics, vertical urban agriculture installations in buildings, production of pure meat without growing animals, increasing vegetarianism, fixing of leaking pipes, and the reuse of treated water. (33) -Development planning should integrate the lessons learned from producing more food with less water via	Alignment = low CIMULACT does discuss resource scarcity implcitly thorugh its positioning on issues of sustainable design of systems and products.	Alignment = low

	drip irrigation, seawater greenhouse and precision agriculture, improved rain water management and irrigation, watershed management, selective introduction of water pricing, and successful community-scale projects around the world. (33)		
Environmental disasters and threats	- The natural infrastructure along the urban coastal zones around the world is deteriorating. This deterioration diminishes nature's ability to reduce the impacts of hurricanes, tsunamis, and pollution, as it also negatively affects ecosystem services essential to livelihood. Over half the people in the world live within 120 miles off a coastline. Hence, without appropriate mitigation, prevention, and management of the natural infrastructure within urban coastal zones, billions of people will be increasingly vulnerable to a range of disasters. (195)	Alignment = none CIMULACT does not suggest research into these areas specifcally, though some of its research topics would be helpful in times of such troubles.	Alignment = low

5.2 Urban and Rural development

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Urban-rural Symbiosis Research should investigate one or several of the following aspects: Differentiated notions of diverse types of spatial development patterns based on empirical studies of concrete cases across Europe Ways to establish cultural and physical linkages across diverse types of spaces. Solutions for sustainable urban/rural environmental resource flows, identification of asset bases and means of co-governing in order to share them, Ways to improve the quality of life and attractiveness of countryside in deprived rural areas, Integrating urban rural planning approaches, Participatory governance of spatial planning, shared urban-rural participative governance structures to be explored, Exploring the drivers of migration both from rural to urban and urban to rural areas, Collecting, analysing and disseminating case studies of good practice of urban-rural symbiosis from different parts	Some 52% of the world's population currently lives in urban areas; by 2025 it will increase to 58%. In 2025, 4.3 billion urban residents will generate 2.2 billion tons of solid waste per year, an increase from 1.3 billion tons per year today. Recycling and use of waste to generate energy and useful by-products will have to become integrated in all urban areas. Without more intelligent human-nature symbioses, increased migrations, conflicts, and disease seem inevitable. Continual improvements and applications of ICT are key to improving the match between needs and resources worldwide and in real time. (45)	Alignment = low Expert report provides statistical data conerning urbanization trends, and explcitly calls for 'more intelligent human-nature symbiosis.', which addresses calls for more sustinable urban development in CIMULACT. However CIMULACt frames symbiosis as developing both urban dn rural lifestyles and systems so as to benefit both, reducing the strain urban environments cause, and reducing the brain drain and economic impact of urbanization on rural communities.	Alignment = low
Making dense and growing urban areas more sustainable and liveable Research should answer to the challenges of density, diversity, ecology, populations development, and financial sustainability of dense and growing cities, by addressing the following areas in	-Population is growing faster than many cities around the world can adequately manage and properly update infrastructure. New approaches to urban system ecology and smarter cities are beginning to be invented and implemented. (42)	Alignment = med Expert report provides statistical data conerning urbanization trends, and explcitly calls for 'more intelligent	Alignment = med

combination, not on their own, using different forms of citizen consultation in every area: The mixed/integrated urban fabric: distribute common services in time and space in order to avoid centralization and crowding and reduce tension between centres and suburbs. Facilitating the adoption of new efficient sustainable practices (i.e. behaviour change; sustainable lifestyles) Identification of innovative practices and social innovation, including from outside Europe, that can be scaled up The diffusion/dissemination of "promising/good" practices (i.e. advanced urban sustainability; urban agriculture; urban regeneration…) The creation of an integrated system of public (macro) and private (micro) transportation.	-Examples of other ways to help balance future populations and resources are: (…)Integrate urban sensors, mesh networks, and intelligent software to create smarter cities that let citizens help in urban improvements, and teach urban systems ecology. (45) -Recycling and use of waste to generate energy and useful by-products will have to become integrated in all urban areas (45)	human-nature symbiosis.', which addresses calls for more sustinable urban development in CIMULACT.	
Topics mentioned only in the expert based study			

6 GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies

6.1 Community Building

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowering diversity in community Research should investigate approaches for empowering diversity in communities by creating better models for understanding the relation between societal conditions and readiness for social inclusion taking into account differences across cultures. There is a need to search for successful models of empowering diversity in communities from abroad and examine their transferability into local policies and educational activities. Research should also investigate the compatibility between legal and social norms. In processes of empowerment for diversity, models of collaborative conflict resolution should be explored.	-Europe's low fertility rate and its aging and shrinking population will force changes in pension and social security systems, incentives for more children, and increases in immigrant labor, affecting international relations, culture, and the social fabric.(48) -The Center for Strategic and International Studies forecasts that people of Muslim origin will grow to 25% of France and 33% of Germany by 2050.(48) -Continuous evaluation of individual learning processes designed to prevent people from growing unstable and/or becoming mentally ill, along with programs aimed at eliminating prejudice and hate, could bring about a more beautiful, loving world, which will become more necessary as increasingly destructive technologies become more available to individuals.(111) -Future effects of climate change could create up to 400 million migrants by 2050, which could further increase conditions for conflict.(120) -Massive public education programs are needed to promote respect for diversity and the oneness that underlies that diversity (122) - The growing immigrant population in Europe will challenge European integration processes, ethical standards, and future immigration policies, all spurring increasing discussions of ethics and identity for Europe.(176)	Alignment = med Expert report cites numeours figures that play a role in creating the conditions under which CIMULACT research suggestions were formulated. However, expert study does little to address the actual empowerment of citizens or culturally diverse communities, particularly in the light of governance, legal, and social norms, as called for by CIMULACT.	Alignment = high

Evidence- based community building Research should focus on creating models for evidence based policy across multiple science sectors and creating more informed mindsets among citizens and policy makers. There is a need to study and develop evidence based intervention programs for reducing prejudices within and between communities. There is a need to explore models of participatory processes for collective agenda setting based on different and specific citizens needs and environments. This requires theoretical and empirical research on how communities can be transformed by knowledge, including: Introducing steps for change of mind-sets in the society, involving citizens in decisionmaking Empowering citizens through accessible informational campaigns and digital tools Grounding decisions in research and data Specifying the relation between citizens' and experts' contributions	Freedom House notes that 12% of sub-Saharan Africa's population lives in 10 countries rated "free," 53% lives in 19 countries "partly free," while 35% lives in the 20 countries with "not free" status. (55) -Massive public education programs are needed to promote respect for diversity and the oneness that underlies that diversity (122)	Alignment = low Expert report supplies some figures that are indirectly related to CIMULACT research suggestions. It does not address participatory process for governance, or generating relationships between citizen and expert contributions.	Alignment = low
Community building development Theoretical and empirical research should be developed on infrastructures that could underpin inclusion, cohesion and collaboration within hybrid and diverse populations in the long term. Research areas might regard: **Decentralization:** Developing local communities, their infrastructure, to keep the inhabitants and provide needed services **Social activism:** Building activities, actions, platforms of engagement: involving citizens in all phases of decision-making **Community spaces:** Building and evaluating new physical/social spaces for collective action and collaboration. Both should allow inclusion across generations and skills. **Digital empowerment:** Building and evaluating digital tools for collaboration, collective intelligence and collective action	...synergistically self-organized human rights movements for sustainable global democratic systems are taking place all over the world. (52)	Alignment = low Expert report genrally addresses new organizations that are forming, with reagrd to sustainable, democratic systems. CIMULACt is much more specific in its calls for research regarding inclusivity, cooperative structures, collaboration across diverse populations, and it focuses on localized needs.	Alignment = low

Topics mentioned only in the expert based study			
Empowerment of Women	Challenge 11 will be adressed seriously when gender-discriminatory laws are gone, when teh goal of 30%+ women's representation in rational legislatures is achieved in all countries, when discrimination and violence against women are prosecuted, and when development strategies include gender equity throughout all sectors. (128-138)	Alignment = none CIMULACT only addresses gender based inequalities as implied within more general discussion of inequality.	Alignment = none

6.2 Participatory Governance

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Empowered citizens Understanding the dynamics and challenges of citizen empowerment and participation in a diverse, digital society and exploring, in empirical and/or experimental ways, how citizens could play an active part in designing, producing or running public services as well as democratic processes. The methods and tools, which are developed, should ensure that everyone (society in its diversity) has the capabilities and is motivated to take part in the process; all types of knowledge should be defined and included equally in the participatory processes. The research should take into account how this redesign can improve both the inclusiveness and the outcomes of public services and democratic processes. The research should also explore what are the requirements for participation to be successful, and what are the different impacts of the different participatory methods applied.	-established democracies should not forget that democracy can be corroded or lost. Increased surveillance of people in general and political protesters specifically at the behest of governments or private companies also calls into question the respect of basic human rights. Abuse of executive power, impunity, and the growing power of lobbying reduce citizens' confidence in elected governments around the world (52) - With only 85 people owning as much as the total of the bottom half of the world population, worries are justified that the neutrality of political institutions and governments gets undermined and that the interests of economic elites get served over those of the majority (52) -Although the perception and implementation of democracy differ globally, it is generally accepted that democracy is a relationship between a responsible citizenry and a responsive government that encourages participation in the political process and guarantees basic rights.(53) - Some factors helping the evolution of more democratic systems worldwide include legitimate tamper-proof election systems with internationally accepted standards for election observers, a bettereducated world public, increasing access to information, more democratic institutions, knowledge diplomacy, data sharing, more efficient international regulations that are globally binding and enforced, and the growing number and influence of international NGOs (54) - More participatory democracy may grow from e-government to we-government.The e-generation is more borderless and wants to design new worlds. Petitions circulating around the world are beginning to influence decisions and hold governments and large organizations accountable through public participation rather than just relying on national judiciary systems. News is independently reported or validated. Some argue that access	Alignment = med Expert report highlights interrealtionahips between economic actors and democratic structures, particularly with regard to corrosive elements of fiscal incentives to derail democratic functions. It also mentions that more participatory governance can airse through the deployent of digital technologies. CIMULACt on the other hand focuses more on participatory governance as a research field that should be centerd on local communities, with experiemntation across numerous locales, epistemological modes, and the develpment of effective methods and toolsets.	Alignment = med

	to the Internet should become a human right (like libraries) as a tool for an informed public, freedom of expression, and association. (54) - An educated and truthfully informed public is critical to democracy; hence, it is important to learn how to counter and prevent various ideological disinformation campaigns, information warfare, politically motivated government surveillance and censorship, reporters'selfcensorship, and interest-group control over the Internet and other media. (54-55) -Collaborative systems, social networks, and collective intelligences are self-organizing into new forms of transnational democracies that address issues and opportunities. (74) We need to create better incentives for ethics in global decisions, promote parental guidance to establish a sense of values, teach ethics and solidarity principles in schools, encourage respect for legitimate authority while demanding accountability, support the identification and success of the influence of role models, implement cost-effective strategies for global education for a more enlightened world, and make behavior match the values people say they believe in.(174-175)		
Meaningful research for community Research should explore: Ways for research to be evaluated, selected and prioritized according to its ability to contribute to sustainable development and potential beneficial impact to the community. Better understanding of publicly vs. privately funded research for securing broad perspectives in research. Ways of building on open access and open science.	Increasingly, governments are creating some form of future strategy Units... Leaders should make these new systems as transparent and participatory as possible to include and increase the public's intelligence and resilience.(64)	Alignment = low Expert report often discusses democratization and participatory governance in more global terms, whereas CIMULACt calls for a focus on community development, particularly through inclusive research. Sustainablility and long-term thining paly a role in each, but are more prevalent in framing CIMULACT research.	Alignment = low

Snakes and ladders- Connecting scales of issues and actors Research should explore possibilities for exchanging knowledge and for taking joint actions in response to shared challenges between actors on diverse scales. This can include transdisciplinary development of practical, methodological, and technological experiments linking actors across scalar issues. Research projects can also include design and implementation of new governance structures, transparency policies, and decision-making processes.	-The financial crisis involving Greece and other Southern European countries raises moral issues about the interdependent ethical responsibilities among citizens, the state, and members of the eurozone.(176) Since decisionmaking is based on beliefs about the future, collecting and responding to diverse feedback about these beliefs should improve decisionmaking. However, judging information about the future is increasingly difficult due to the acceleration, complexity, interdependence, and globalization of change. In addition, the growing number of people and cultures involved in decisions also increases uncertainty and ambiguity about the future. (62) -An emergent property from synergies among three elements: 1) data/ info/knowledge; 2) software/hardware; and 3) experts and others with insight that continually learns from feedback to produce just-in-time knowledge for better decisions than any of these elements acting alone.[…] A useful and efficient collective intelligence system should connect these three elements into a single interoperable platform. (216) -Collective intelligence is becoming the next big thing in information technology (217) -the Global Futures Intelligence System provides both content about the global situation with prospects, and a collection of methods useful for futures research (219) -The global financial crisis and the efforts to resolve it clearly demonstrated the need for global systems of analysis, policy formation, and policy implementation (220) -The global challenges facing humanity are transnational in nature and transinstitutional in solution. No government, international organization, or other form of institution acting alone can solve the problems described in this	Alignment= med Expert report acknowledges the increasingly complex condition under which deciisions are made, many of them resulting from differences in scales of action (including globalization writ large). CIMULACT however is more focused on developing localized knowledge of global trends and systems, and communicating how behaviors at the local level play a role in shaping those systems.	Alignment = med

	report: climate change, cybersecurity threats, organized crime, rich-poor gaps, environmental pollution, international finance, gender discrimination, changing disease situations, and the need for sustainable development (221)		
The transparancy toolbox Research should explore pathways towards transparency in diverse societal contexts and ways to transform processes of governance so they can be accessible to all. Secondly we need to understand under which conditions citizens' power, agency and influence impact upon outcomes of decision making processes. Research shall also examine barriers and restrictions to transparent governance, alongside the enablers and benefits that transparency is expected to deliver.	-Abuse of executive power, impunity, and the growing power of lobbying reduce citizens' confidence in elected governments around the world (52) -Freedom House also found that press freedoms have declined in both authoritarian and democratic settings over the past several years (53) -At the same time, new technologies also make it easier for more people to do more good at a faster pace than ever before. Single individuals initiate groups on the Internet, organizing actions worldwide around specific ethical issues. News media, blogs, mobile phone cameras, ethics commissions, and NGOs are increasingly exposing unethical decisions and corrupt practices.(173) -Despite the progress made, corruption remains prevalent throughout the world.(173)	Alignment = med Expert report outlines a number of specific socio-political trends that are framed as corroding transparency and democratic functions. It also highlights technologies that can foster transparency. CIMULACT also calls for research regarding individual agency with regard to governance processes, and the barriers and restrictions to transparency that exist (where does distrust start and grow).	Alignment = low
Topics mentioned only in the expert based study			

6.3 Economy

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Debating alternative economic models There is an absolute necessity for a Europe-wide dialogue about these alternative economic models that exist and are emerging world-wide. Method: Community Support Actions should design a multi-actor approach (scientists, policy makers, businesses, citizens, civil society organisations) to foster a dialogue about experiences with available alternative models, with the aim of: • Exploring, assessing, benchmarking and evaluating alternative economic models to build a common knowledge base • Dissemination to and engagement of all relevant stakeholders in co-creation activities • Integrating and adapting models for regional / local context • Developing strategies for policy implementation	-Ethical market economies require improved fair trade, increased economic freedom, a level playing field guaranteed by an honest judicial system with adherence to the rule of law and by governments that provide political stability, a chance to participate in local development decisions, reduced corruption, insured property rights, business incentives to comply with social and environmental goals, a healthy investment climate, and access to land, capital, and information.(89) -Tiny cameras can be swallowed and steered by an MRI machine for more-precise diagnosis. Self-propelled devices can float through the blood stream to deliver drugs. With these advances, synthetic biology, nanomedicine, and various forms of computational science, it is reasonable to assume we will live longer, healthier lives than seem possible today. If so, the concept of retirement and financial planning will change.(163)	Alignment = low Expert report suggests some of the elements that create functional economic systems, but does little to address the need for dialogue concerning alternative economics, engagement with stakeholders during such deliberations, development of effective strategies, or policy implementation itself.	Alignment = low
Social economy Research should explore promising economic models that answer societal needs and investigate supporting infrastructures. This research can be firstly approached by a comprehensive inventory of what has already been implemented and by promoting further studies (scientific production and manual of good practices). This research should involve citizens and multi-actors and analyze ways to make the transition from the current economy to new models. The criteria of success of these new economic models should be sustainability, education, equality, respect of environment.	-Ethical market economies require improved fair trade, increased economic freedom, a level playing field guaranteed by an honest judicial system with adherence to the rule of law and by governments that provide political stability, a chance to participate in local development decisions, reduced corruption, insured property rights, business incentives to comply with social and environmental goals, a healthy investment climate, and access to land, capital, and information.(89) -	Alignment = low Expert report suggests some of the elements that create functional economic systems, but does not address the history of alternative economic models and their results, nor how to most effectively transition communities of different scales to such alternative economic models.	Alignment = low

Basic universal income so nobody is left behind Theoretical and empirical research should be developed to investigate ways to implement a BUI. This implies a preliminary understanding of the concept and its effects, through the study of best practices, and a study on the cultural change of the value perception of working. Then, the research will explore the diverse models of BUI with regard to the diversity of cultures in Europe. Finally it will investigate the question of the source of funds and the long-term sustainability. A pilot project that introduces BUI in certain Member states should be done. It implies the selection of a specific testing group of people, the piloting of different models of BUI and the assessments of its effects	The World Economic Forum identifies income disparity as the most likely global risk over the next decade, while the impacts of unemployment and underemployment are seen as being both likely and serious.(84)	Alignment = low Expert study cites WEF data concerning inequality in income distribution, but makes no metnion of UBI nor the other conditions (mass unemployment due to automation) that are likely to foster UBI's implementaiton. I	Alignment = low
Alternative economic model Research should investigate alternative economic models that promote sustainable ways of living. It needs to monitor, promote and expand the most relevant and efficient models, so policies can maintain the best possible catalogue of indicators. The directions to investigate include: basic income; reward for helping others/hard work/morals; economics of happiness; models that deal with the complexity of the transition of problems at different geographical scales; existing alternative models, based on a perspective of "lessons learned"; system of incentives that supports the current economic model and the needed incentives that would promote a shift to a new economic model.	-Europe's low fertility rate and its aging and shrinking population will force changes in pension and social security systems, incentives for more children, and increases in immigrant labor, affecting international relations, culture, and the social fabric.(48) -The World Economic Forum identifies income disparity as the most likely global risk over the next decade, while the impacts of unemployment and underemployment are seen as being both likely and serious. (84) -The ratio between wages and profit is increasingly and dangerously imbalanced. Well aware of this, financial leaders are placing inequality and structural reforms on the top of the world policy agenda. (84)	Alignment = low Expert report suggests some of the elements that could foster discussions or actions towards alterantive economic systems, but does not address the history of alternative economic models and their results, nor how to most effectively transition communities of different scales to such alternative economic models.	Alignment = low
From wall street to main street The current financial sector needs reformation to foster sustainability and well-being. There are many examples and evidence of more sustainable approaches, as well as investment practices, but they do not easily reach mainstream. More research is	-The UN estimates that a tax on international financial transactions might generate up to $250 billion per year, which could help offset the costs of the continuing economic, financial, fuel, climate, and food crises. Taxes on shadow banking could be a new source to help address development gaps (88)	Alignment = low Expert report mentions two factors that could incentivze the more comprehensize regulation of the financial sector that	Alignment = med

needed to understand how to transform this knowledge to the right stakeholders for the greatest impact, because the system suffers from great inertia. Greater insight needs to be generated in order to understand how to overcome this inertia by looking at regulations, technical skills and other practices, thus making the "Sustainable and Responsible Investment (SRI)" approach more adopted. To develop a green system for an effective interaction between the lender and borrowers.	-The U.S. and the eurozone have the world' s largest shadow banking systems, in 2011, with assets worth some €18 trillion (~ $24.6 trillion) and €17.2 trillion (~ $23.5 trillion), respectively. (88)	CIMULACT is calling for.	
Topics mentioned only in the expert based study			
Growing inequality	-The World Economic Forum identifies income disparity as the most likely global risk over the next decade, while the impacts of unemployment and underemployment are seen as being both likely and serious. (84) -The ratio between wages and profit is increasingly and dangerously imbalanced. Well aware of this, financial leaders are placing inequality and structural reforms on the top of the world policy agenda. (84)	Alignment = med CIMULACt addresses this in terms of food insecurity, helathcare access, but not so overty in regrds to general economic change (though again it is implied through many of the research stream suggestions).	Alignment = low

6.4 Education

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Educational ecosystem as a driver of social innovation and local development Research should investigate how systematic learning could be used as driver for local innovation and development. Traditional schools should be supplemented or modified to become multi-thematic hubs, dedicated to education and collaboration among citizens of all ages. Every hub should be as integrated as possible with the human context and material culture. Thereby they should promote values and foster cooperation among learning agents (schools, families, territorial stakeholders, communities, technology, environment, etc.), to satisfy individual and community needs and expectations (including personalized and practical education), promote cohesion and inclusion, and support capacity building and the increase of social capital.	-The ability to learn this knowledge is also improving, with Webbased asynchronous highly motivational educational systems, adaptive learning models such as cellular automata, genetic algorithms, neural networks, and emerging capabilities of collective intelligence systems.(162)	Alignment = low Expert report mentions a number of technical systems that could play a role in education and learning, but is not focused on education system reform itself as we find in CIMULACT.	Alignment = low
Design thinking and doing and life skills for all The research should investigate the power of design inquiry, thinking & doing/ as a mean to foster creativity and innovation and boost learners' abilities to think "out of the box" (set and solve the so called wicked or "ill-defined" problems). By adopting a system's approach (systemic) in studying the scaling up and potentialities of design thinking & doing from individual to communities' organizations (learning ecosystem). The research should identify good practices and methods in developing creativity. Also, the development of concrete approaches and tools in order to enable teachers and schools to implement design thinking and doing as a core educational process. The research should develop methods of diagnostics of students' talents (indicating tools, stages in development of psychological knowledge, evaluation of effectiveness of changes introduced) in order to spot and encourage particular skills and inclinations	-In addition to knowledge acquisition and socialization, Ministries of Education should declare increasing intelligence as a national goal of education, which could speed up learning applications of advances in cognitive science and brain research.(111) -Brain functioning or intelligence could be increased by combinations of improved nutrition, reasoning exercises, believing that increasing intelligence is possible (placebo effect), responding to feedback, consistency of love coupled with diversity of environment, contact with intelligent people via Internet avatars, brain enhancement pharmaceuticals, software and games, memes (intelligence is sexy), and low-stress stimulating environments, with certain music, colors, and fragrances that improve concentration and performance.(111)	Alignment = low Expert report fo-cuseson increasing 'intelligence' - a moebius term - and does not speak to the more focused curriculum reform efforts outlined in CIMULACT.	Alignment = low

Also, an evaluation of the implementation of design thinking & doing at every stage of the educational process and analysis of impact of the changes achieved.	-With the use of public communications to reinforce the pursuit of knowledge and the use of these learning innovations and concepts, individual and collective intelligence of societies could be improved. (111)		
Learning for society Research should explore the following aspects: • Educational leverages to the sense of community and common good/progress • Promoting collective intelligence (working together, consultation and co-creation) • Facilitate the transformation of “education into action” and development of a new civic sense • Promoting by education the intergenerational connections for the constant rethinking and sharing of values and priorities • Ways to acknowledge the community's problems and understanding the community/ies culture/s • Ways to provide holistic educational lifelong learning opportunities capable of empowering people to take charge of their continuous learning and development	-Continuous evaluation of individual learning processes designed to prevent people from growing unstable and/or becoming mentally ill, along with programs aimed at eliminating prejudice and hate, could bring about a more beautiful, loving world, which will become more necessary as increasingly destructive technologies become more available to individuals.(111) -At the same time, new technologies also make it easier for more people to do more good at a faster pace than ever before. Single individuals initiate groups on the Internet, organizing actions worldwide around specific ethical issues. News media, blogs, mobile phone cameras, ethics commissions, and NGOs are increasingly exposing unethical decisions and corrupt practices.(173) -We need to create better incentives for ethics in global decisions, promote parental guidance to establish a sense of values, teach ethics and solidarity principles in schools, encourage respect for legitimate authority while demanding accountability, support the identification and success of the influence of role models, implement cost-effective strategies for global education for a more enlightened world, and make behavior match the values people say they believe in.(174-175)	Alignment = med Expert report includes elements of research intopsychological unhelath or inbalance, and ethical decision making, with regard to education and learning systems and processes. CIMULACT further couples these notions with education that is tightly integrated within the fabric of a community, and result in more holistic learning.	Alignment = med
SWOT (Strenghths, Weaknesses, Opportunities, Threats) Technological empowerment Research should investigate the usage of the latest technology in education, with more creativity and “out of the box” thinking and possibility of virtual education with a greater attention to cognitive processes of students. This can change the form, content and processes of education. The SWOT analysis of technologies needs to be studied, in order to understand how to design technologies making people	-It is reasonable to assume that the majority of the world will experience ubiquitous computing and eventually spend much of its time in some form of technologically augmented reality.(74) -multitasking with smart phones may cost the world economy billions per year in lost productivity due to lack of concentration and interruptions (74) -With future autonomous robotics, advanced 3D manufacturing, and globally connected artificial intelligence,	Alignment = low Expert report metions a number of technolgoies that could shape education, and more importantly could shape the	Alignment = low

"smarter". Going beyond and reinventing ways of producing knowledge, reintroducing creativity in the process and making it driver of intelligent collective dynamics is part of the research scope. Finally, research needs to explore ways, models and solutions of technology-use in the creation of social and economic synergies on local and global level.	job-less economic growth could become the new normal. The industrial age and much of the information age has produced more jobs than they eliminated, but the speed, capacity, synergies, scope, and global dynamics of the coming changes will be unprecedented. The sooner the world has serious and systematic conversations about these issues, the more likely it is that the acceleration of S&T can benefit humanity (164) -Quantum theory also encompasses the controversial "many worlds interpretation" of our existence. In the MWI, every event is a branch point that may go in any number of directions, creating an almost infinite set of branches, each of which describes a simultaneously existing alternate world, a remarkable and counterintuitive reality. Although seemingly remote from improving the human condition, such basic science is necessary to increase the knowledge that applied science and technology draws on to improve the human condition. (165) -There is little relationship between some of the accelerating advances in S&T and what is covered in the news, discussed by politicians, taught in schools, or fills the public's mind around the world. We need a global collective intelligence system to track S&T advances, forecast consequences, and document a range of views so that all can understand the potential consequences of new and possible future S&T. (165) -Despite the extraordinary achievements of S&T, future risks from the continued acceleration and globalization remain (see the Science and Technology section under Research in GFIS) and give rise to future ethical issues (see Future Ethical Issues, also under Research in GFIS).(172)	work that education and learning seeks to ready students for. CIMULACT however is more focused on the co-development and assessment of technologies as appropriate for education (as well as appropriate for the communities themselves). Experts call for global intelligence systems, while CIMULACT calls for numerous local intelligence systems.	
Ecological future education Research should assess the relative importance of two different approaches to create systems thinking: 1)'The education path': Improve the knowledge transfer in education and address that we live in a fast changing world. The use of	-We need to teach decisionmaking throughout our educational systems, fostering an awareness that the acceleration of change reduces the time from the recognition of the need to make a decision to the completion of all the reasonable steps to make a good decision. And we need to teach how global changes are increasingly affecting our local decisions. (62)	Alignment = low Expert report discusses learning about global ecologies (of environ-	Alignment = low

innovative learning methods that stimulate creativity such as serious gaming should be investigated. Develop efficient eco-learning concepts such as teaching the value of ecosystem services. 2)'The narrative-action-path': It is not primarily about educating people, but engaging them in 'good' stories – both as 'ordinary' citizens and as politicians/decision-makers. Research on narratives as mobilizing forces for behavioural change in politics and society today.		ment, trade, migration etc), and teaching decision making and complexity managment within that framework. CIMULACT calls for the development of an educational ecology that can use mutliple modes of learning to engage students along learning path (pedagogy) that include seeing themselves as participants in complex systems.	
Topics mentioned only in the expert based study			

7 GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

7.1 Technology and Social Impact

CIMULACT Research Topic	Quotations from Text	QA 1	QA 2
Data for all- Share the power of Data Research should aim at finding ways of safely and securely sharing the power of data with non-specialists and individual citizens for use in their own lives and for participating in collective decisions. Two sets of challenges need to be addressed by research on: • People-centered challenges: data literacy, personal data privacy, co-production of data, data access ethical data use, and • Data-centered challenges: quality of data, openness of data, standardization of data.	-Open source software and the Internet's non-ownership model may become a significant element in the next economic system. (74) -Billions of people with smart phones, big data access, and common platforms and languages create a unique global capacity. This capacity may be augmented by personal assistant artificial brains that know"everything"about you (75) -this explosive growth of Internet traffic, mainly from video streaming, has created a stress on the Internet's capacities, requiring new approaches to keep up with bandwidth demand, while the ubiquity of the Internet in society makes its reliability critically vital. (76) -Security and privacy have become prominent aspects of current developments in Web usage; multi-million-dollar fines have been levied against careless data custodians. The legal complexities of accelerating changes in ICT are forcing new jurisprudence (76) -Fundamental rethinking will be required to ensure that people will be able to have reasonable faith in information. We have to learn how to counter future forms of information warfare that otherwise could lead to the distrust of all forms of information in cyberspace (77)	Alignment = Low Expert report notes trends in data transfer and access to software and hardware that spurs these trends. It also cites information security and digital warfare as critical. CIMULACT is more interested in opening data for social and community research, securing personal and private data within that framework, and teaching the necessary data literacey and communication skills to foster citizen participation ina wide range of decision-making processes that are typically data sensitive.	Alignment = med

Here, there and everywhere Research should explore ways individuals can be encouraged in the future to move from their current context (here), to different contexts (there), and ultimately to acquire a global view (everywhere) using both physical and virtual reality tools. There is a need for technological infrastructures and equal internet access, and for public investment into communication and mobility. This also calls for an interdisciplinary approach on the economic aspects of virtual mobility and on the medical and psychological aspects in order to understand the risks of physical and virtual mobility, and eventually raising awareness about them.	Web capacities are allowing businesses to carry out training, sales, and meetings in interactive and visual cyberspaces that compete with conventional reality.(74)	Alignment = med While the expert report itself is global in nautre, and at times calls for the fostering of more global, systems thinking through available technlogies (see education above), CIMULACT is additionally concerned with increasing public investment in digital infrastructure and mobility capacity, as well as understanding the risks involved with hybrid virtual/physical technologies psychological, or data security issues).	Alignment = low
Transforming technologies for planet and people In order to ensure that technology is being used for the wellbeing of people and not primarily for maximizing profits, research should consider to address one or several of the following aspects: • Develop practices of participatory development of sustainable technologies • Creating mandatory curricular programmes that address the subjects of technology and a more sustainable use of resources • Establishing a legal framework for responsible technology development and monitoring the promoted practices • Conceiving new policies and providing financial resources for the research and development of new technologies that are more environmentally friendly	It is time for a U.S.–China Apollo-like 10-year goal and global R&D NASA-like strategy to address climate change, focusing on new technologies like electric cars, saltwater agriculture, carbon capture and reuse, solar power satellites, maglev trains, urban systems ecology, pure meat without growing animals, and a global climate change collective intelligence system to support better decisions and keep track of it all. (24)	Alignment = med Expert study calls for global research agency and agenda that can focus on teh co-development of key enabling technologies for the embetterment of the planet and people. This aligns well with the ultimate goal of CIMULACT's proposals, except that CIMULACT frames these goals	Alignment = med

- Reducing bureaucracy, speeding up the research and implementation of new initiatives		within decentralized, participatory, and experimental models for policy design, tech assessment, and co-development.	
Topics mentioned only in the expert based study			
Nanotechnologies	-Examples of other ways to help balance future populations and resources are: (…) Accelerate safe nanotechnology R&D (to help reduce material useper unit of output while increasing quality). (…) (45)	Alignment = none Too specific a technological trend for CIMULCAT.	Alignment = none

8 Further topics from the study

Other Research Topic	Quotations from Text	QA 1	QA 2
Terrorist threats and threats from conflicts	-Mail-order DNA and future desktop molecular and pharmaceutical manufacturing, plus access (possibly via organized crime) to nuclear materials, could one day give single individuals the ability to make and use weapons of mass destruction (SIMAD: Single Individuals Massively Destructive)—from biological weapons that could kill millions in an epidemic to low-level nuclear “dirty” bombs. To prevent this, three areas should be developed: mesh networks of nanotech sensors and other advanced technology to detect such threats; mental health and education systems to detect and treat individuals who might otherwise grow up to use such weapons; and clarification of the roles and responsibilities of the public to detect potential SIMADs.(119) -Future effects of climate change could create up to 400 million migrants by 2050, which could further increase conditions for conflict.(120) -Because society’s vital systems increasingly depend on the Internet, cyberweapons to bring them down can be thought of as weapons of mass destruction. (121) -Massive public education programs are needed to promote respect for diversity and the oneness that underlies that diversity (122) -the participants in a Real-Time Delphi study conducted in October December 2013 by the Israeli Node of The Millennium Project maintained that nearly a quarter of terrorist attacks carried out in 2015 might be by a lone wolf, and the situation might escalate: about half of the participants in the study thought that lone wolf terrorists might attempt to use weapons of mass destruction around 2030 (207)	Alignment = None This field of factors does not explictly emerge within CIMULCAT's framing of its research agenda or suggestions.	Alignment = None
How can the changing status of women help improve the human condition?	Challenge #11	Alignment = low CIMULACT recognizes inequalities regarding women only in the more general sense of	Alignment = None

		inequality that pervades its research topics.	
How can transnational organized crime networks be stopped from becoming more powerful and sophisticated global enterprises?	Challenge #12	Alignment = none This does not play a major role in influencig CIMULACT research suggestions.	Alignment = None
How can growing energy demands be met safely and efficiently?	Challenge #13	Alignment = low CIMULACT is interested in Smart Energy govenance (see above), but the expert report frames teh entire discusio in a different light, and while providing numerous statstics and figures, does not address specific research topics suitable to CIMULACT goals.	Alignment = None

ANNEX

4

Report #1

Using Foresight to Support the Next Strategic Programming Period of Horizon 2020 (2016-2018)

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Emerging Epidemics**	At the same time the risk of catastrophic emerging epidemics is not eliminated, as poverty and environmental degradation increase the risks of new health threats. Efforts must therefore be targeted at exploiting the opportunities created by the conjunction of health, ageing, the environment and social conditions. (29-30)	Alignment = none Epidemics were not evident in citizen visisons. This could indicate that citizens priortize addressing current healthcare issues over potential threats.
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	**Synthetic Foods**	The development of fully synthetic food products, for instance, is seen as a remedy to population growth (outside of Europe) and resource scarcity (p.33)	Alignment = none Citizens do mention biotechnology as part of Good Food Research, but do not mention synthetic foods by name, nor as a solution to population growth's effect on food markets.
GRAND CHALLENGE 3 – Energy	**Resource Scarcity and Energy Demand**	The collision of population growth, the rise of a global “middle class”, and climate change creates overwhelming pressure on food, water, materials and energy reserves. A number of developed economies are at risk of experiencing power blackouts as energy demands exceed temporarily supply outputs. (16) Breakthrough strategies, such as harnessing resources exploited in space to supplement similar resources coming to an end on earth.(33)	Alignment = none
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	**Environmental Degradation**	Environment degradation is the reduction of the capacity of the environment to meet social and ecological objectives, and needs. It involves the destruction of natural habitats and the depletion of natural resources. (11) Given the extent of environmental degradation to date, the focus of policies and strategic programmes has to be the coupling of adaptation and mitigation strategies to rectify the trajectory of this driver.(33)	Alignment = low CIMULACT results imply that environmental degradation is a problem area, but orients its suggestions in a pro-active, solution-oriented manner. CIMULACT is aware of environmental degradation, and seeks to address it indrectly through various research agenda points.
	Space Exploration	While space technology makes significant contributions to the improvement of the performance of technologies and services on earth, only a small fraction of the possibilities offered by space is exploited or even known. Pushed by diminishing resources and energy sources on the planet, we are seeking to explore and exploit the theoretically infinite reserves of space. (14)	Alignment = none

		Breakthrough strategies, such as harnessing resources exploited in space to supplement similar resources coming to an end on earth.(33)	CIMULACT research makes little to no mention of space exploration and related research, though numerous scientifica nd technological advances have come from the sector.
	Rampant Vulnerability to Natural catastrophes	Intense and repeated natural disasters of major scale could overcome our society's capacity to deal with their consequences. Destructive climate change including rising sea levels could lead to massive destruction of infrastructure and loss of high-quality agricultural land in low-laying coastal areas and require relocation of entire populations. Vulnerability to natural disasters could develop into major humanitarian catastrophes, characterised by major threats to food security and large-scale epidemics. (26) The multiplication of extreme natural events is emerging as a strong trait of environmental and climate change. Natural catastrophes are a reality, not a possibility, for our society. Just like other continents, Europe requires better preparedness to these extreme events, to minimise their impact a priori and encourage multi-country collaboration in preparing for them. Because extreme events could multiply, it is important for Horizon 2020 to move towards a higher systemic resilience, through better forecasting models supported by High Performance Computing and connected to better contingency plans.(32)	Alignment = none CIMULACT results do not tend to prioritize natural catastrphes on the research agenda. Rather, through addressing climate change drivers through other means (improved energy, transport, food, etc) CIMULACT would attempt to curtail climate change and the vulnerabilities that result.
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials			
	Ageing Population	Ageing population is the cause of new economic and societal issues in Europe. A reducing active population has to bear the cost of a larger, older group. Social models of solidarity and fairness need to be reshaped. (9) The main challenge posed in Europe by this driver is the gradual ageing of the population. This is usually seen as a threat, although the health expert panel gathered as part of the project workshop did point out that older citizens can, and do, contribute to the economic and social well being of Europe.(29)	Alignment = low While CIMULACT suggests research into medical technologies and social organizations that can confront aging peoples, it seems less inclined to mention the more general trend of ageing populations that the experts hilighlight.
	Trust and Reputation	Trust can be defined as the belief that people will behave predictably. Institutions are built on trust and are a means to develop trust. The more interdependent people, economic actors, and institutions are becoming the more important trust is for the effective functioning of our societies. (24)	Alignment = low Though trust is implicit in some of the community building and empowerment research suggested by CIMULACT, the expert report centralizes trust as an important component for governing entities to piritize.
	Dissolution of European Union	Together with a regain of populism and a return to national, rather than European, responses, this could ultimately lead to the dissolution of the European Union. A weakened unifying and moderating framework raises the risk of the emergence of new divisions and conflicts within Europe.(25)	Alignment = none This possibility was not mentioned in the CIMULACT visions, which is more focused on maintaining and strengthening the EU.

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**Globalization**	Globalisation is a process of international integration covering increasingly the planet and characterised by the growing movement of goods, capital, information, people and services around the globe, itself resulting from liberalisation of trade over the last half of the last century and the establishment of an almost global information and supply chain infrastructure. Part of this process involves the rise of new economic powers and new distributions of economic activity. (9) IT connectivity and infrastructure create competitive environments, where European economic actors face new competitors and partners in a virtual and globalised marketplace. This is a strong opportunity for European businesses to capture new revenue streams from customers they could not reach economically until now. (32)	Alignment = low CIMULACT seems to recognize globalization through research items like diversified communities, urban food culture, and the need for greater inclusion. Expert report regards this as a primary driver of changes across domains.
	Trust and Reputation	Apart from social unrest, such a mistrust of the political governance of our society would almost immediately generate a high degree of uncertainty and impact much of commerce and the financial system...Even if public order could be maintained, widespread disruptions to supply chain and public services would follow and make everyday life unbearable. (24)	Alignment = low Though trust is implicit in some of the community building and empowerment research suggested by CIMULACT, the expert report centralizes trust as an important component for governing entities to pritirize.
	Crisis Prone Global Economy	Given the anaemic recovery experienced in the last two years, successive economic shocks may create a downward spiral of economic depression, protectionism, social unrest and political extremism. Starting with unmanageable inflation (or deflation), a major systemic financial failure could occur. This could set off an unsolvable market labour imbalance, with rising unemployment, and severe income disparities.(25)	Alignment = low Expert group prioritizes economic crises of the past and future as essential drivers of change. This could be underlying reason for CIMULACT's interest in alternative economic models, but it is not explicit..
	Advanced Automation	Advanced automation is likely to challenge our notions of work in a major way, raising very important political, economic and policy issues. (31)	Alignment = none CIMULACT does not prioritize Automation in its research agenda, unless implictly through improved production processes (as long as they increase sustainabilitiy, not just productivity).
	Gender Equality	Education is a fundamental factor in development and societal progress, enabling litera-cy and facilitating the integration of individuals in society in general and in employment in particular. (12)	Alignment = low Expert group does explciitly mention Gender Equlatiy in education, whereas this might only be implied within the CIMULACT report.
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom	**Robotics and Automation**	A further question is posed by the increased use of robots in the manufacturing of goods and the provision of services. The growing role of machines throughout our social, personal and economic interactions creates an uncertainty, in the medium to long term. Advanced automation is likely to challenge our notions of work in a major way, raising very important political, economic and policy issues. (p. 31)	Alignment = none CIMULACT does not make mention of robots or automation, rather emphasizing human-to-human relationships, and organizing principles.
	Conflict and Insecurity	Wars and conflicts may well remain a constant in the coming decades, with likely more civil wars and terrorist activities and certainly a rise in cyber-crime and cyber-war. Some see the emergence of unconventional weapons (such as deadly viruses) as a possible escalation in new conflicts, driven by state or non-state actors. (25)	Alignment = none War and Conflict do not factor in heavily to the CIMULACT research agenda, while the expert group sees this as a driver of change worth monitoring.

Societies - Protecting Freedom and Security of Europe And Its Citizens	**Cyber Security**	Nevertheless, for all the promises a fully connected world holds, IT shapes huge challenges for our social models: advanced automation and employment; national identities and digital natives; a global financial system and **cyber-crime,** amongst others. Addressing this challenge requires global collaboration with private and public actors, both in Europe and in other regions of the world. Cyber-defence may be a space where Europe could coordinate relevant efforts of its member states.(32)	Alignment = low CIMULACT research agenda prioritizes data literacy, and personal privacy, whereas expert group sees cyber security as playing an important role in infrastructure, financial, and social challenges.
	Multi-disciplinary Convergence	Finally, by taking a multi-disciplinary approach, Horizon 2020 can make better use of the opportunities created by multiple drivers converging. In the space formed by the interaction between driving factors (be they drivers or disrupters) Europe can identify ways to enhance prosperity and well-being within the planetary boundaries: thriving economies, flourishing societies, engaged communities and scope for personal fulfilment. (34)	Alignment = low CIMULACT does mention multi- and trans-discipline research within certain contexts, but this expert group makes such research a stand-alone priority area. Ultimatley the two reports align well on this topic, the expert are just more explicit in its mention.

Report #2

100 Opportunities for Finland and the World

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being			
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy	**Energy storage/ new energy sources**	-Artificial leaf and synthetic fuel from the sun light and carbon dioxide (130) -The production of biofuels using enzymes, bacteria or algae (131) -Flying wind power and other new ways to produce wind energy (132) -Piezoelectrical energy sources, harvesting of kinetic energy (133) -Serial production of small nuclear reactors, fission and fusion (134) -Rapidly charging light batteries and supercapacitors (135) -Massive storage of energy in high capacity batteries (136) -Solar heat and long-term storage of heat (138) -Inexpensive storage of hydrogen in nanostructures (138)	Alignment = low Experts highlight a number of essential technological developments towards the creation of smart energy grids that draw significantly more power from alternative energy sources. Such technical necessities re not the focus of Citizen research suggestions, but might be implied be overarching citizen vision.

GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**Autonomous vehicles**	-As the price of the Lidar systems had gone down, Lidar has become an essential part of autonomous navigation of automobiles and unmanned ground vehicles (UGVs). (90) -Described as a "lenseless camera" the screen developed in MIT extends liquid-crystal display devices while enabling the screen to both capture images and display them.(…) In 2030, a main application area might be autonomous navigation of automobiles and unmanned ground vehicles (UGVs). (91) -It seems that the development is now proceeding rapidly and car producers have promised that during the years2018-2020, self-driving cars will be in sale for consumers.(97) -Based on the improved ICT, electric motors and batteries, one or two wheeled self-balancing, battery-powered electric vehicles are developing and becoming practical. (…)In 2030, these vehicles will probably transport also goods without drivers. In comparison with bicycles, they are much more suitable for carrying than public transportation vehicles. They are especially suitable for urban environments and might replace the use of cars and equality in transportation. (98)	Alignment = low
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies			
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its			

Citizens			

Report #3

AN OECD HORIZON SCAN OF MEGATRENDS AND TECHNOLOGY TRENDS IN THE CONTEXT OF FUTURE RESEARCH POLICY

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	Reacting to new health threats	-**trends are at work in society that suggest that future progress in countering infectious diseases may become harder to achieve.** Urbanisation is continuing to gather pace in the developing world; climate change is influencing geographic patterns of human and animal infections (e.g. malaria); international tourism is growing; global migration levels are unlikely to abate; and excessive current use of antibiotics is set to reduce the future effectiveness of drugs against some communicable diseases (e.g. TB). (46) -While the annual number of deaths due to infectious disease is projected to decline, the total annual number of deaths from non-communicable diseases (NCDs) is project-ed to increase from 38 million in 2012 to 52 million by 2030. This **epidemic of NCDs is being driven by powerful forces such as demographic ageing, rapid unplanned urbanisation, and the globalisation of unhealthy lifestyles.** While many chronic conditions develop only slowly, changes in lifestyles and behaviours are occurring rapidly and pervasively. The leading causes of NCD deaths in 2012 were cardiovascu-lar diseases, cancers, respiratory diseases and diabetes. These four major NCDs were responsible for 82% of NCD deaths. Going forward, annual cardiovascular disease mortality is projected to increase from 17.5 million in 2012 to 22.2 million in 2030, and annual cancer deaths from 8.2 million to 12.6 million (WHO, 2014b). The prevalence of diabetes has been increasing globally in recent decades, and WHO projects that it will be the seventh-leading cause of death in 2030 (46) -Cases of **neurological disease**, spurred in particular by rising longevity and the anticipated rapid ageing of societies in the coming decades, are expected to multiply (Figure 27). Alzheimer's Disease International (ADI), for example, estimates that 46.8 million people worldwide are living with dementia in 2015, and that the number will almost double every 20 years, reaching 74.7 million in 2030 and 131.5 million in 2050. (47) -Finally, as noted earlier, use of antibacterial drugs has become widespread over several decades (although equitable access to antibacterial drugs is far from being available worldwide). These drugs have been extensively misused in both humans and food-producing animals in ways that favour the selection and spread of resistant bacte-ria. Consequently, **antibacterial drugs have become less effective** or even ineffective, resulting in an accelerating global health security emergency that is rapidly outpacing available treatment options (48)	Alignment = none
		-It is estimated that **60% more food will be required to feed the world population by 2050** (18)	

GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	Food security	-food and nutritional insecurity will persist in many, predominantly poor, regions (18) -**Soil degradation** will affect the amount of land available for productive agriculture: around half of the world's agricultural land is already affected by moderate to severe degradation and around 12 million hectares of productive land become barren annually due to desertification and drought (18) -biofuels may provide up to 27% of the world's transportation fuel by 2050, up from the current level of 2% (IEA, 2011), though with uncertain consequences for food security. (19) -**Extreme and variable rainfall** will have major impacts on water availability and supply, food security, and agricultural incomes, and will lead to shifts in the production areas of food and non-food crops around the world (IPCC, 2014). The impacts of climate change on yields of the major crops (wheat, rice and maize) will be negative for most countries and commodities, though are likely to affect the poorest populations the most (Ignaciuk and Mason-D'Croz, 2014). They will likely reduce renewable surface water and groundwater resources in most dry subtropi-cal regions, intensifying competition for water among different sectors (22) - Synthetic biology may also help meet bio-economy objectives, i.e. reduction of greenhouse gas emissions and attaining food and energy security. As global population continues to grow and threats to water and soil quality increase, synthetic biology offers far-reaching agricultural applications that promise to increase productivity and efficiency. Examples include not only crops that are resistant to drought and diseases and increase yields, but also plants that produce their own fertilisers. (67)	Alignment = None
	Water Stress	Water demand outpaced population growth by a factor of more than two during the twentieth century. Based on continuing socio-economic trends and no new policies to improve water management (a baseline scenario), **water demand is projected to increase by 55% globally between 2000 and 2050.** Agriculture will remain the largest consumer of water, (15) By 2050, **groundwater depletion may become the greatest threat to agriculture and urban water supplies in several regions.** The quality of surface water in many OECD non-member economies is also expected to deteriorate, through nutrient flows from agriculture and poor wastewater treatment. The consequences will be increased eutrophication, biodiversity loss and disease (OECD, 2012b).(18)	Alignment = None
GRAND CHALLENGE 3 – Energy	Energy security	-The IEA (2014) projects world oil supply to rise to 104 million barrels per day in 2040 and estimates this will require some USD 900 billion per year of investment in upstream oil and gas development by the 2030s. The Middle East and the Russia/Caspian region will likely remain the largest oil exporters over the next decades, while Asia Pacific and Europe will remain the largest importers. (20) -Demand for natural gas will grow by more than half, the fastest growth rate of all fossil fuels (21) -an increasingly flexible global trade in liquefied natural gas will offer some protection against the risk of supply disruptions (21)	Alignment = None

	Energy security	-A more stringent mitigation scenario that leads to CO2-equivalent concentrations of about 450 parts per million in 2100 would meet the 2°C targets agreed at the recent Paris climate conference. This **2°C Scenario (2DS) is characterised by 40-70% reduc-tions in global GHG emissions by 2050 compared with 2010.** It will mean increasing the share of low-carbon electricity supply from the current share of approximately 30% to more than 80% by 2050 (22) - Synthetic biology may also help meet bio-economy objectives, i.e. reduction of greenhouse gas emissions and attaining food and energy security. (67)	
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	**Transportation Systems**	Commercial transport – includ-ing airplanes, shipping, trains and trucks – will account for virtually all of the growth in energy demand from transportation. Most of this demand growth will be met by oil (ExxonMobil, 2015). (19) *Transport systems* The IoT holds great promises for the improvement of transport management and road safety. Sensors attached to vehicles and elements of the road infrastructure may become interconnected, thereby generating information on traffic flows, the technical status of vehicles and the status of the road infrastructure itself. Traffic lights and road toll systems may be adapted to the actual road usage, emergency services can be trig-gered automatically, and car theft protection may be enhanced (OECD, 2015h).(51) Direct product manufac-turing using printing technologies can reduce the number of steps required for parts production, transportation, assembly and distribution, reducing the amount of material wasted in comparison with subtractive methods (OECD, 2015c). (64)	Alignment = None
	Resource Scarcity	- A growing world population and increasing economic development will enlarge global demand for water, food and energy, putting further pressures on the natural environment (17) -Based on continuing socio-economic trends and no new policies to improve water management (a baseline scenario), water demand is projected to increase by 55% globally between 2000 and 2050. Agriculture will remain the largest consumer of water, but sharp increases in demand are expected from manufacturing (+400%), electricity generation (+140%) and domestic use (+130%) (17) -Groundwater is being exploited faster than it can be replenished across many parts of the world – the depletion rate more than doubled between 1960 and 2000 – and is also be-coming increasingly polluted. By 2050, groundwater depletion may become the greatest threat to agriculture and urban water supplies in several regions (18) -An increasing number of regions will face water scarcity, and the competition for scarce water resources could lead to internal and international conflict (18)	Alignment = None

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	Environmental disasters and threats	-1.6 billion people – almost 20% of the world's population – are projected to be at **risk from floods.** The economic value of assets at risk is expected to be around USD 45 trillion by 2050, a growth of over 340% from 2010 (18) -**Soil degradation** will affect the amount of land available for productive agriculture: around half of the world's agricultural land is already affected by moderate to severe degradation and around 12 million hectares of productive land become barren annually due to desertification and drought (18) -Heat waves will likely occur more often and last longer, while extreme precip-itation events will become more intense and frequent in many regions. Rainfall will most likely increase in the tropics and higher latitudes, but decrease in drier areas. The oceans will continue to warm and acidify, strongly affecting marine ecosystems. The global mean sea level will continue to rise at an even higher rate than during the last four decades. The Arctic region will continue to warm more rapidly than the global mean, leading to further glacier melt and permafrost thawing. However, while the At-lantic Meridional Overturning Circulation will most likely weaken over the 21st century, an abrupt transition or collapse is not expected (22) -Reducing and managing the risks of climate change will require a mixed strategy of mitigation and adaptation. The extent of mitigation efforts will determine levels of future GHG emissions: without additional efforts beyond those already in place today, warming by the end of the 21st century will lead to a high risk of severe, widespread and irreversible impacts globally, even with adaptation (22)	Alignment = None
	General economic risks	- The fact that armed conflict can impact negatively on openness to trade and investment seems intuitively obvious, and yet the matter has attracted little attention from economic research until fairly recently. Work by Kamin (2015), for example, suggests that major conflicts can indeed reduce trade flows (by up to two-thirds) … For export-ing nations, understanding and anticipating the risks and the nature of these economic impacts will be an important part of conducting business in an increasingly complex geopolitical future. (30)	Alignment = None
		-**Inequalities within countries will pose major political, social and economic risks in the coming years.** Over two-thirds of emerging and poor countries, encompassing 86% of the population of the developing world, will experience growing inequalities. (40) -The evidence suggests that what matters most is the gap between low-income households and the rest of the population. Indeed, over the last 30 years, incomes at the low end of the scale often grew much more slowly during the prosperous years and decreased during downturns. Unsurprisingly perhaps, for the vast majority of developed countries for which data are available, poverty rates increased from the mid-1990s to the 2010s, pushing up rates for the OECD area as a whole by 1.5 percentage points.(41)	

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Reducing growing inequality	-Over the last couple of decades the risk of poverty has shifted markedly away from the elderly towards families with children. Hence, large families with three or more children also tend to have higher levels of poverty risk. Moreover, **child poverty is seen to be increasing in almost all OECD and EU coun-tries.** On average across the OECD, the child poverty rate increased from 12.2% in 2000 to 13.2% in 2010 (41) -Also at risk are young adults, who make up an increasing share of the poor. The increase in youth poverty is to be found particularly among youngsters not in educa-tion, employment or training who run a greater than average chance of unemployment, lower wages, poorer health and therefore a greater risk of long-term “scarring”. In many countries, migrant families and their children are also at risk. Within Europe, this is particularly true of non-EU immigrant families and their offspring (Jokinen and Kuronen, 2011). And finally, there are those families facing persistent poverty. These are most likely to be older people, single people (especially women both with and without children) and jobless households. (42) -Recent analysis (e.g. Piketty and Zucman, 2013; Braconier et al., 2014) suggests that the trend towards increasing inequality in incomes and wealth will very likely continue for many years to come. Indeed, based on current trends, **earnings inequality in an average OECD country could rise by more than 30% by mid-century,** bringing OECD economies as a whole to the same level of inequality experienced in the United States (43) -**inequality undermines education opportunities for the disadvantaged,** which in turn reduces social mobility, leading to a slowing of human capital accumulation. Survey results tend to support this theoretical approach. The OECD’s Adult Skills Sur-vey (PIAAC) demonstrates that widening income disparities hamper the development of skills among those segments of the population with poorer educational background. (44) - Growing social inequalities will result not only from job destruction and employment polarisation that will inevitably come along with the structural shift in skills, but also from weaker social mobility and a persisting digital divide. Discrimination enabled by data analytics may result in greater efficiencies, but may also limit an individual’s ability to modify path-dependent trajectories and escape socio-economic lock-ins. In addition, a new digital divide is arising from growing information asymmetries and related power shifts from individuals to organisations, from traditional businesses to data-driven busi-nesses, and from government to data-driven businesses (OECD, 2015i). Social cohesion and economic resilience could be undermined, especially in developing economies. (53)	Alignment = None
		Growth in female enrolment at all levels of education will continue, and will have important implications for labour markets and family life. (7)	

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**Educated Women**	Through concerted efforts by governments, civil society and the development com-munity, **girls' enrolment at all levels of schooling in the developing world has risen significantly over the last two decades.** Most low-income countries, for example, made substantial progress during the 1990s in achieving gender parity in both primary school enrolments and literacy.(44) At the higher educa-tion level, too, gender equality is making significant inroads. In most OECD countries, women already account for at least 50% of tertiary education enrolments. That propor-tion could increase yet further through 2025 – to over 70% in Austria and the United Kingdom, and well over 60% in North America and parts of Scandinavia (OECD, 2008). It goes without saying that the emergence of such strongly qualified female cohorts has important implications for economic growth, labour markets, family life, patterns of childcare and elderly care. (44)	Alignment = None
	Digitized Education Paradigms	As digital technologies make ever-deeper inroads into education, and in particular at university level, learning methods and strategies will change. The scope for person-alisation is already expanding, as the capabilities and the willingness to use digital re-sources help create bespoke pathways for learning,...(45) Nonetheless, far from placing the technology and the IT infrastructure in the foreground, the focus is expected to continue to shift toward conceiving it as a **digital learning environment** (Brown, 2015). Access to education, of course, is not necessarily access to knowledge. The future is on a course that will increasingly thrive on ubiquitous access to ever-growing volumes of information and data in contexts other than those of a structured learning/teaching environment. The keys are the growing penetration of the Internet and mobile tech-nology. (45)	Alignment = None
	Inequalties and Education	[Developing] countries are typi-cally among the poorest and already struggle to provide educational and employment opportunities for their young people. A reservoir of disaffected young people with low education and few job opportunities may lead to greater political and social instability. (10) New large economies in 2030 (measured in total GDP at purchasing power parity [PPP]) will include Mexico, Indonesia, Turkey, Nigeria and Viet Nam, their eventual success depending largely on the quality of their govern-ance and of their economic policy, their demographic profile and the level of education they provide to their citizens (ESPAS, 2015). (24) Also at risk are young adults, who make up an increasing share of the poor. The increase in youth poverty is to be found particularly among youngsters not in educa-tion, employment or training who run a greater than average chance of unemployment, lower wages, poorer health and therefore a greater risk of long-term "scarring".(42) The reasons, it is suggested, are to be found primarily in human capital accumulation theory: **inequality undermines education opportunities for the disadvantaged,** which in turn reduces social mobility, leading to a slowing of human capital accumulation.(44)	Alignment = None

		The average level of educational attainment is set to rise more quickly in developing countries than in advanced economies, shrinking the gap between the two. The number of students around the globe enrolled in higher education is forecast to more than double to 262 million by 2025. Nearly all of this growth will be in the developing world, with more than half in China and India alone.(44)	

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	Reducing the risk of Technology-abuse	- Security and privacy are considered the most important risks relating to the IoT. Hack-ers may be able to remotely take over connected objects such as the electricity grid and driverless cars or manipulate IoT-generated data. The reliability of the network is a major issue, since human lives may depend on successful, sometimes real-time trans-fers of data. The key issue of consent and perhaps the notion of privacy itself are also challenged by the near-continuous flow of sensitive data that the billions of ubiquitous sensors will produce (OECD, 2015h). Furthermore, artefacts in the IoT can become ex-tensions of the human body and mind. Human autonomy and agency may be shifted or delegated to the IoT, with potential risks for users' privacy and security (IERC, 2015). (51) - Legal institutions must also evolve to better promote a seamless flow of data across nations, sectors and organisations. There are growing concerns about how to define and appropriate open access rights, while maintaining publishers' and researchers' incentives to keep publishing and performing research. International co-operation will be key in that respect (53) - Big data analytics offers a unique possibility to combine personal data with pattern recognition programmes, enabling the generation of new information and knowledge about people (ITF, 2014). However, the same data and same programmes could serve to manipulate people, distort their perception of reality and influence their choices (Glancy, 2012; Helbing, 2015; IERC, 2015; Piniewski et al., 2011). Individual autonomy, free thinking and free will would be challenged, potentially undermining the founda-tions of modern democratic societies. (53)	Alignment = None
		- Nanomaterials face several challenges if they are to find widespread commercial applications. On a technical level, signal transmission between the nanoscale and the macroscopic world remains problematic, as does controlling mechanical responses at the nanoscale (Fahlman, 2011). These technical restrictions continue to hinder develop-ment of cost-effective, large-scale commercial applications of nanomaterials.	

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	**Nanomaterials**	There are also questions around unintended hazards (toxic effects) to humans and the environment. While particle size alone is insufficient to account for toxicity (SCENIHR, 2009), using nanomaterials in some specific environments may need to be regulated (OECD, 2015k). For example, due to their small size, nanoparticles can permeate cell membranes (via skin absorption, ingestion, inhalation) and travel to places in the body where larger particles cannot physically reach (Suran, 2014). The same risk has to be considered for the use of nanoparticles in agriculture (Das et al, 2015). Risk assessment is still confronted with a considerable lack of data on exposure of nanomaterials to the environment, requiring further research (EC, 2014a; OECD, 2011c; Fahlman, 2011). (62)	Alignment = None
	General importance of fundamental research	The imperative to restore a more inclusive growth; the needs of ageing societies; en-vironmental pressures; the depletion of natural resources; threats to energy, water and food security; and various health issues all require new technological breakthroughs for which the disruptive potential of research will need to be mobilised. (73) Research is likely to remain high on policy agendas, and the utilitarian view of science is poised to strengthen. The increasing attention paid to ethical and societal dimen-sions of research is already reflected in the framing of more “responsible research and innovation” policies. Following these recent policy developments, govergovernments will likely encourage greater involvement of civil society in research policy. (73) Still, science will not be in a position to address all sorts of issues it is presented with. Moreover, there is a threat that citizen- and challenge-driven scientific agendas may focus on more immediate and applied outcomes to the detriment of longer-term blue-skies research. Fundamental research is by its nature unpredictable and a too-risky endeavour for market interests. To ensure future opportunities are not to be missed, fundamental research that is disconnected from current challenges will need to be preserved. (73) New public-private partnerships (PPPs) have emerged and reinforced a market perspective in academic research. As public budgets remain under pressure, PPPs will remain strategic policy instruments in the near future, and the traditional industry-science dichotomy will continue to blur through further cross-sectoral funding(75) But more technology platforms and physical spaces for researchers to meet are still needed. Likewise, governments will also need to support the interoperability of scien-tific infrastructure, shared methodologies and tools (e.g. codes, applications), stand-ards for digital repositories, and common access rules.(76) Novel research fields will develop around data mining, machine learning, privacy, database interop-erability etc. with a view to enabling big data science (EC, 2014b). Big data analytics should open new research avenues and create new business models. New research fields will also emerge from the convergence of technologies (e.g. bioinformatics, bio-sensors).(77)	Alignment = None

	National research policy frameworks are increasingly shaped by a more global con-text, as science, technology and innovation networks extend beyond national frontiers. Countries, firms, universities and researchers are increasingly organised into open and collaborative networks that connect local research and innovation hubs across frontiers (Figure 32). Ideas, assets and resources concentrate in these pockets of excellence. At stake is the capacity of research ecosystems to offer attractive environments to highly mobile talent and international investments, including robust (and expensive) research infrastructures, e.g. libraries and information archives that both will need to be re-newed as they wear out or become outdated. (78)	

Report #4
Copenhagen Research Forum II (2012)

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being			
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy			
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials			
		- Long-term planning should be implemented through use of flexible, openended multiannual roadmaps for each challenge - Short-term planning should be carried out by challenge-specific programme with clear reference to the respective roadmap - Challenge-specific research should focus on mid-term needs (5-15 years)	

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**Flexible roadmapping**	- Short-term needs should be dealt with through continued, effective communication between researchers and end-users, with at least 10% of the resources being spent on a supported project/programme/partnership/network - The longer-term perspectives should be addressed by the European Research Council (ERC) and the National Research Councils with reference to institutional priorities in research infrastructure and recruitment (7)	Alignment = None
	Structuring Inclusion	**Suggestion: Less criteria equals more inclusion** - Consortium forming should be left open as much as possible to industry and academia; additional criteria for participating companies (e.g. size, geographical position) should only be imposed when these criteria are needed to deliver the expected impact of the project - Make plans for further elaboration of synergistic activities between European universities together with other public research institutions and European publicprivate partnership initiatives - Include topics aimed at commercialisation and encourage SME involvement through increments in the dissemination score - Allow for formal participation of stakeholders with low or non-financial contribution e.g. end-users - An elaborated plan for dissemination of research results should be included as an integral part of any project proposal; the dissemination plan should have well-defined end goals and parameters so the project's effect on civil society and other stakeholders can be monitored (9)	**Alignment = low**
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens			

Report #5

Copenhagen Research Forum II - Visions for H2020

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Re-emergence of Infectious Disease and Antimicrobial Resistance**		Alignment = None
	Obesity and related conditions		Alignment = None
	Research Infrastructure	Research excellence needs excellent research infrastructures that not only underpin research but also lead its development and create an attractive climate for world-class researchers. (24)	Alignment = None
	Integrative IT and Modelling	Modelling can lead to groundbreaking innovations in many areas of utmost interest, for example from pharmacokinetics to cancer treatment; the interpretation of medical imaging to data mining in statistics; and from the design of prostheses to the use of electronic aids. The ESFRI proposals are relevant for this.(24)	Alignment = None
	Unified EU professional taxonomy, research calssification schema, and biomedical standards.	An important tool will be European cooperation schemes and the enhancement of student and researcher mobility... The benefits of a common approach for classifying research portfolios applied across research organisations are clear.(27)	Alignment = None
	Tissue engineering	Nanomedicine and synthetic biology are emerging technologies, which are quickly establishing themselves as key enabling technologies. These are promising approaches to realise the vision of a bio-based European economy through research and innovation as well as to delivering competitive and sustainable growth in Europe.Development and optimization of artificial, bioartificial and tissueengineered organs are related to this.(25)	Alignment = None
	Holistic Life Cycle Approaches	Hence, a full chain approach should be taken, ensuring overall optimisation and providing solutions that truly link raw materials, the conversion processes and the needs of consumers and other actors in the food chain.(33)	Alignment = Nnne

GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	**Intellectual Property Rights from research**	Since companies normally will not invest in participation in public research and innovation programmes unless there is some protection of future income from innovations in that area, agreement on intellectual property rights (IPR) are generally a prerequisite and should be prepared upfront.(37)	Alignment = Nnne
	Blue growth	Unravelling the life principles in extreme oceanic environments should be a particular research target as life forms under high pressure, low temperatures or combinations thereof would be of particular interest for application in processing technology (microbial systems and novel enzymes) for food, feed and ingredients (33)	Alignment = Nnne
GRAND CHALLENGE 3 – Energy	**Previous and On-Going Energy focused Programs**		Alignment = Nnne
	Intellectual Property Rights from R&I		Alignment = Nnne
GRAND CHALLENGE 4 – Smart, Green and Integrated Transport	**Technology Focused Research (ICT, Energy, Egineering)**	• Cleaner and safer vehicles of all modes; • Cost-effective alternative fuels, (electric) drives, propulsion technologies, battery and chemical storage of energy and new materials for vehicle construction; • Advanced ICT for personalised real-time travel information, modal integration, metropolitan traffic management and smart payment systems; (54) Microscopic European travel and transport data. (56) Concepts such as door-to-door mobility, seamless connectivity, and global interoperability can contribute to developing more customer-oriented services. Deployment of robust co-modal systems calls for more advanced transport optimization methods which have become increasingly more vigorous as modern ICT such as Global Navigation Satellite System (GNSS), Radio Frequency Identification (RFID), smartphones etc. further improves the quality of real-time tracking of goods and generate vast amounts of relevant data from real-life transport operations. (53)	Alignment = None

GRAND CHALLENGE 4 – Smart, Green and Integrated Transport GRAND CHALLENGE 4 – Smart, Green and Integrated Transport	**Trans-disciplinary Research**	It is welcomed that social and behavioural sciences will be fully integrated within each of the main pillars of Horizon 2020. Yet, one should be cautiously aware of the risk that the above-mentioned important social science aspects will not get due attention in the research priorities of the calls when compared with the obviously important, technology-oriented projects (54) Classical cost benefit analysis has developed in recent decades into more advanced appraisal methods that more adequately value time savings ... and encompass environmental and safety impacts and other derived effects. (57) The cultural, political and economic underpinnings for learning architectures connecting transport governance effectively to surrounding societal needs and developments are to be studied. (59)	Alignment = None
	Global Freight Transport	... overriding challenges also relates to long-distance freight transport which call for further R&D&I. (55) Transport research therefore should be (and have been) using multidisciplinary approaches ranging from several branches of engineering to various disciplines in social sciences, such as economics, sociology, psychology, geography and political science. (18)	Alignment = None
	Road Fatalities	Reaching ambitious targets such as ‘move close to zero’ requires a paradigm shift and a Safe System approach is considered to be a very promising such transformation. The road system should be redesigned taking into account the fallible and vulnerable human being. (55)	Alignment = None
	GOVERNANCE, FINANCING AND ORGANISATION	During the past 25 years, so-called new public management (NPM) reforms have marked the organisational shaping of the public sector, and not least the transport sector. (57-58)	Alignment = None
	Improving railways	However, the research in new solutions has to be conducted taking into account the political and institutional barriers in individual countries for creating radically different, harmonised framework conditions and in recognition of the inherent complexity of operating on the same railway tracks local, regional, and international services as well as of balancing passenger and freight. (59)	Alignment = None

	Resource Scarcity	A general paradigm for dealing with resource scarcity is reducing the need for – and more efficient use of – the resource, combined with the adaptation of human activities to changed conditions and/ or the recognition of resource scarcity. (63)	Alignment = None
		Main research areas include:	

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**Earth System Mechanism and Interactions**	• Research into mechanisms behind climate change and their interactions on spatial and temporal scales, in particular using the past; • Research into the hydrological cycle and its interaction with the Earth system; • Assessment of vulnerability to climate change of specific ecosystems and societies; and • Better understanding of the interactive role of biological processes of the climate system and their responses to climate change. (67) It is an important and necessary element of especially climate research to improve our understanding of climate change and use this knowledge to improve the climate models, hence providing more accurate future climate projections (68)	Alignment = None
	Bioeconomic Development	Traditionally, Europe has been strong in the development of a bio-based and more sustainable economy but must be prepared to meet increased global competition. (32) One challenge of the European bioeconomy will be to build secure and sustainable agricultural, horticultural and aquaculture supply and product processing chains to meet the increasing demand for food, feed, fibre, chemical feedstock and biomass for energy. (31)	Alignment = None
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**EU community within a global context**	Attention should be given especially to analysing and operationalising specific forms of cooperation that emerge in the era of global power dispersion and non-western powers. (77)	Alignment = None
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens			

Report #6

RAND (EU) - Foresight Services to Support Strategic Programming within Horizon 2020

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being			
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	**Precision Agriculture**	One of the most important ways that digital technologies are impacting agriculture is through precision agriculture, defined as an approach 'that uses information technologies to bring data from multiple sources to bear on decisions associated with crop production.' (70) They suggested that data could be shared and managed collectively, following the model of cooperative farming, with ICTs enabling the virtual aggregation of farms. Meanwhile, parallel developments in the democratisation of science (see Theme 9) could enable farmers to contribute to innovation. (74)	Alignment =
	Agriculture Robotics	With the potential to do a range of functions, from ploughing and planting to spraying, milking and picking, robots may also play an increasingly significant role in agriculture and could help reduce food waste by improving efficiency in harvesting and food processing (71) Particular applications highlighted in the report include automated ripeness sensing and picking, site-specific spraying...controlling weeds without the need for herbicides... automated systems for the inspection and sorting of plant or animal products, small inexpensive robots to assist humans in harvesting strawberries, aerial vehicles that can take water samples from remote areas and improved robotics for handling large numbers of live plants or animals (USDA 2013). Interviewees also highlighted the importance of unmanned aerial vehicles (drones)... (71) Larger-scale coordinating actions and/or projects that 'critically accompany' the established [Robotics] research community's activities should be supported at the EU level, given the need to understand how to recognise the place of advanced robotics in our societal context. As the trend analysis for this theme indicates, the focus should also consider how to overcome the 'European Paradox' of getting such technologies to market. This may be driven by longer-term testing of prototypes and transposition of technologies from the factory to various 'human' areas of research, such as offices, homes, and hospitals. Such activities should also ensure that the (legal and ethical) conditions for increased take up of robotics technology are addressed. (102-3) Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should closely coordinate with the Joint Programming Initiatives on agriculture. Furthermore, coherence across the entire food chain, examining consumption, consumer behaviour, labelling, monitoring and waste should be considered. (103)	Alignment =
GRAND CHALLENGE 3 – Energy			

GAND CHALLENGE 4 – Smart, Green and Integrated Transport

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

Distributed Manufacturing	The fluctuation of roles and responsibilities, either through the blurring of lines or the development or intro-duction of new actors, leads to legal challenges and questions. Mota (2011) asks ‘While the manufacturing industry is currently subject to regulations concerning the safety, quality and environmental impact of the goods they produce, how can these be applied to the objects individuals fabricate themselves? Who is liable if someone gets injured by one of these home-made objects?’(55) As such there is a need for recyclable materials to use for 3D printing endeavours. If such materials arrive, there is room for a more positive scenario where supply and demand will be better coordinated especially if consumers only manufacture what they need (57) Two specific directions emerge for research in this area under H2020: (i) the development of technologies that will enable and encourage the prevalence of sustainable methods of 3D printing, if and when sustainable means arise to deal with this phenomenon, and (ii) greater understanding of what open hardware, open software and 3D printing mean for economic models. Smaller research projects may be used to encourage alternative conceptions of these models. (101)	Alignment =None
	The traditional key players in the global robotics market – Japan,135 USA, Republic of Korea and Germany – continue to dominate overall, representing about 50 per cent of the global market. It should be noted, however, that there has also been an upsurge in industrial robot installations in other Asian (e.g. Taiwan, India and Indonesia) and Central and Eastern European countries. (59)	

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**Automation and Consumer Robots**	The yearly figures for the number of patent publications and families have tripled since 2004.137 In terms of global distribution of (priority) patents (Figure 28), Japan is the clear leader with approximately 31 per cent of all patents first filed here [Europe is second with approx. 14%] (60) There have also been an increasing number of 'prize' or 'challenge' competitions in the field of robotics, several of these to tackle challenging 'real world' application scenarios such as disaster recovery, manufacturing, safe operations in oil and gas environments, and space applications. (61) Away from health, robotics has also found application in areas such as agriculture (e.g. crop management), environmental remediation (e.g. trash collection, clearing up after nuclear disasters, etc.), search and rescue, transport (e.g. autonomous vehicles and drones), professional (e.g. inspection of power plants and infrastructure such as bridges) and domestic services (e.g. autonomous vacuum cleaners and lawn mowers) and space exploration.(62) A key factor that would potentially hold back the progress of a thriving robotics industry, particularly in Europe, is skills and resource shortages in specific areas such as engineering and computer science. (64-5) Moreover, laws concerning liability for robotic errors are still untested and since ethical and cultural laws vary across the world, deciding on a standard set of laws to tackle this issue is a cause for concern (65) Another potential barrier to progress, particularly with robotic tasks becoming progressively more complex, is that of technical standards concerning robots (e.g. international safety standards). (65) ...many surgical robotic systems still have limitations such as 'less dexterity, limited traction, issues with hand-eye coordination, and judgement'. Indeed, Griffen and Sugar (2013) highlight that surgical robotic technologies are 'simply inaccessible'... (65) From a European policy perspective, enhancing research and innovation in the field of robotics is one of the focal priorities of the Digital Agenda for Europe...For example, actively supporting an SME culture in Europe will potentially facilitate robotics technologies to diffuse into new markets; in this respect, ensuring that EU-funded robotics projects move beyond academia into deployment is vital(67) Furthermore, the 'gap' between academia and industry needs to be closed using mechanisms like technology transfer171 and more collaboration could be encouraged between European researchers and their counterparts in, for example, the USA. (67)	Alignment =None

		Finally, it is crucial that the ethical, legal and social implications of robotics are not ignored while rapid technological advances are being made in the field. (67) [Robotics] research should focus on near-market actions to translate a broad research base into practical commercial innovations where there is no current market incentive. Funding grand challenge competitions along the DARPA model may provide best results within the H2020 context. (102)	
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**E-Government & Resistance**	The development of eGovernment is being strongly encouraged at the EU level to improve innovation and efficiency in various areas (e.g. health, education, environment, transport, public procurement, etc.) to pro-vide user-centric and user-driven solution in response to citizens' needs while reducing costs. (82) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82) In parallel to these new forms of democratic consultation, initiatives such as Citizen Lab,214 a watchdog group based at the University of Toronto, and more recently WikiLeaks, illustrate the emergence of more radical forms of political engagement, which directly challenge governments' legitimacy and authority. Web 2.0 tools can enable local problems to win a global exposure. (84) The opening up of administrative and personal data will require the development of appropriate technical standards allowing data sharing and data reuse across systems and countries to stimulate innovation. (84) The lack of interoperability across national and European systems remains a potential barrier to the development of eGovernment and open data... Privacy concerns remain a major obstacle to the full development of political participation and full engagement with ICTs and social media as a tool for governing. (86) In addition, to fully exploit the potential of eGovernment and open data, citizens will need the skills that allow them to interact and understand large amounts of data and information. Communicating complex information is the key to involving citizens in decision-making, especially when huge datasets are opened up to the public. (87) This, however, also requires further advances in other complementary research areas, such as defining appropriate legal regulatory frameworks and mechanisms, especially regarding personal data protection, as well as more research in the current shifts in the organisational and societal structures that underpin the movement towards more open, transparent and integrated policymaking systems. More research should also be conducted to design and implement pan-European interoperable systems that allow data sharing across national systems. (88)	Alignment =None

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies		Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)	
	Consumer Internet Economy	As an emergent research and policy area, research undertaken under the auspices of Horizon 2020 should examine the relationship between the Digital Single Market legal and policy frameworks and these emerging characteristics of the Consumer Internet Economy. Smaller research projects may provide useful instruments to dig deeper into online behaviour and the societal impacts of co-creation and hyperconnectivity. Specific research into new technological developments could also be carried out in this area of research, with direct linkages to IoT research. (95) The consumer-Internet economy offers long-term scope for enhanced near-market actions to accelerate relevant technologies to market... Two further long-term topics of study are the impact of regulatory reform on the wider landscape of consumer regulations in the EU and the application of large-scale data flows to improve the efficiency and operation of emergent Internet economies. (95) In the long term, this theme may cease to be a separate area of research. Many of the most promising trends in the DIY innovation ecosystem are likely to be 'absorbed' into the work of theme 4 (New Economic Models) and 2 (Consumer Internet Economy) by means of focus on production/consumption and the development of new economic models that respond to these changes. In short, it is projected that the DIY innovation trend will become widely embedded in the economic paradigm of Europe and will therefore be best furthered by a concentration in economic and consumer impact.(101) Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should closely coordinate with the Joint Programming Initiatives on agriculture. Furthermore, coherence across the entire food chain, examining consumption, consumer behaviour, labelling, monitoring and waste should be considered. (103)	Alignment =

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies		The long-term landscape of [Digital Governance] shows significant overlaps with trends covered in themes 9 (Digital Art and Science), 2 (Consumer Internet Economy) and 4 (New Economic Models). The theme represents an important long-term priority for Europe that will enable much of the research in these other themes to be successfully implemented. For this reason, one long-term research priority in the field should be the proactive incorporation of developments in other domains into the policy process through new technologies such as Big Data analytics. (106)	
	Crisis-Prone Economy	Crisi-prone economy. Regional instability, especially in the Middle East and South Asia, coupled with greater global multi-polarity (Lijn 2012; National Intelligence Council 2008) can result in global insecurity and economic instability (Atlantic Council 2012). This would be likely to hamper the capacity for developing new models of value creation for the digital economy. (41)	Alignment =
	Breaches of Trust	Security and privacy breaches. The event of major privacy or security breaches is likely to undermine trust among stakeholders in the digital economy. This mistrustful environment would severely compromise, if not reverse, some of the trends identified above, namely the ‘me’ economy, the ‘peer-to-peer’ economy and the ‘distributed innovation’. (41) Thus the importance of developing proper frameworks for data handling and data protection cannot be overestimated. Indeed, it was noted that the EU could play a strategic role by trying to ‘nudge’ industry into doing verification and privacy by design (for example, by changing or enforcing law on liability). (52) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82) Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)	Alignment =

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**Role of Procurement**	Role of procurement (private and public). What role can public procurement and private procurement (e.g. corporate-led business incubators and business accelerators) have in fostering the development of digital start-ups and thereby innovation, economic growth and job creation? (42)	Alignment =
	Income Inequality	Growing income inequality. The benefits of emerging ICT may be unevenly distributed and could even contribute to widening income inequality.80 Highly skilled workers and owners of capital are likely to benefit from greater opportunities (MGI 2013). The new economic models, therefore, might need to put a greater importance on education and training as well as on how to best deal with income inequality. (40)	Alignment =
	Intellectual Property	Inadequate IP and regulatory regimes. One challenge to the new models of value creation will be to craft ways of managing intellectual property across multiple stakeholders (users, producers, suppliers, competitors, researchers) around the world, who have different types of IP requirements and operate under very different legal and regulatory regimes (40) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82) The matter of intellectual property with respect to digital fabrication is an ongoing policy challenge, much the same as it has been for the Internet, where stakeholders maintain different interests and existing regulatory models appear to fall short of reaching a workable compromise between the different parties. (57)	Alignment =
	Entrepreneurial Environment	Entrepreneurial-unfriendly business environment. By and large, most European countries compare unfavourably with other developed economies in offering an entrepreneurial-friendly regulatory environment. (40)	Alignment =
	Distributed Innovation	Several models of distributed innovation have been employed and are likely to continue to expand in the future (Bogers and West 2012). Among them are open innovation (Chesbrough 2012, 2006) and user innovation (Greer et al. 2012)... Sophisticated online platforms will make it easier and simpler to manage, support and mediate among a distributed network of innovation stakeholders72 – companies, users, universities, entrepreneurs, research centres, etc. (38)	Alignment =

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Distributed Innovation	Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)	Alignment =
	Data Literacy and Security	Institutions will face the challenge of devising support frameworks that facilitate the success of European companies in the global consumer Internet economy. This could include fiscal and non-fiscal incentives, e.g. intellectual property and VAT frameworks, but also finding ways in which incentives trickle down to the creative consumers rather than stopping at the company level (24) Finally, big data and analytics are likely to transform the way research is done in higher education institutes. However, tensions are likely to emerge between an increasing importance of data privacy and the utility of data tracking for personalised learning.(28) The STELLAR project (2012) has synthesised four areas of tension between technology-enabled trends and values that could impact the development and adoption of technology-enhanced learning solutions. Finding solutions to these tensions would be worthy of further investigation within European programmes: 1) Privacy and data analytics for learning, 2)Widening digital divides despite technology spread, 3)Focused and critical processing of information vs ubiquitous learning opportunities, and 4)Standardised vs individual learning paths. (33) Pertinent questions are being asked about security issues affecting Internet infrastructure, privacy, data protection and ethical considerations related to individual freedom... It has also been suggested that educating customers about privacy and security of data generated will become increasingly important as IoT networks become more widespread (51) The rising number of stakeholders in the Big Data ecosystem (e.g. individuals owning their own data, third parties like ISPs, data vendors, app developers, social medias, etc.), alongside with the growing recognition of the economic value of personal information, is also likely raise questions about data ownership in the future, hence challenging the role of governments and individuals as principal data owners. (82)	Alignment =

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies		In addition, to fully exploit the potential of eGovernment and open data, citizens will need the skills that allow them to interact and understand large amounts of data and information. Communicating complex information is the key to involving citizens in decision-making, especially when huge datasets are opened up to the public. (87) This, however, also requires further advances in other complementary research areas, such as defining appropriate legal regulatory frameworks and mechanisms, especially regarding personal data protection, as well as more research in the current shifts in the organisational and societal structures that underpin the movement towards more open, transparent and integrated policymaking systems. More research should also be conducted to design and implement pan-European interoperable systems that allow data sharing across national systems. (88) Work is also necessary on developing proper frameworks for data handling and data protection, which may be facilitated by engagement with international standards bodies (where appropriate). For these, a variety of different instruments can be used. For example, smaller projects that develop potential new applications and tools could be supported, alongside larger networks of researchers that monitor and react to technological/legal/policy developments. (100) Future H2020 research in [Digital Governance] should focus on three streams of work: (i) trust between public administrations and citizens (ii) co-creation of/collaboration in service design and delivery, and (iii) the new roles of government in an era of austerity and shifting nature of data ownership. Such projects would be suitable for implementation both as research and later as PCP to deliver technology outcomes directly to government. (106)	
	Digital Divides	The STELLAR project (2012) has synthesised four areas of tension between technology-enabled trends and values that could impact the development and adoption of technology-enhanced learning solutions. Finding solutions to these tensions would be worthy of further investigation within European programmes: 1) Privacy and data analytics for learning, 2)Widening digital divides despite technology spread, 3)Focused and critical processing of information vs ubiquitous learning opportunities, and 4)Standardised vs individual learning paths. (33) This, however, also requires further advances in other complementary research areas, such as defining appropriate legal regulatory frameworks and mechanisms, especially regarding personal data protection, as well as more research in the current shifts in the organisational and societal structures that underpin the movement towards more open, transparent and integrated policymaking systems. More research should also be conducted to design and implement pan-European interoperable systems that allow data sharing across national systems. (88)	Alignment =

	Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake and future device development. Such research will provide a strong basis for continued EU leadership in the field.(100) The long-term landscape of [Digital Governance] shows significant overlaps with trends covered in themes 9 (Digital Art and Science), 2 (Consumer Internet Economy) and 4 (New Economic Models). The theme represents an important long-term priority for Europe that will enable much of the research in these other themes to be successfully implemented. For this reason, one long-term research priority in the field should be the proactive incorporation of developments in other domains into the policy process through new technologies such as Big Data analytics. (106)	
Art Questions Technology	... disharmony between, for instance, scientists and artists, is positive because it increases the potential for change. In addition, the arts can act as a glue bringing together areas with disparate aims, such as pharmaceutical businesses and the sciences, to look at complex problems like antibiotic resistance. (80) Small exploratory research projects focusing on developing multiple disciplinary approaches to understanding the role of the hard/exact sciences in technological innovation would be useful to help set a future research agenda. These smaller projects would need to elaborate on the mechanisms and processes with which art can contribute to the innovation process.(104) [Digital Art and Science] may also further broaden the stakeholder base of future research programmes. Community building between these different worlds would also be useful, through continuation of previous EU-funded activities in this area.(105) The long-term landscape of [Digital Governance] shows significant overlaps with trends covered in themes 9 (Digital Art and Science), 2 (Consumer Internet Economy) and 4 (New Economic Models). The theme represents an important long-term priority for Europe that will enable much of the research in these other themes to be successfully implemented. For this reason, one long-term research priority in the field should be the proactive incorporation of developments in other domains into the policy process through new technologies such as Big Data analytics. (106)	Alignment =

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	**IoT & Wireless Connetivity Research**	Innovative techniques such as spectrum sharing (Ofcom 2014a) and 'white space'92 spectrum access (Weightless 2014a; Ofcom 2014a) are being investigated in the particular context of the IoT to meet the increasing growth in demand for wireless data capacity. Research is also being carried out to investigate the feasibility of using fifth generation (5G) wireless communications technology to support IoT (45) First, the sheer number and diversity of connected devices in the IoT creates significant scalability, heterogeneity (Iera et al. 2010; Miorandi et al. 2012) and systems engineering issues. (50) A crucial aspect will be the policy apparatus that will be required to ultimately deliver the Internet (e.g. rural broadband roll-out) to the places where the 'things' will be.119 The complex systems engineering challenges associated with deploying IoT ecosystems on a large-scale is another area that could potentially be addressed under Horizon 2020, particularly as the IoT is going to be the critical infrastructure for 'smart-X' markets(52) As an emergent research and policy area, research undertaken under the auspices of Horizon 2020 should examine the relationship between the Digital Single Market legal and policy frameworks and these emerging characteristics of the Consumer Internet Economy. Smaller research projects may provide useful instruments to dig deeper into online behaviour and the societal impacts of co-creation and hyperconnectivity. Specific research into new technological developments could also be carried out in this area of research, with direct linkages to IoT research. (95) Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake and future device development. Such research will provide a strong basis for continued EU leadership in the field.(100) Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should closely coordinate with the Joint Programming Initiatives on agriculture. Furthermore, coherence across the entire food chain, examining consumption, consumer behaviour, labelling, monitoring and waste should be considered. (103)	Alignment =
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens		The successful evolution of the web's architecture will also be largely dependent on the characteristics and patterns of the traffic that will be communicated across the IoT, with the majority of data being directed to and from 'machines' (51) Pertinent questions are being asked about security issues affecting Internet infrastructure, privacy, data protection and ethical considerations related to individual freedom (51)	

Innovative techniques such as spectrum sharing (Ofcom 2014a) and 'white space'92 spectrum access (Weightless 2014a; Ofcom 2014a) are being investigated in the particular context of the IoT to meet the increasing growth in demand for wireless data capacity. Research is also being carried out to investigate the feasibility of using fifth generation (5G) wireless communications technology to support IoT (45)

Internet - Architecture and Infrastructure **IoT & Wireless Connetivity Research**	First, the sheer number and diversity of connected devices in the IoT creates significant scalability, heterogeneity (Iera et al. 2010; Miorandi et al. 2012) and systems engineering issues. (52) A crucial aspect will be the policy apparatus that will be required to ultimately deliver the Internet (e.g. rural broadband roll-out) to the places where the ‘things’ will be.119 The complex systems engineering challenges associated with deploying IoT ecosystems on a large-scale is another area that could potentially be addressed under Horizon 2020, particularly as the IoT is going to be the critical infrastructure for ‘smart-X’ markets(52) A crucial aspect will be the policy apparatus that will be required to ultimately deliver the Internet (e.g. rural broadband roll-out) to the places where the ‘things’ will be.119 The complex systems engineering challenges associated with deploying IoT ecosystems on a large-scale is another area that could potentially be addressed under Horizon 2020, particularly as the IoT is going to be the critical infrastructure for ‘smart-X’ markets(52) Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake and future device development. Such research will provide a strong basis for continued EU leadership in the field.(100) As an emergent research and policy area, research undertaken under the auspices of Horizon 2020 should examine the relationship between the Digital Single Market legal and policy frameworks and the emerging characteristics of the Consumer Internet Economy. Smaller research projects may provide useful instruments to dig deeper into online behaviour and the societal impacts of co-creation and hyperconnectivity. Specific research into new technological developments could also be carried out in this area of research, with direct linkages to IoT research. (95) Work is also necessary on developing proper frameworks for data handling and data protection, which may be facilitated by engagement with international standards bodies (where appropriate). For these, a variety of different instruments can be used. For example, smaller projects that develop potential new applications and tools could be supported, alongside larger networks of researchers that monitor and react to technological/legal/policy developments. (100)	Alignment = Alignment=
	On the positive side, singularity could lead to ‘utopian post-scarcity world’ where disease has been eradicated, and humanity has everything it could possibly want and need (Solez et al. 2013: 113). The negative outcome paints the opposite picture and describes a catastrophe that could even mean the end of humanity. (7) Research in the near-term should link socio-economic research (user analysis, policy frameworks, legal considerations) to considerations for uptake and future device development. Such research will provide a strong basis for continued EU leadership in the field.(100) Research projects in [digital agriculture] should focus on emerging technologies in the areas highlighted above, and should link specifically to IoT (theme 5). Other areas of interaction include the Emergent Consumer Internet Economy (theme 4). Projects should The uncertainty of the arrival of singularity and its potential consequences requires policy makers to at least consider the implications of singularity related developments. This directly leads into the	
Singularity	policy challenges of this theme. Since the projections of what may happen in the future are largely based on speculations due to the unpredictable nature of the developments, policy makers are challenged to consider how research can ensure a positive outcome. (9) Programming European research in this field is relatively difficult, given the uncertainty of the theme; however, crossovers between this theme and others described below may prove incredibly fruitful and develop new understandings and rationales for innovation processes. Mapping activities, such as those already underway in the form of the Human Brain Project, are very useful for identifying potential areas of research. This theme may be most appropriately considered for larger scale coordination and/or support actions. (93) Future research into the theme is best managed in the respective industrial and social domains that govern sub-topics such as robotics for cyber-physical enhancements or large-scale computing systems for machine intelligence. In the long term, the topic of ‘Singularity Research’ is likely to be an unproductive grouping of diverse research streams. It is recommended that clearly focused research projects that make use of trends in this theme be pursued under other domains to maintain their focus on subject-specific areas. (93-4)	Alignemnt = none
Whole Brain Emulation	Whole brain emulation (WBE), also referred to as uploading or downloading, would take a particular brain, scan its structure in detail, and take that scan to construct a software model which, when run on the appropriate hardware, will behave in the same way as the original brain (Sandberg & Bostrom 2008). (8)	Alignment = none

Report #7

Envisioning 2030: US Strategy for the Coming Technology Revolution

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Reacting to new health threats**	While there are a huge number of potentially beneficial products of the synbio revolution, there are also growing concerns about the potential for the bioengineering of deadly viruses by error or design. (17f.)	Alignment = None
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy	**Shale Revolution**		Alignment = None
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials			
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive,			

Innovative and Reflective Societies			
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens			

Report #8

Ten Technologies which could change our lives

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Wearable technologies**		Alignment = low
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	**Aquaponics**	The use of aquaponics could lead to the development of a more closed-loop system of agriculture wherein resource efficiency is prioritised, resulting in minimal economic throughput. (p.15)	Alignment = None
GRAND CHALLENGE 3 – Energy	**Electricity Storage**	Hydrogen (p.19)	Alignment = None
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	**Drone Delivery**	The use of drones to deliver commercial goods and services, such as transport of goods, is widely expected in the future.(p.14)	Alignment = None
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**Graphene**	Concrete technologies, such as Graphene, aquaponics, smart home technologies	Alignment = None
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies			
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	**Social Behavior Change**	Smart homes and data privacy: The impacts on social behaviours, both within and outside of private home lives, individual privacy and security and the universality, or not, of smart home technologies represent just some of such concerns which have yet to be fully addressed by policy-makers (p.18)	Alignment = None

Report #9

Preparing the Commission for Future Opportunities

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Human Enhancements**	Pushed by military and medical research, human enhancement might change the day-to-day life experience of many Europeans in a few years from now-on, e.g. by creating an "augmented reality" and receiving information from IT via nerves-IT-interfaces. The big potential in terms of economic growth will be accompanied by policy and regulatory challenges and maybe even a societal divide. Any regulatory response must build on international cooperation to be efficient. (p.51)	Alignment = None
	Synthetic Biology	Scientific advances in synthetic biology are expected to provide the foundations for realising the full innovation potential of biotechnology in contained-use applications, mainly in health and industrial biotechnology applications. It will provide innovative solutions for the conversion of our current unsustainable fossil-based industries into sustainable and competitive bio-based industries for bioproducts (e.g. chemicals, polymers) and bioenergy, for new antibiotics and vaccines, and new diagnostics and treatments for cancer and rare diseases. (p.53)	Alignment = None
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy			
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials			
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive,			

Innovative and Reflective Societies			
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens			

Report #10
ESPAS - Global Trends to 2030

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Combating Inequalities**	Combating inequalities calls for comprehensive solutions Long-term analyses confirm that more attention needs to be paid to the impact of inequalities on economic and political systems. Inequalities not only affect those who suffer from them but also the overall economic performance and political stability of states and societies. These effects can be magnified by a lack of social mobility, which limits opportunities an d prospects for improvement for the most deprived members of society. (p.62)	Alignment = None
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	**Water Shortage**	Unless some significant technological break-through occurs, water shortages will have a major impact on agriculture: in some countries, such as China, 90 % of water consumption is for food production. In 2030, between 1.9 and 2.6 billion people are likely to suffer from a lack of water. In Europe, the supply difficulties in the south and east are likely to worsen. (37)	Alignment = none
	Food Water Energy Nexus	Food and water supply will be about managing scarcity — a problem made worse by climate change;By 2030, 93 % of the rise in energy consumption will be in non-OECD countries. (37)	Alignment = none
GRAND CHALLENGE 3 – Energy	**Energy Union**	Development of a genuine ‘Energy Union’ and the combating of climate change. The fragmented energy market and the transition towards renewables must be addressed rapidly and comprehensively, by policies that also reduce the seriously risky current dependence on outside sources. Security of supply and competitiveness should both be enhanced. The goal of a genuine ‘Energy Union’ should also contribute to the European Union’s endeavours to reduce emissions in the light of the dangers posed by climate change. (p.9)	Alignment = none
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials			

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Migration Debate	**Reshaping the migration debate. Many European Union Member States face increasing pressure from high levels of migration challenging the cohesion of their societies. That pressure, especially from the Southern neighbourhood, is likely to increase further over the coming decades, for demographic and political reasons. There are no easy solutions to this problem. At the same time, ageing in Europe implies that over the longer term there will be fewer people of working age to keep the economy going. Before 2030, migration policies must be re-framed, with a view to a more economically sustainable, humane and carefully managed migration strategy.(p.9)** In most European Union Member States, they are an integral part of society and provide a necessary contribution to the labour market. Although far from forming homogenous groups, immigrant workforces tends to be younger and less skilled than average. Education is the best tool to avoid ethnic segmentation and exclusion, alongside effective diversity and non-discrimination policies. (61)	**Alignment = low**
	Shfting International Power Centers	Analysts agree that globalisation is moving towards a more polycentric and segmented system, with a bigger cast of players, more interconnected economically, financially and technologically. Globalisation will continue to increase interdependence between states and between public and private sectors. (41) Global economic and geopolitical issues will be ever more interlinked. Negotiations on climate change, cyber security, finance or trade will be increasingly influenced by the geopolitics of assertive new powers. (44)	Alignment = none
	EU R&D Strategy	But the European Union is not helped by the fragmentation of its R&D activities and investments — more effort could be brought to bear on mobility of scientists and researchers, in favour of more inter-disciplinary cooperation, as well as reinforcing an education system to promote STEM (science, technology, engineering, mathematics). (56) Public policy could focus on the development of innovative eco-systems, the incorpora-tion of financing, infrastructure (centres of excellence), better connections between industrial and academic R&D, and simpler regulations. The issue is no longer solely cross-disciplinary; it must be 'co-disciplinary', creating the possibility of interfaces between economists, entrepreneurs, scientists, other academ-ics and society itself. (58)	Alignment = low

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Mobilisation of public and private investment	to help to boost Europe's economy. A stronger convergence of public and private investment, among other things tapping into private savings, would stimulate job-creation and help to sustain the European model of a social market economy.(p.8)	**Alignment = none**
	European Single Market	Further efforts to complete the single market feature in every recommended strategy for improving Europe's economic performance. It is still not completed. The single market for goods is still hampered by uneven application of European Union regulations and non-tariff barriers, whilst only 20 % of service markets operate across intra-European Union borders. Elimination of the remaining barriers to trade in goods and services would help to triple the gains already achieved during the last 30 years, with a revenue gain around 15 % and a doubling of internal European Union trade. (54)	Alignment = none

	However, many analysts consider that unless and until the European Union manages to lift EMU to the level of a more mature currency union, with a higher level of policy integration and risk-sharing, its construction will remain vulnerable and the European economy will not be able to reap all its potential benefits. (55)	
Enhanced governance of the euro area.	The management and reduction of public debt in the euro area, as well as the definitive repair of the banking system, will require political unity and resolve. The coordination and delivery of major economic reforms in Member States' economies and the completion of Economic and Monetary Union (EMU) are the short- and medium-term tasks (p.9) energy	
Building a European research and innovation area.	Despite European Union programmes, fragmentation of R&D both in the public and in the private sector leads to inefficiency, lack of critical mass and multiple product standards. Mobility of scientists between academia and industry and bold initiatives are the likely keys to more streamlined investments and maximum innovation. (p.9)	
Talent Scarcity	Improving the education system is crucial, in particular to ensure that as many citizens as possible acquire the necessary skills and tools to cope with this new order. Recent modelling of demand in Europe points to a gap in the supply of e-skills of about 900 000 people by 2020. Moreover, this is likely to be a global phenomenon; therefore in an age of increased mobility Europe will have to compete in the world market place to attract and keep people endowed with these skills. (58)	Alignment = none

	European Union is far from fully equipped with the appropriate policies, instruments and strategic focus to deal effectively with such threats. It will still need to: • Foster stability and development in its wider strategic	

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	**Security Threats**	neighbourhood, including engaging more deeply with key actors, while reversing the present downward trend in defence spending, in order to preserve the European Union's own security and to be able to act when necessary. • Reinforce the global system, by efficiently promoting a multilateral framework that is adapted to the newly multi-polar world and still remains based on universal values. • Further develop its alliances and engage with rising powers. Existing strategic partnerships should be deepened, notably with the United States as key partner. Such partnerships should promote economic integration, but also be reinforced wherever appropriate with security and defence dimensions, cross-investments and management of human flows. Rising global powers should not be isolated, but rather engaged with and encouraged to take up greater global responsibilities. The rise of China, as a fundamental game-changer, calls for a reassessment of the European Union's relationship with this country in a way that matches its future importance. (p.10) ***The Eastern Neighbourhood: dealing with Russia's ambitions:*** Russia is attempting to establish itself as a pole, distinct from the European Union, and to organise Eurasian geography around its own interests and values. Given its economic weaknesses, it is uncertain whether Russia will succeed in its Eurasian project, but the latter will impact considerably on the nature of relations with the European Union, whatever happens. (68) ***The Southern neighbourhood and beyond: scene set for further unrest*** To the European Union's south and south-east, many countries are in a fragile state and there are multiple sources of instability. The main challenge will be to create the conditions of sustainable peace between the key regional actors — Turkey, Iran, Saudi Arabia and Israel — and to promote some cooperation between them, so that the region can stabilise with improved governance, economic prosperity and social development. (68) Continuous erosion of security and the spread of violent conflict recur ever more frequently in literature on global trends. Disturbingly, parallels are often drawn between the present situation and the eve of the First World War. Observers note that historically, power transitions have often been precursors of, or accompanied by war. Currently there is a worrying combination of a multi-polar world, potential flash points for conflict and weak international governance. (45)	Alignment = none
	Soft Power	For reasons to do with 'negatives' such as a lack of leadership, weak economic growth and pressure from its neighbourhoods, but also simply because of the rapid development of the rest of the world, the coming period could be one of gradual marginalisation for Europe, witnessing a relative, though by no means an absolute, decline on the international stage. The main question is whether Europe will be able to preserve its influence and continue to shape the world of the future. (71)	Alignment = none

Report #11

The Global Economy in 2030: Trends and Strategies for Europe

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Human augmentation**	...human augmentation technologies will likely transform everyday life, particularly for the elderly and mobility-impaired populations.(40)	Alignment = None
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy	**Food Water Energy Nexus**	Technology advances will be required to accommodate the increasing demand for resources owing to global population growth and economic advances in still under-developed countries. Such advances can affect the food, water and energy nexus by improving agricultural productivity through a broad range of technologies encompassing precision farming and genetically modified (GM) crops for food and fuel.	Alignment = None
	Shale Gas	Securing competitive gas supplies for the EU could therefore become an issue for policy-makers because investors both inside and outside the EU might not be willing to take the risk of making sufficient investments in gas supplies and infrastructures, especially as natural gas market outlooks for virtually every other part of the world are more promising. (51)	Alignment = None
	Nuclear Energy	With regards to nuclear energy, it is apparent that important member states have taken diametric approaches. In Germany and some other countries, nuclear energy is being phased out, whereas it is being retained, or possibly even expanded, in other member states such as France and the UK. These differences will lead to different national energy market structures (and mixes) which will make it more difficult to achieve a common energy policy and to complete the internal market in energy.(96)	Alignment = None
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	**Arctic Trade Routes**	Some estimates suggest that the North Sea Route would reduce shipping time from northeast Asia (i.e. Japan, South Korea, China and Taiwan) to northwest Europe by as much as 20-25%, resulting in a potentially large increase in trade flows. Within the EU, the northwest member states with ports would of course gain more relative to the continental and southern ones (100)	Alignment = None

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**Natural Resource: Metals (Rare Earths)**	In dealing with these risks, the EU is best advised to follow a multi-pronged strategy, which includes energy and resource efficiency, increasing domestic production of critical resources where possible, better waste management and recycling, as well as the substitution of these resources with more common materials. This requires action from various policy areas and related DGs from the European Commission (47)	Alignment = None
	Water Availability	Access to fresh water in sufficient quantity and quality is becoming a major challenge almost everywhere, as a result of population growth, urbanisation, wasteful consumption, pollution and climate change... Ensuring a reliable supply for agriculture requires huge public-sector investments, which today are rarely in place... (48) The source, i.e. water, is normally not priced at all (throughout the EU and globally). Even in the EU, water use for agriculture is often not even measured, let alone priced...The agricultural sector thus suffers from poor infrastructure, waste and overconsumption (Egenhofer et al., 2012). The appropriate policy response would be adequate metering and pricing.(49)	Alignment = None
	Carbon Budget	The latest IPCC report estimates that the global 'carbon budget' is one thousand pentagrams (GT C). About one half of this budget has already been used. This implies that the amount that can still be emitted corresponds to about 1,350 to 1,985 billion tonnes of CO2. However, the known recov-erable reserves today of fossils fuels correspond to over 2,500 tonnes of CO2. This implies that a considerable part of the reserves of fossil fuels must be left in the ground. (56-7) The trend is at present away from explicit carbon prices to impose caps on specific sectors. By 2030, a large part of the economies of the G-3 (EU, US and China) will probably operate under such caps to achieve the planned reductions in emissions, but explicit carbon prices might either be absent or remain low.(57)	Alignment = None
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**UNFCC**	The challenge is to find a way to include all key countries in a structure that brings about meaningful emissions reduction on an appropriate timetable and at acceptable cost, while recognising the different circumstances of countries in a way that is more subtle, more sophisticated and – most importantly – more effective than the dichotomous distinction of past years. (98)	Alignment =None
	EU Emissions Trading System	The centrepiece of the EU's climate policy remains its emission trading system (ETS), which is today in disarray as prices have fallen so low that they are no longer materially relevant for investment decisions.(98) The oversupply of allowances which led to the collapse of the EU ETS is due partially to the economic crisis, which has reduced power demand to below expectations. This might be only a temporary phenomenon. Another important reason, however, is that European policy-makers were – and still are – not willing to solely rely on the ETS to steer the transition to a low-carbon economy in Europe. Instead, they have adopted additional measures, most notably on renewables and energy efficiency. Whereas these complementary measures also aim to drive decarbonisation, they are interacting in sometimes undesirable ways, undermining the visible price signal provided by the EU ETS.(98)	Alignment = None

		...as stipulated by the EU Directive on the promotion of the use of energy from renewable sources, individual EU member states have implemented national support schemes for renewables. Each national support scheme effectively leads to a different implicit CO2 price, varying by member state and renewable technology (98)	
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**Labour Migration Policy**	The future needs for skilled labour in EU countries require EU and SEMC policy-makers to modernise EU migration policies to encompass new admission rules and regulations, and labour migration programmes that better manage the flow of labour migration from SEMCs to EU *and back to home countries*.(103)	Alignment = None
	Undemocratization of Economies	the [Global Freedom House Indicator] has deteriorated to about 1.8 in 2000 and then to about 2.2 in 2010, indicating that that on average the economy is still mostly ‘free’, but no longer with the highest standard of political rights. Looking forward, we use the projections of the model to calculate the 2030 indicator, which deteriorates to about 3.2, indicating that the centre of gravity of the global economy will shift to countries that are no longer judged to be free. Using GDP at PPP leads to a similar conclusion. With PPP weights, the pace of change is somewhat slower, but the eventual outcome (a global average of 3.35) is even worse. (103)	Alignment = None
	Baumol Cost Disease	According to Baumol (2012) it is possible to turn the cost disease into an opportunity for future development of modern economies beyond the conventional GDP-based growth model. The key is to make sure that the unprecedented productivity growth continues at the global level in the future, for this will ensure that both wages and per capita income will continue to rise, making most products and services cheaper relative to consumers’ buying power. (42)	Alignment = None
	Remaining in the G3	At present, European representation in the international financial institutions is subject to a double dynamic: on the one hand, the pressure to give more room to the voices of rising economic powers and, on the other hand, the case for shifting the intra-European representational roles from member states to the euro area or the EU. Taken together, these two dynamics are a source of dual pressure on individual member states to cede space in favour of a single European representation as well as in favour of other countries.(90)	Alignment = None
	Military Spending	The relative decline of the individual member states of the EU continues, of course. A hypothetical entity comprised of the EU’s larger states would today still account for 15% of the G20 total and thus be placed second [in global military spending]. By 2030, even a combined EU would be placed third, behind China (which spends only a slightly larger percentage of GDP on the military, but which would by then have a higher GDP). (91)	Alignment = None
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**Defined Contribution**	... between now and 2030, major world economies will be in demographic transition simultaneously and during this phase excess savings might arise. ... the EU (but not exclusively) is unlikely to find comparable opportunities for investment abroad – either in terms of magnitude or return. Europe’s future retiree generation will thus have to be maintained with the region’s own productive resources. Defined contribution, rather than defined benefits, will have to become the norm. (92)	Alignment = None

	Inward Directed Foreign Direct Investment	The share of international FDI flows originating in emerging economies is thus set to explode. This implies that FDI from non-EU countries will increase greatly in absolute terms as well as in relative terms vis-à-vis FDI of EU origin. Member countries might thus be increasingly tempted to compete against each other to attract FDI from the savings-rich emerging economies (China, for example). (95)	Alignment = None
	Financial Fragmentation	Despite the measures undertaken by the ECB, the interbank market remains segmented, suggesting that single market mechanisms are not functioning properly... The banking union is expected to play a key role in overcoming such dynamics, but for the moment integration seems unlikely to return by itself.(95)	Alignment = None
	Sovereign Debt	...debt could indeed slowly decline under the assumption of an inflation rate above the 2% target. Another option is of course debt restructuring. While during the crisis the dominant line has been in the direction of avoiding default, some sporadic episodes, including Greek and Cypriot private sector involvement, suggest that this option may not be completely off the table. A third option, less drastic than default, would consist of converting debt in hybrid forms of equity-debt.(96)	Alignment = None
	Automation of Knowledge Work	The automation of knowledge work could bring great societal benefits – such as improved quality of health care and faster drug discovery – but it may also spark complex societal challenges, particularly in employment and the education and retraining of workers.(41)	Alignment = None

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	**Internet of Things**	The spread of sensors (motion and temperature detectors, level indicators, smart meters, etc.) enable the gathering of huge amounts of data about the real world and the sharing of this data through the cloud. Services around the data value chain are expected to proliferate in the coming decades, generating new waves of productivity growth and consumer surplus. (39)	Alignment = None

Report #12

ESPON - Making Europe Open and Polycentric

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being			
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy			
GAND CHALLENGE 4 – Smart, Green and Integrated Transport	**Europe as Global Hub**	Links between European and neighbouring regions in the form of transport, telecommunication and energy services and infrastructures need to be further developed. Global gateways already emerge in some neighbouring regions, both intercontinental airports and ports. Trade and traffic across de Mediterranean, Middle East and Eastern countries will continue to grow if neighbouring countries become successful emerging economies. Beyond infrastructure provision, markets for network industries should also be gradually integrated in the framework of free trade agreements, closer association and/or European Union’s full membership. (14)	Alignment = none
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials			
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies			
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens			

Report #13

Strategic Foresight: Towards the 3rd Strategic Programme of Horizon 2020

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Biotechnology**	Biotech will lengthen human lifespan and improve health, through genetic testing and treatments. It will affect industrial processes, biofuels, agriculture and animal breeding, and transform the food chain... A key driver for the advance of biotechnology is the demand for health related products and services, be they diagnostics or treatments. (38) Biotechnology will revolutionise nearly all aspects of healthcare, with the prospect of personalised medicine...(39)	Alignment = low
	Post-work society	-As biology becomes DIY and the bio-economy becomes automated, the question of a post-work bio-economy e.g. oriented towards happiness, becomes important. (12) - A question for the post-work society – who will work and why? There will be opportunities for better and more efficient services, for greater empowerment of individuals, but also threats to patterns of employment, and a greater security risk of major cyber-crime or cyber-terrorism. Niches will flourish, e. g. creative jobs, eco-jobs, crafts etc.(12) - The drive for happiness and well-being could fuel migration and become central in a post-work society. (12)	Alignment = none
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy			
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials		-Satellites also help better agriculture and land use, closer monitoring of climate and other environmental issues, including oceanology. (5)	

	Climate change/ Global warming/Environmental threats	-Marine ecosystems offer huge opportunities but international cooperation is fundamental so that threats like ocean warming and increasing acidity do not result typically in the collapse of the ocean food chains. The enormous implications of rising sea levels, diminishing ice cover also require research on mitigation and adaptation strategies taking advantage of Big Data collection and sense-making capacity. (5) --Economic and political instability combine with an accumulation of problems related to climate change, desertification, and severe perturbations of the water/energy/food nexus to produce rising migration and social unrest, potentially including in the EU. As the link between climate change and conflicts will compound this systemic instability, the preparedness of society to face crisis has to be increased, and technologies and institutions have to strengthen resilience, which becomes a prominent concern (6) -Population growth and current models of economic growth are driving the world towards greater environmental dangers. (12) -The pressure of population growth (10-12 billion by the end of the next century) will challenge the ability to sustain the biosphere. (12) -Climate change is a threat multiplier: it exacerbates poverty and water; it compounds food and nutrition insecurity.(11)	Alignment = low
	Resource scarcity	-Global population pressures (sheer numbers and lifestyles) will put a focus on ways of changing resource limits – through harvesting space or the marine environment, or by using bio processes to generate energy. (12) -The pressure of population growth (10-12 billion by the end of the next century) will challenge the ability to sustain the biosphere. (12) - Ecological resources are still largely monetised without externalities and extracted without proper acknowledgement of social and environmental costs. (11) -High population growth outside Europe – Asia, Africa, South America – will intensify competition for resources, and may spark greater migration, and innovation through harvesting space or the marine environment, or by using bio processes to generate energy. New technologies could change the limits and boundaries of production and consumption: nano, bio, material science etc. Bio processes could change the affordability of desalination. A number of new technologies – solar power, new techniques for managing gas – could revolutionise energy security and prices in Europe. Sustainability limits would need to be re-thought. There are new scientific frontiers in understanding complex inter-connected systems, with global / local thresholds or boundaries, together with the material cycles of carbon, nitrogen, phosphorus and other elements. Advances in agricultural science, precision agriculture, aquaculture and innovations in food could revolutionise the capability to provide food. (11)	Alignment = low
		The climate, the oceans and space are global commons which can give rise to pacifying / unifying projects for humanity as a whole. (33)	

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**Governance of Global Commons (Space, Oceans, Climate)**	Satellites help agriculture and land use, closer monitoring of climate and other environmental issues, including oceanology. The offshore economy can bring new opportunities for health, energy and food security. At the more radical edge, space may become an alternative source of materials, energy, and an important environment for health research... Environmental sustainability and resource concerns are driving the perceptions of climate, oceans and space as "commons". (33) The use of data plays a fundamental role in defining sustainability transitions and managing them. Sustainability is one of the first areas of application of big data. By allowing for example, tracking ofwaste, Big Data is helping to meet the planet’s growing demand for energy and food as the worldpopulation reaches near nine billion and climate change will be major disruptions in food productionpatterns. Another powerful use of Big Data is its ability to help assess environmental risks, both in real time and in the future. Breakthroughs in sense-making of Big Data are expected to visibly contribute to resolving environmental issues. Hyper-connectivity in 'smart cities' and 'smartcountryside' will enable sustainability to be managed and monitored. (23)	Alignment = none
	Resiliency	Essential hyper-connectivity should be resilient to system breakages. Infrastructures need to withstand challenges from shocks including cyber-crime and warfare, and should ensure appropriate levels of data privacy and security. Smart Cities and Smart Countryside approaches need to promote resilient design principles, including energy supply based on local as well as “grid” sources, and resilient transport infrastructures and services.(42)	Alignment = none

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**State of Instability as New Norm**	Economic and political instability combine with an accumulation of problems related to climate change, desertification, and severe perturbations of the water/energy/food nexus to produce rising migration and social unrest, potentially including in the EU. As the link between climate change and conflicts will compound this systemic instability, the preparedness of society to face crisis has to be increased,..(41)	Alignment = none

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its	**Biotechnology**	**-Biotechnology (and preference for certain patterns of diets) will affect industrial processes, biofuels, agriculture and animal breeding, and transform the food chain, waste treatment and environmental remediation. Abounding with radical opportunities, biotechnology is very likely to form the new wave of disruptive technologies. (6)**	**Alignment = none**

and Security of Europe And its Citizens		- volatility in job markets is expected to spread, and skills shortages may become significant. In terms of competencies needed, one could think of bio-designers – skilled bio-engineers will need to understand risk and ethical issues. (12)	

Report #14
European Value Changes

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Human Bio-Selection**	Weak Signal 6: Human Bio-selection (34) The technical manipulation of the human condition represents a spreading value change at odds with the view of human nature as untouchable. This development is largely influenced by the diffusing perception of the right of self-determination, also by aspects of human life related to the beginning of life, the end of life, and the treatment and care of diseases.(45)	Alignment = none
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy			
GRAND CHALLENGE 3 – Energy			
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials			
		Weak Signal 12: New leadership of the Catholic Church (37)	

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**New Catholic Leadership**	A principal impediment to social cohesion is the diversification of belief systems, because a far-reaching shaping of society by single religions or the STI paradigm is no longer possible. The relationship between belief and the fast-changing world is expressed differently amongst individuals and also amongst religions. (47)	Alignment = none
	Islam and Post-enlightenment Value Systems.	Weak Signal 13: Co-development of Islam and (post)enlightenment value systems (37) Irreconcilable value systems may lead to a disconnected melange of societal fragments that is not conducive to societal progress as a whole. (47)	Alignment = none
	Rise of Far-Right	Weak Signal 16: Popularity of far-right movements and parties (39) Anti-science activities may hinder the creation of knowledge by STI and the opportunities of new applications developed by innovators... According to some observers, the freedom of the sciences will be jeopardised if science becomes subjected to power struggles and severely restricting management practices.(47)	Alignment = none
	Care Economy	Weak Signal 8: Changing attitudes towards care (35) In a globalised and interconnected world, value system changes at societal level are often event driven. Examples are...natural and technical disasters leading to prioritisation of environment and health values (over economy and wealth values)... As the probability and actual occurrence of such events and their impacts are unpredictable, related abrupt value system changes can hardly be anticipated 46)	Alignment = low
	Informal Sector	Weak Signal 17: Informal sector (40) From a government perspective, an expansion of the informal sector would mean the loss of control over a significant part of society, and also, for example, over tax evasion...If criminal or radical groups step in powerfully, citizen-government relations could be at severe risk in the long term. (48)	Alignment = low
GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens			

Report #15

OBSERVE - FET Proactive Topic Generation

Grand Challenge
GRAND CHALLENGE 1 – Health, demographic change and well-being

Research Topic Title	Citations from expert report	Alignment score and QA
Bacteria Management Strategies	Observe 36 Several of the OBSERVE findings relate to the way humanity deals with bacteria. One of the most prominent aspects is the rise of antibiotic resistance which poses a severe threat to many established practices of today’s societies. All the more relevant seem other ways of dealing with bacteria such as antibacterial shields but also better understanding of the role of bacteria for human life (microbiome) and ways to influence bacteria e.g. through genome editing. At the same time bacteria are increasingly being used for processes.	Alignment = Low
Molecular Microbial Machinery (Re-engineering Life)	**Key Idea** Molecular Machinery delivered via a microbe-like designed scaffold. Design of synthetic communities Control and regulation of such communities Making this technology globally accessible **Aspects** Designing artificial microbes such that they can reliably execute a function in context Designing artificial collectives of multiple types of such microbes to achieve more complex effects Designing ways to regulate and communicate with these communities in situ (e.g. light, magnetism, ultrasound) e.g. in medical technologies Resolving ethics aspects, fair access, Storage and delivery for global usage	Alignment = none
	Rationale	

GRAND CHALLENGE 1 – Health, demographic change and well-being	**Revolutionary Healthcare**	Healthcare diagnostics will undergo major changes in the next decades. Research should be focused on the exploration of new disruptive technologies for diagnosis of personalised human wellbeing (e.g. cancer, HIV, psychological conditions, nutrition etc.). The costs for national healthcare systems need to be reduced. Key Idea Develop personalised diagnostic environments that enable fast and real time detection of diseases including rare ones and abnormalities. Environments to be considered are domestic applications, the medical doctor, and machine components.	Alignment = none
	Human AI Negotiation Processes	Key Idea Humans move within a cloud of potentially supportive AI artefacts (robotic resources). The artefacts follow different kinds of goals: some explicit goals preset by factory (e.g. safety, economy) some learned goals from the key client some explicitly set by the key client some level of autonomy improvisation In order to get something done humans give only general rules (e.g. I want to see my kids more often) and the system improvises to realise the. Thus humans and machine enter into a continuous negotiation process on different levels. Value conflicts become apparent (e.g. between individuals values and actual actions, between individuals and environments (e.g. house, city). If the system provides a solution humans may question it. The breakthrough that is required to realise this vision is to develop the adequate language for the goal setting process. Systems cannot only be based on learning from history like in deep learning. We need an explicit process to interact. Such a language could be similar like for strategic games.	Alignment = none
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Time**	Key Aspects How can we manipulate the time something takes? Change the perception of time: More time for good experiences, more valuable spending of time Pain pattern: Concentrate on nicer moments Synchronise different perceptions of time Different cultural readings of time (circular, static) Influx of information in condensed time Optimisation of speed of human development Time as a currency- value and uses (shifting time from one place to another) Learning applications (human organism) Changing use of time Working time (the social uses of time) Time (management) and mental health	Alignment = none

	Wearable and implantable intelligent devices	Key idea Develop wearable and implantable devices that restore damaged functions (e.g. mobility, organs) but also in the long term enhance human capacities in several respects: Additional senses Cognitive augmentation e.g. memory Vastly increased bandwidth (I/O) Personalised medicine (diagnostics) Key required breakthroughs: Getting information across for controlling the devices in a minimal invasive way. Energy provision. Tackle ethical aspects. Additional aspects Link with bacteria management, antibiotics Evolutionary devices, intergenerational devices	Alignment = none
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	**Molecular Microbial Machinery (Re-engineering Life)**	OBSERVE 17 **Key Idea** · Molecular Machinery delivered via a microbe-like designed scaffold. · Design of synthetic communities · Control and regulation of such communities · Making this technology globally accessible **Aspects** · Designing artificial microbes such that they can reliably execute a function in context · Designing artificial collectives of multiple types of such microbes to achieve more complex effects · Designing ways to regulate and communicate with these communities in situ (e.g. light, magnetism, ultrasound) e.g. in medical technologies · Resolving ethics aspects, fair access, · Storage and delivery for global usage	Alignment = none
GRAND CHALLENGE 3 – Energy		OBSERVE 17	

	Minimising Energy Dissipation	**Key Idea** In today's energy system most energy is lost for human use through dissipation (transformed into heat). It is generally overlooked that dissipation loss is now a severe barrier for internet of things, local energy production, smart sensors, high performance computing etc. The goal of this research is to substantially minimise this loss in: Energy transformation processes Energy transport Energy conversion and use Energy storage through new materials, processes and transformations. **Communities** Electronic engineers, material scientists, transport companies, power plants, IT	Alignment = none
	Next Generation Energy Storage (Beyond Lithium)	Observe 36 Research and innovation in energy storage is highly dynamic driven by the rise of decentralised and renewable energy solutions. Important aspects are energy conversion efficiency, speed of storage, cost effectiveness; use of materials with low environmental and social impact. The field includes several potentially disruptive developments that go beyond today's lithium battery based solutions.	Alignment = none
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

Understanding potentials and limits of human machine co-evolution interfaces	Observe 17 **Key Idea** Develop a framework for assessing who benefits and who is impacted in co-evolving systems of humans, technology and nature of any scale. Thereby enabling ex-ante value-sensitive design paradigm on (non-)symbiotic interfaces. Make interfaces transparent so explicit decisions can be taken. Develop technologies to enhance the beneficial feedback loops between societies of living systems.	Alignment = none
Climate change	Observe 36 **2.12 Dormant Effects of Climate Change** The dynamics and effects of climate change are subject to intense research in many disciplines. Researchers from all-over the world point to the increasing likelihood of yet unknown catastrophic events as well as severe health risks and urge acting now. While some aspects are widely researched and discussed, the OBSERVE screening brought up also less explored aspects such as the rise of wildfires, possible emergence of superstorms and effects on soil bacteria. In addition the following current research fronts emerged in this context (N&S24): - Regional climate models (required to investigate regional dynamics that may substantially differ from global patterns) - Model analysis of non-CO2 greenhouse gases	Alignment = none

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials

	Observe 36 **Water Challenge**	

	Resource scarcity	Water and especially clean water is becoming a scarce resource in ever more areas as climate change threatens water security. We need global strategies to prevent this or deal with. Implementation of existing strategies such as the European Water Framework Directive (WFD) requires suitable tools and methods. Water was one of the most addressed topics in 2015 science related tweets. Topics were water: -generation, -cleaning,-recycling,-pollution, -splitting, -based energy generation, - saving and -quality monitoring as well as measures dealing with droughts. Ways of measuring the quality of oceans, coastal and transitional waters is becoming an important research front in ecology. Another strand of debate is focussing on the future of oceans. Research on the impact of ocean acidification on marine ecosystems is growing fast. Artists such as Maarten Vanden Eynde (plastic reef) point towards the rise of plastic debris in the ocean - a topic that is also much discussed in science publications and media in general.	**Alignment = none**
GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	Infrastructures for Communicating in New Dimensions	Observe 36 The OBSERVE screening revealed a diverse set of items related to the way we communicate: - Compressed conversations SP4 - Terahertz communication enables a new range of wireless applications in the future T14 - Spectrum overcrowding N11 - Active audiences H3 - Molecular communications S4	Alignment = none
		Observe 36	

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	**Biomimicry New Frontiers**	A rapidly growing number of technologies are inspired by biological functions and solutions. One driver of the new momentum for biomimicry is the advance in simulation and freeform manufacturing (3D printing). Current examples of cutting edge biomimicry innovations include smell-guided-navigation, jellyfish inspired locomotion, insect-inspired robot design (vision and movement) and research into animal system behaviour (e.g. ants) that could help us develop the internet – or even understand how cancer spreads. Furthermore, biological principles and characteristics could be used for better computing. There are already many attempts to emulate biological systems in order to enhance computer chip performance or binary communication processes as well as bioinspired parallel and neuromorph computing. In the 2015 Lift China Conference there was a focus in biomimicry as the next generation sustainability concept.	Alignment = None

Report #16
State of the Future (2013-2014)

Grand Challenge	Research Topic Title	Citations from expert report	Alignment score and QA
GRAND CHALLENGE 1 – Health, demographic change and well-being	**Reacting to new health threats**	- Antibiotic resistance, malnourishment, and obesity are increasing problems. (98) --Investment and development of new antibiotics have not kept pace with current and potential antibiotic resistance around the world. This could make major antibiotic classes (such as beta-lactams, carbapenems, fluoroquinolones, and aminoglycosides) useless and lead to the reemergence of TB, malaria, and HIV. It could also increase the likelihood of new "superbug" pandemics. (98) -Poverty, urbanization, travel, immigration, trade, increased encroachment on animal territories, and concentrated livestock production move infectious organisms to more people in less time than ever before and could trigger new pandemics (100-101)	Alignment = None
GRAND CHALLENGE 2 – Food security, Sustainable Agriculture and Forestry, Marine, Maritime and Inland Water Research and the Bioeconomy	**Need for changes in food-production and consumption**	-It is estimated that growing pure meat without growing animals would generate 96% lower GHG emissions, use 45% less energy, reduce land use by 99%, and cut water use by 96% compared with growing animals for meat. These technologies have tob e supplemented by policies tat support carbon taxes, cap-and trade schemes, reduced deforestation, industrial effeciencies, cogeneration, conservation, recycling, and a switch of government subsidies from fossil fuels to renewable energy. (24) -Seriously addressing global warming will require better conservation, higher efficiencies, changes in food and energy production, methods to reduce the GHGs that are already in the atmosphere, and adaptations to climate changes already in motion for many years to come. (24) -Development planning should integrate the lessons learned from producing more food with less water via drip irrigation, seawater greenhouse and precision agriculture, improved rain water management and irrigation, watershed management, selective introduction of water pricing, and successful community-scale projects around the world. (33) -Conventional farming relying on expensive inputs is not very resilient to climatic change. Agricultural productivity could decline 9–21% in developing countries by 2050 as a result of global warming. (44)	Alignment = none

		-New agricultural approaches are needed, such as producing pure meat without growing animals, better rain-fed agriculture and irrigation management, genetic engineering for higher-yielding and droughttolerant crops, reducing losses from farm to mouth, precision agriculture and aquaculture, planting sea grass to bring back wild fish populations, and saltwater agriculture (halophytes) on coastlines to produce food for human and animals, biofuels, and pulp for the paper industry as well as to absorb CO2, reduce the drain on freshwater agriculture and land, and increase employment.(44)	
GRAND CHALLENGE 3 – Energy			
GAND CHALLENGE 4 – Smart, Green and Integrated Transport			
GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials	**Global warming/ climate change**	- Seriously addressing global warming will require better conservation, higher efficiencies, changes in food and energy production, methods to reduce the GHGs that are already in the atmosphere, and adaptations to climate changes already in motion for many years to come. Scientists are studying how to create sunshades in space, build towers to suck CO2 from the air, sequester CO2 underground, spread iron powder in oceans to increase phytoplankton, and reuse carbon at power plants to produce cement and grow algae for biofuels. Large–scale geoengineering, such as spraying sulfate aerosols into the atmosphere to reflect some sunlight, may have problems in terms of depleting stratospheric ozone, reaching an international agreement, and making the daytime sky significantly brighter and whiter. Other suggestions include retrofitting coal plants to burn leaner and to capture and reuse carbon emissions, raising fuelmefficiency standards, and increasing vegetarianism (the livestock sectormemits more GHGs than transportation does). Others have suggested new taxes, such as on carbon, international financial transactions, urbanmcongestion, international travel, and environmental footprints. Such taxes could support international public/private funding mechanisms for highimpact technologies. Massive public educational efforts by professional networks (from scholarly associations to Rotary Cubs) should use social media, popular films, television, music, games, and contests to stress what we can do to better pressure political and other leaders. Without a global strategy to address climate change, the environmental movement may turn on the fossil fuel and livestock industries. The legal foundations are being laid to sue for damages caused by GHGs. Climate change adaptation and mitigation policies should be integrated into an overall sustainable development strategy. Without sustainable growth, billions more people will be condemned to poverty, and much of civilization could collapse, which is unnecessary since we know enough already to tackle climate change while increasing economic growth. Unfortunately, we do not have sufficient acceptance of universal ethical principles for successful implementation. (24-25)	Alignment = None

GRAND CHALLENGE 5: Climate Action, Environment Resource Efficiency and Raw Materials		-Water should be central to development and climate change strategies. If climate change results in significant sea level rise, we may see 20% of the world's coastal fresh water become saline. (33) -Future effects of climate change could create up to 400 million migrants by 2050, which could further increase conditions for conflict.(120)	
	Scarcity of resources	- Because of falling water tables around the world, climate change, various forms of water pollution, and an additional 2 billion people in just 36 years, some of the people with safe water today may not have it in the future unless significant changes are made. The faster the recommendations in this report are implemented, the less suffering, disease, and conflict will occur. But progress is not yet on the scale necessary to meet the water needs of humanity and nature. (32) - Agriculture accounts for 70% of human usage of fresh water; the majority of that is used for livestock production. Such water demands will increase to feed growing populations with increasing incomes. Global demand for meat may increase by 50% by 2025 and double by 2050, further accelerating the demand for water per person (33) -Breakthroughs in desalination, such as pressurization of seawater to produce vapor jets, filtration via carbon nanotubes, and reverse osmosis, are needed along with less costly pollution treatment and better water catchments. Future demand for fresh water could be reduced by saltwater agriculture on coastlines, hydroponics, aquaponics, vertical urban agriculture installations in buildings, production of pure meat without growing animals, increasing vegetarianism, fixing of leaking pipes, and the reuse of treated water. (33) -Development planning should integrate the lessons learned from producing more food with less water via drip irrigation, seawater greenhouse and precision agriculture, improved rain water management and irrigation, watershed management, selective introduction of water pricing, and successful community-scale projects around the world. (33)	Alignment = None
	Environmental disasters and threats	- The natural infrastructure along the urban coastal zones around the world is deteriorating. This deterioration diminishes nature's ability to reduce the impacts of hurricanes, tsunamis, and pollution, as it also negatively affects ecosystem services essential to livelihood. Over half the people in the world live within 120 miles off a coastline. Hence, without appropriate mitigation, prevention, and management of the natural infrastructure within urban coastal zones, billions of people will be increasingly vulnerable to a range of disasters. (195)	Alignment = None

	Empowerment of Women	Challenge 11 will be adressed seriously when gender-discriminatory laws are gone, when teh goal of 30%+ women's representation in rational legislatures is achieved in all countries, when discrimination and violence against women are prosecuted, and when development strategies include gender equity throughout all sectors. (128-138)	Alignment = None

GRAND CHALLENGE 6: Europe in a Changing World - Inclusive, Innovative and Reflective Societies	**Growing inequality**	-The World Economic Forum identifies income disparity as the most likely global risk over the next decade, while the impacts of unemployment and underemployment are seen as being both likely and serious. (84) -The ratio between wages and profit is increasingly and dangerously imbalanced. Well aware of this, financial leaders are placing inequality and structural reforms on the top of the world policy agenda. (84)	Alignment = None

GRAND CHALLENGE 7: Secure Societies - Protecting Freedom and Security of Europe And Its Citizens	**Nanotechnologies**	-Examples of other ways to help balance future populations and resources are: (…) Accelerate safe nanotechnology R&D (to help reduce material useper unit of output while increasing quality). (…) (45)	Alignment = None
	Terrorist threats and threats from conflicts	-Mail-order DNA and future desktop molecular and pharmaceutical manufacturing, plus access (possibly via organized crime) to nuclear materials, could one day give single individuals the ability to make and use weapons of mass destruction (SIMAD: Single Individuals Massively Destructive)—from biological weapons that could kill millions in an epidemic to low-level nuclear “dirty” bombs. To prevent this, three areas should be developed: mesh networks of nanotech sensors and other advanced technology to detect such threats; mental health and education systems to detect and treat individuals who might otherwise grow up to use such weapons; and clarification of the roles and responsibilities of the public to detect potential SIMADs.(119) -Future effects of climate change could create up to 400 million migrants by 2050, which could further increase conditions for conflict.(120) -Because society’s vital systems increasingly depend on the Internet, cyberweapons to bring them down can be thought of as weapons of mass destruction. (121) -Massive public education programs are needed to promote respect for diversity and the oneness that underlies that diversity (122) -the participants in a Real-Time Delphi study conducted in October December 2013 by the Israeli Node of The Millennium Project maintained that nearly a quarter of terrorist attacks carried out in 2015 might be by a lone wolf, and the situation might escalate: about half of the participants in the study thought that lone wolf terrorists might attempt to use weapons of mass destruction around 2030 (207)	Alignment = None
	How can the changing status of women help improve the human condition?	Challenge #11	Alignment = None
	How can transnational organized crime networks be stopped from becoming more powerful and sophisticated global enterprises?	Challenge #12	Alignment = None
	How can growing energy demands be met safely and efficiently?	Challenge #13	Alignment = None