Co-design

towards the first strategic plan for Horizon Europe

A report on the web-based consultation and on the European Research and Innovation Days

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Research and Innovation

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1. EXECUTIVE SUMMARY

The implementation of the Horizon Europe Specific Programme shall be facilitated by a multiannual Strategic Plan of research and innovation activities, which will also promote consistency between Horizon Europe work programmes, EU priorities and national priorities.

The Strategic Planning Process shall focus in particular on Pillar II 'Global challenges and European industrial competitiveness' and cover also relevant activities in other pillars and the part 'Widening Participation and Strengthening the European Research Area', also in close coordination and synergy with the planning of the Knowledge and Innovation Communities (KICs) of the European Institute of Technology (EIT) and other relevant EU programmes.

This iterative process ensures early involvement and extensive exchanges with the Member States, the European Parliament, as well as the consultation of stakeholders and the public at large, based on an Orientations Document and an Implementation strategy for Horizon Europe.

As part of this exercise, two sets of co-design activities that took place between June 2019 and October 2019:

- A web consultation, opened to all interested respondents between 28 June 2019 and 4 October 2019, which have collected 6806 answers;
- Three days of direct interactions between the Commission services and almost 4000 stakeholders, during the European Union Research and Innovation Days (24-26 September 2019).

This report aims at providing a direct glimpse on the ideas and insights provided along the different co-design activities. Therefore, their presentation has been reported in the following pages as directly as possible. The qualitative conclusions to be drawn will be integrated in the updated Orientations document that will be published online in early November 2019. The Commission will then open to additional comments from any interested stakeholder during November 2019, especially from the transnational umbrella organisations, with a view to bolster the EU added value of the document.

Written and oral feedbacks indicate clearly a broad agreement on the Orientations, as well a strong appreciation for the co-design approach, from a wide range of stakeholders.

Strong confidence on Research and Innovation has been expressed, especially as regards the daunting challenges ahead:

- Sustainability is becoming the driving force of our economies and societies. There is a strong call for the EU to take the lead on sustainable sciences and sustainably solutions;
- New deep tech and disruptive innovations will shape a new world and Europe is in pole position for this transformation. There is a power shift coming up and we stand ready. This will require new skills, a culture of public-private cooperation and the capacity to invest and regulate smartly.

As for the main settings of Research and Innovation programming

- direction should be given without prescribing solutions to give more space for creativity;
- Technologies should have a purpose, but space should also be given to explore "out of the box";
- We should facilitate the discussions between the dreams of researchers and our legal and socio-economical backgrounds.

2. INTRODUCTION

The implementation of the Horizon Europe Specific Programme shall be facilitated by a multiannual Strategic Plan of research and innovation activities, which will also promote consistency between Horizon Europe Work Programmes, EU priorities and national priorities.

The Strategic Planning Process aims to:

- implement Horizon Europe's Programme-level objectives in an integrated manner and provide focus on impact for the Programme overall and coherence between its different pillars;
- Promote much better, synergies between Horizon Europe and other Union Programmes, thus becoming a point of reference for research and innovation in all related programmes across the EU budget and non-funding instruments;
- Help to develop and realise EU policy for the relevant areas covered, and complement policy development and implementation in the Member States;
- Reduce fragmentation of efforts and avoid duplication and overlaps between funding possibilities;
- Provide the frame for linking the direct research actions of the European Commission Joint Research Centre and other actions supported under the Programme, including the use of results and data for support to policy;
- Ensure a balanced and broad approach to research and innovation, at all stages of development, which is not only limited to fostering frontier research, the development of new products processes and services on the basis of scientific and technological knowledge and breakthroughs, but also incorporates the use of existing technologies in novel applications and continuous improvement and non-technological and social innovation;
- Ensure a systemic, cross-disciplinary, cross-sectoral and cross-policy approach to research and innovation in order to tackle challenges while also giving rise to new competitive businesses and industries, fostering competition, stimulating private investments and preserving the level playing field in the internal market;

The result of this Strategic Planning Process shall be set out in a multiannual Strategic Plan (the first one for 2021-2024), for preparing the content of the Work Programmes, while retaining sufficient flexibility to respond rapidly to new and emerging challenges, unexpected opportunities and crises.

The Strategic Planning Process shall focus in particular on Pillar II 'Global challenges and European industrial competitiveness' and cover also relevant activities in other pillars and the part 'Widening Participation and Strengthening the European Research Area', also in close coordination and synergy with the planning of the Knowledge and Innovation Communities (KICs) of the European Institute of Technology (EIT).

The European Commission ensures early involvement and extensive exchanges with the Member States, and with the European Parliament, that are complemented by consultation with stakeholders and the public at large in the desirable frame of a stronger engagement with citizens and civil society in a novel co-design process.

A web-based consultation for comments from all interested parties has been launched in view of the preparation of the first strategic plan, based on a supporting ('Orientations') document: https://ec.europa.eu/research/pdf/horizon-europe/ec_rtd_orientations-towards-the-strategic-planning.pdf

The co-design process has been organized so far with two main phases:

- The web-based consultation, open from 28 June to 4 October 2019;
- The Research and Innovation Days on 24, 25 and 26 September 2019.

The main indications from responses gathered up to 4 October are presented below in two chapters:

- The first chapter presents the results of the web based consultation;
- The second chapter reports the discussions held during the European Research and Innovation Days, both in the 21 spaces of the Research and Innovation Days village, and in the 43 co-design sessions, including sessions on missions.

3. THE WEB BASED CONSULTATION

The web-based consultation has been organised through an EU survey questionnaire, structured in four sections (*about you; where should Horizon Europe play its greatest role?; what kind of impacts should Horizon Europe should target?; More in detail on the Orientations document*) and is composed in total of 20 questions, both closed and open.

The questions refer to the possible contributions of Horizon Europe to the political priorities of the European Union, as well as to economic, scientific and societal impacts that Horizon Europe should target during its first four years of activity (2021-2024), in line with its legal basis.

To provide a level playing field among all respondents and to facilitate the broadest ownership of Horizon Europe, a supporting ('Orientations') document has been published together with the consultation.

The Orientations document represents the outcome of the first phase of the co-creation of Horizon Europe implementation among all Commission services. This is meant to facilitate the co-design of the strategic plan between the European Commission, the European Parliament, Member States and the largest possible number of Research and Innovation stakeholders.

The answers to the survey have been assessed by the Commission services, in co-creation. They have been harnessed to optimise the organisation of the co-design activities during the Research and Innovation Days, both in the village and in the relevant policy conferences, including the co-design sessions.

The results presented in this interim report take into account the responses received from the launch of the survey on 28 June 2019 until 4 October 2019, as well as the discussions held during the co-design activities of the Research and Innovation Days. As for the survey, almost 90% of the respondents are based in one of the 28 Member States of the European Union or in one of the three Countries of the EEA (Iceland, Lichtenstein, Norway).

Due to the significant interest shown both in this web-based co-design exercise and in the Research and Innovation Days, the closing date of this web-consultation has been extended from 8 September to 4 October 2019, which was the closing day of a parallel web consultation on the implementation strategy of Horizon Europe.

All the data and statistical figures reported below have been harvested and elaborated from the 6806 answers received to the web-based co-design exercise, as well as from the view expressed by the 3874 participants to the Research and Innovation Days co-design activities.

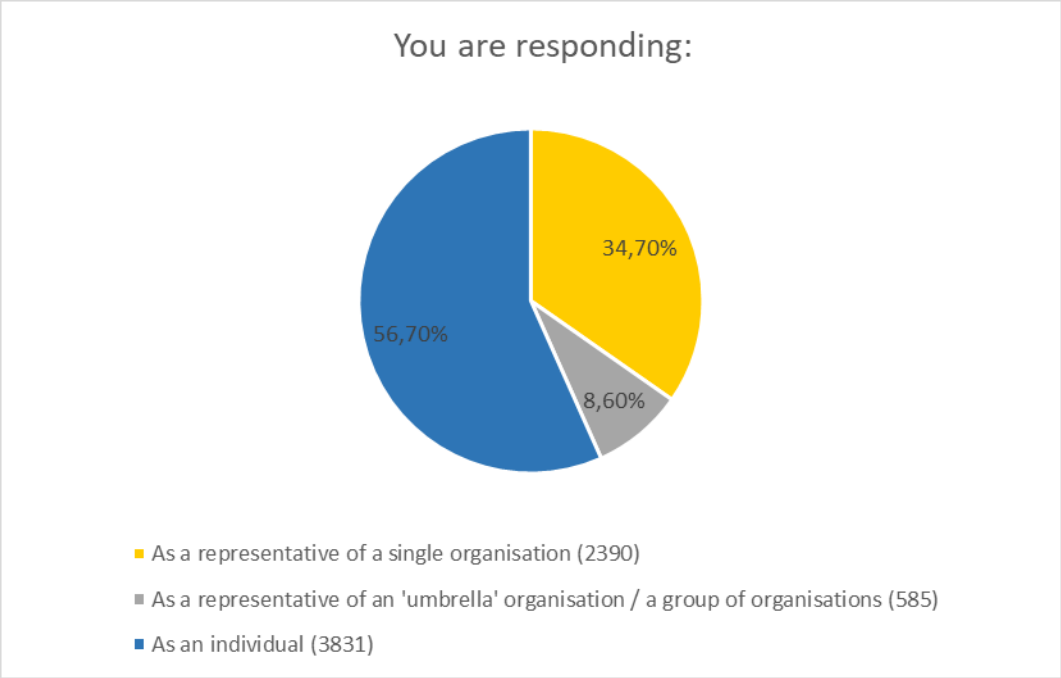
3.1. Presentation of the respondents'profile

This section takes into consideration the answers given to section - A (about you) of the questionnaire.

The replies provide an indication about: (i) the identity of respondents, (ii) their acquaintance and participation patterns in the European Union Research and Innovation Framework programmes, (iii) and their main areas of interest in Horizon Europe.

i) Identity of the respondents: a balanced group of respondents ensuring ownership beyond research and innovation actors.

The profiles of respondents are balanced in different ways:



- More than half of respondents answered on a personal basis, driven by their own interest to Horizon Europe, whereas the other half represent an organisation.

- Respondents are based in 99 different States. European Union Member States are representing approximately 87% of the respondents.

- Among the respondents from Third Countries, the 16 Associated Countries to Horizon 2020[1] represent circa 66.9% of the answers[2].

- Among the respondents from Third Countries, the Countries that belong to the EU:

[1] https://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-list-ac_en.pdf

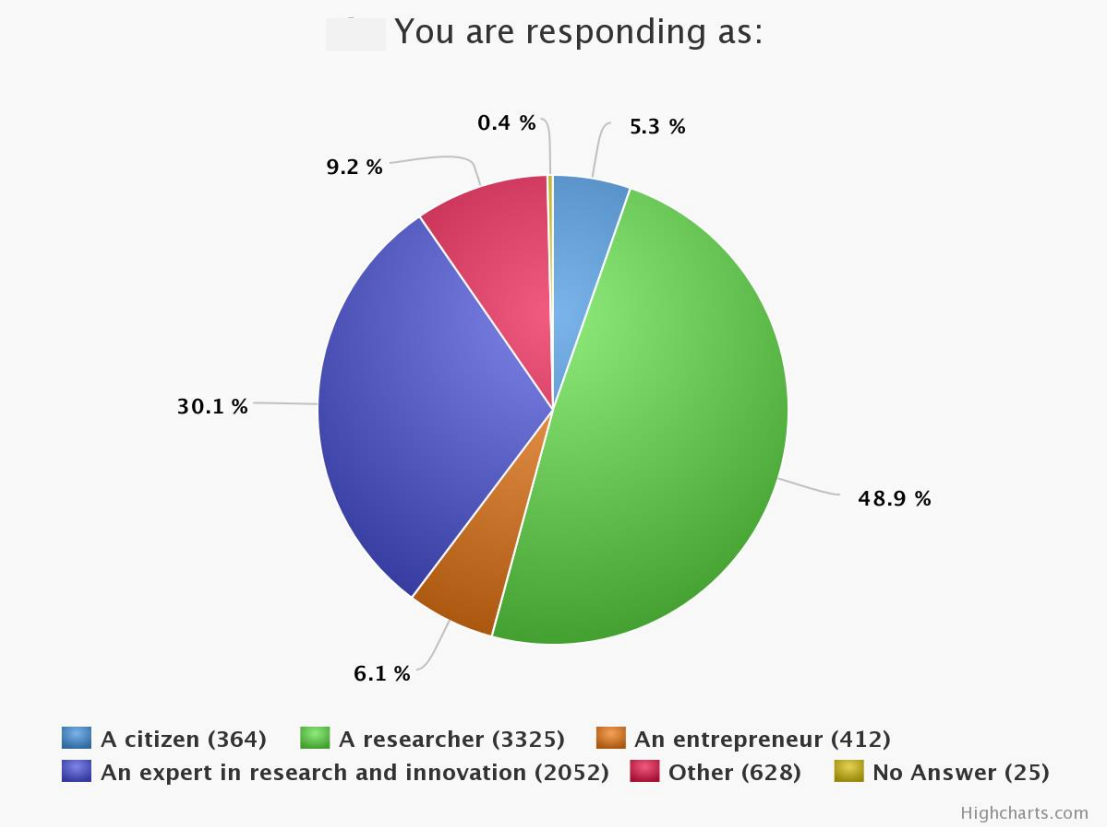
[2] Please note that Tunisia belongs both to the group of the Associated Countries to Horizon 2020 as well as the Participating Countries of to the EU Africa high level policy dialogue

- The Community of Latin American and Caribbean States High level policy dialogue on science, technology and innovation [3]represent 12.9% of the answers.
- The Africa High level policy dialogue on science technology and innovation[4] represent 9.9% of the answers.

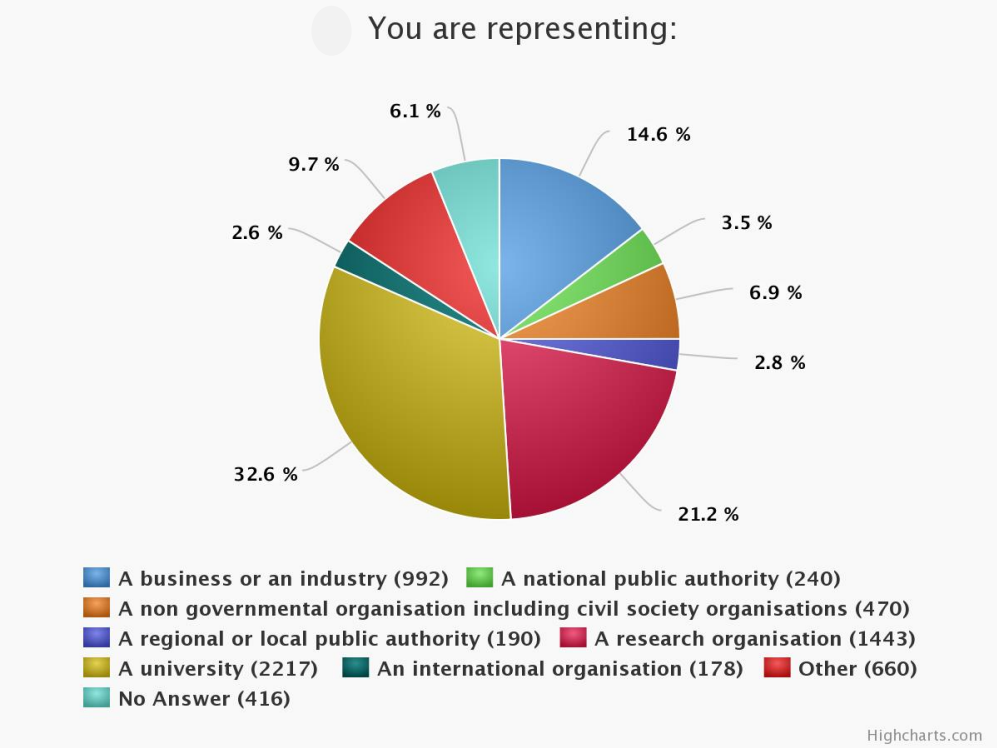
• Among the respondents from Third Countries, those based in Turkey represents 7.4% of the answers, those in India 2.7% and those in China 1.7%.

[3] https://eeas.europa.eu/headquarters/headquarters-homepage_en/13042/EU-CELAC%20relations

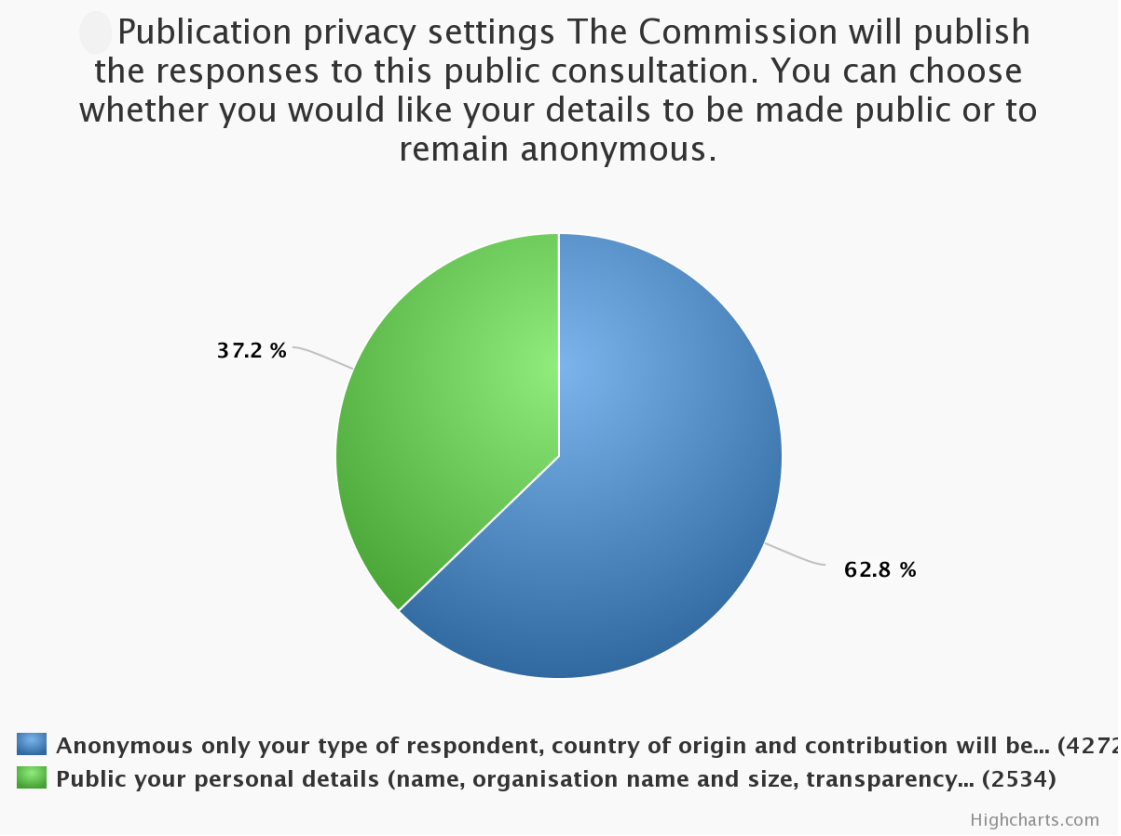
[4] https://ec.europa.eu/research/iscp/index.cfm?pg=africa



- More than half of respondents are research and innovation creators (*researchers and entrepreneurs*) whereas the other half is composed of research and innovation managers and/or users, i.e., citizens, entrepreneurs and other.

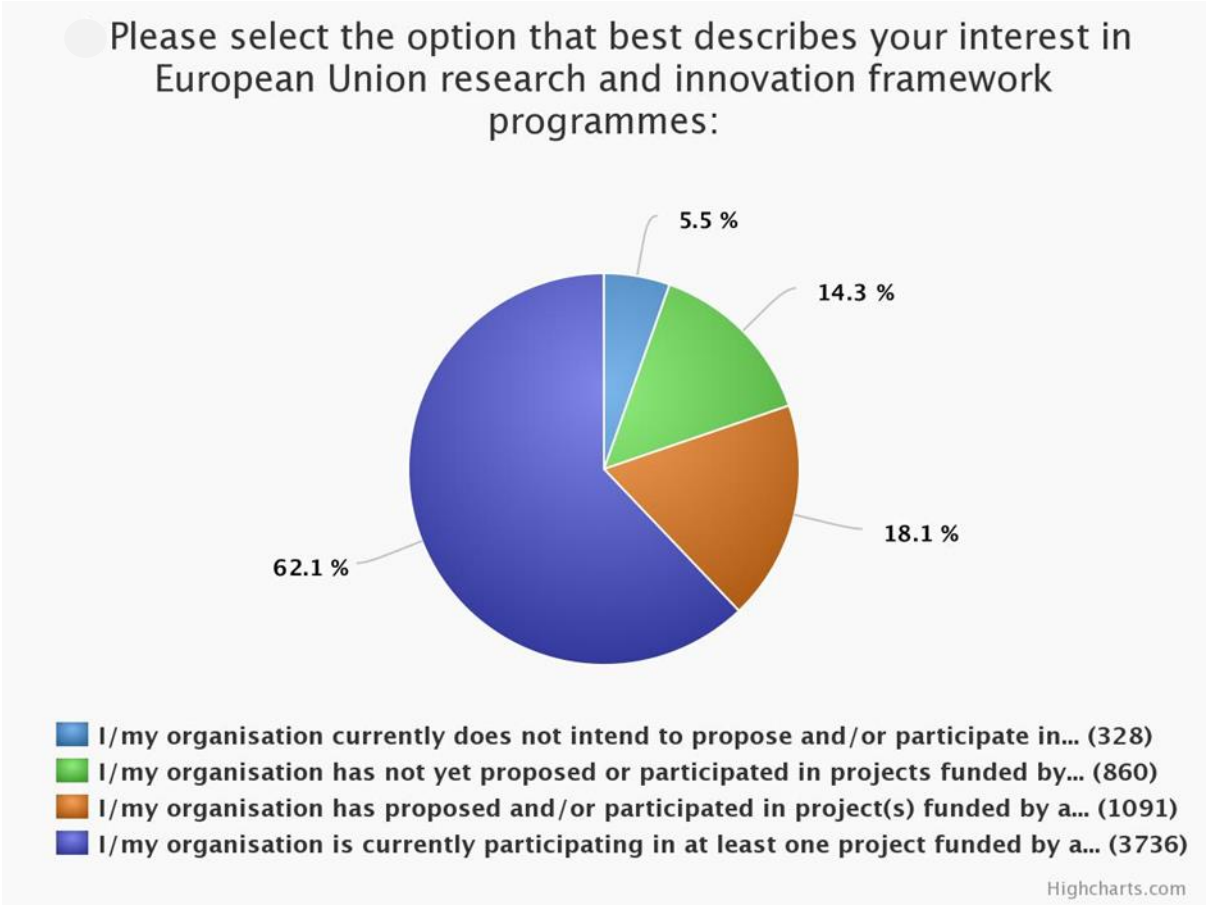


- More than 25% of respondents can be qualified as Research and Innovation end users -without prejudice to their possible involvement in Research and Innovation activities (*business or industry, national, regional or local public authority, non-governmental organisation*).



- Privacy preferences of the respondents were relevant for optimising the settings of the co-design activities, be it remote exchanges or face-to-face events such as the European Research and Innovation Days.

ii) Participation patterns in the current and previous EU Research and Innovation framework programmes



From the top to the bottom, in full:

I/my organisation currently does not intend to propose and/or participate in projects funded by European Union Research and Innovation framework programmes, but I may be interested in the results of the projects/programme.

I/my organisation has not yet proposed or participated in projects funded by European Union Research and Innovation framework programmes, but would be interested to do so.

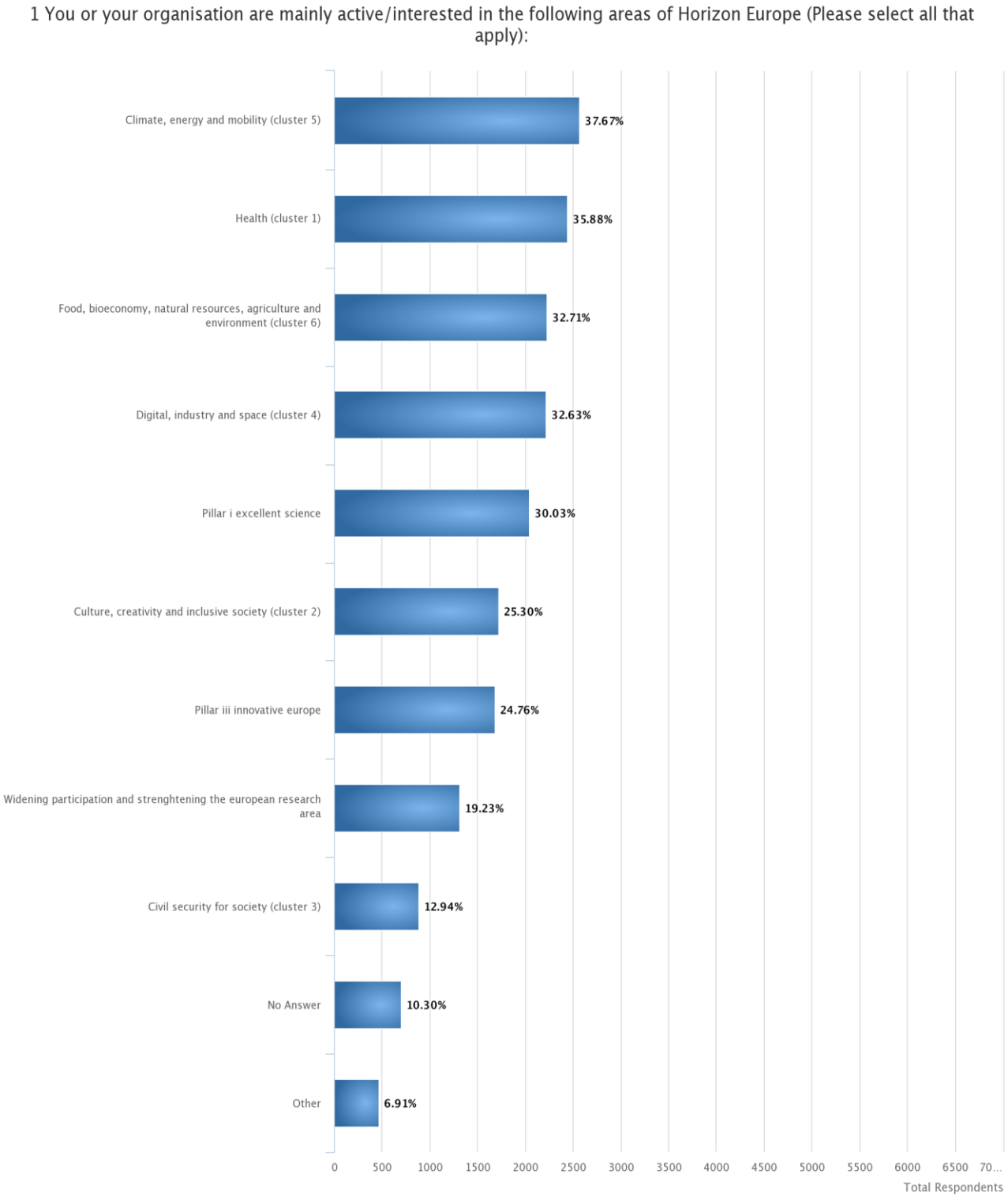
I/my organisation has proposed and/or participated in project(s) funded by a European Union Research and Innovation framework programme in the past, but I am/it is not participating in a running project at this moment.

I/my organisation is currently participating in at least one project funded by a European Union Research and Innovation framework programme.

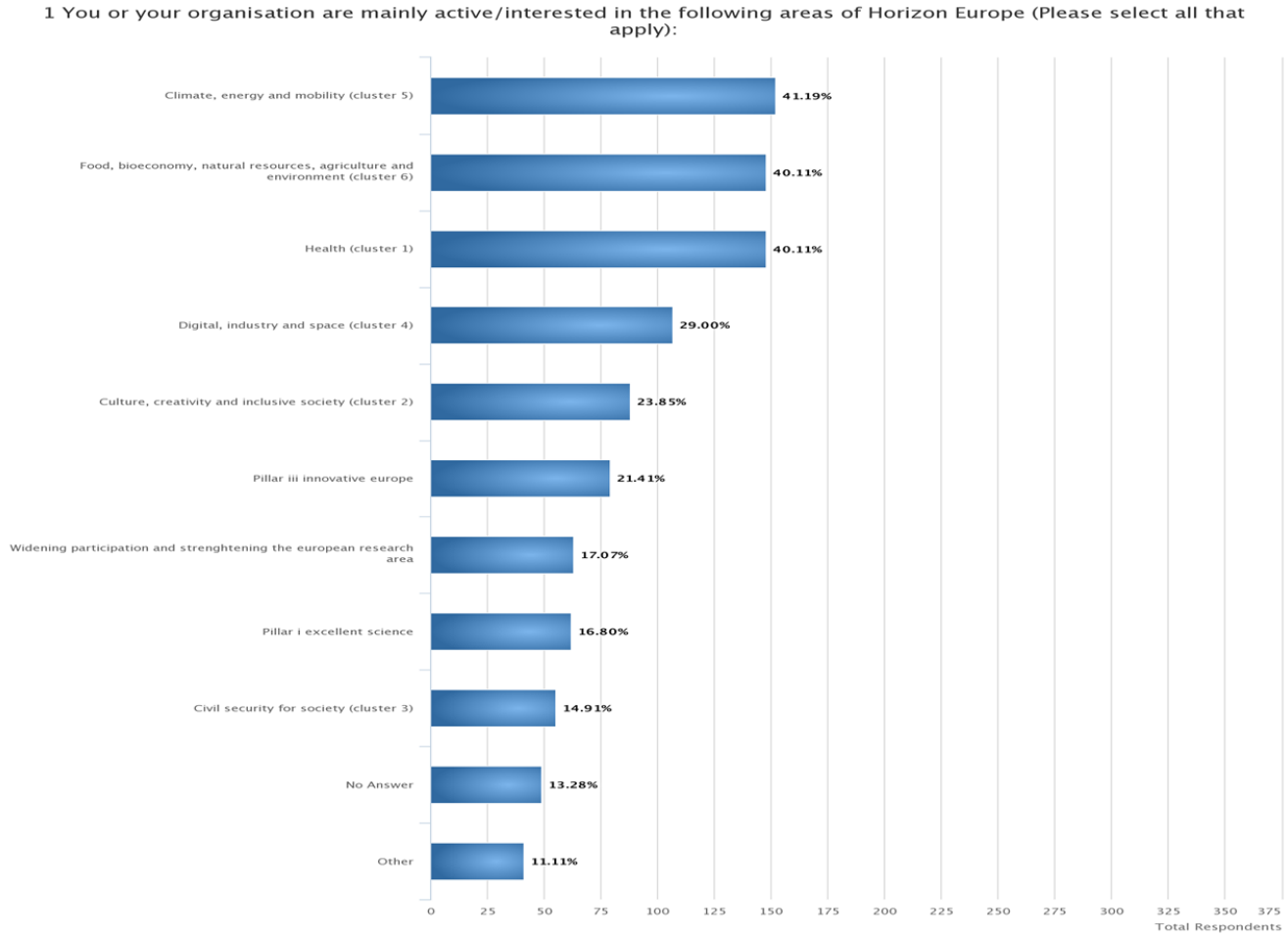
- The majority of respondents are currently involved in at least one activity funded by the current EU Research and Innovation framework programme, Horizon 2020. Nevertheless, many respondents are interested in Horizon Europe without being currently involved in Horizon 2020, thus signalling a broad community of interested stakeholders.

iii) Main areas of interest in Horizon Europe

All respondents



Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (but that may be interested in the results of the projects/programme).



- All parts of Horizon Europe have received satisfactory signals of interest by the respondents. The cluster on climate, energy and mobility seems to be the part receiving more attention.

3.2. Main lessons learnt from the respondents feedback on the clusters targeted impacts

This section takes into consideration only answers given to section - C (*what kind of impacts should Horizon Europe target?*) of the questionnaire.

The replies provide an indication about: (i) the main messages sent by respondents at cluster level, (ii) their appreciation to the targeted impacts elaborated at cluster level to provide bridges between the legal basis and the work programmes.

The feedback received so far largely confirms the drivers, the challenges, the future policy priorities and the targeted impacts described in the Orientations document and the relationships among them. The replies to the consultation offered interesting suggestions, which have been discussed during the Research and Innovation Days and considered in further iterations of the document.

As a first impression, a number of points repeated in many comments and across different areas, are summarized below:

- Certain themes (e.g. Climate change, biodiversity, environment, migration) should be considered as cross-cutting, beyond their individual place in a given cluster;
- There is a need for exploiting synergies across clusters in order to maximise impact;
- Research infrastructures are seen as key platforms to provide support to the activities undertaken in other pillars and to facilitate international cooperation and interdisciplinary research activities for addressing global challenges;
- Respondents strongly support gender equality being set as a cross-cutting issue in Research and Innovation and underline the need to integrate the gender dimension within each component of Horizon Europe;
- Specific attention should be given in research activities to youth and children (e.g. educational opportunities, health inequalities, gender aspects).

Cluster 1 (Health) –Participants to the Programme. The respondents consider that the proposed impacts are well in line with the main objective of a fair Europe: for the six health-related impacts, no major disparities are to be signaled. Overall, the comments are, more often than not, a plea from a research community to gear funding in their own direction, not really responding to the orientations document/questionnaire. Some responses appear to be coordinated as they contain identical or similar phrasing. The targeted impacts with most comments are those dealing with disease and their prevention.

Feedback on the targeted impacts

"**Staying healthy in a rapidly changing society**". To further boost impact, specific attention should be paid to invest in the health and wellbeing of children and youth, creating solid foundations for their healthy lives. The elderly should not only be considered as a burden but as an asset and a resource, building on their positive experiences and best practices for staying healthy.

"**Living and working in a health-promoting environment**". To deliver on this impact, a stronger emphasis should be put on assessing the impact of the urban (built) environment and climate-related factors on health and well-being, while acknowledging the positive impact of a health-promoting environment (e.g. access to green spaces, biodiversity), including on mental health. Focus should be increased on how to reduce health inequalities, largely caused by the social determinants of health, but that should be addressed via holistic

approaches involving not only the health sector but also other sectors such as education and employment. Integrated approaches should also be adopted to address multiple stressors/pollutants. As health improvements can be an important co-benefit of climate or biodiversity policies, emphasising these benefits could increase political support for such policies.

"**Tackling diseases and reducing disease burden**". To further reinforce impact, specific attention should be paid to addressing health inequalities, vulnerable populations, co- and multi-morbidity. Repurposing of medicines should be encouraged. More interdisciplinary research is needed, together with a better integration of the scientific and clinical communities. Basic research on understanding of mechanisms of diseases also offers significant potential. There is also a need to trigger investment of Industry in certain underfunded areas of Research and Innovation (e.g. brain-related disorders, Anti-Microbial Resistance (AMR), poverty-related and neglected diseases). The patient perspective and patient engagement in the research could be also mentioned.

"**Ensuring access to sustainable and high-quality health care in the EU**". We need to take into consideration several comments on the relevance of primary care and rehabilitation services, as well as calls for more implementation research, and ensure transfer of innovative technologies into daily life. This is actually planned to be addressed through the potential partnership "Large-scale innovation and transformation of health systems in a digital and ageing society". Other suggestions deserving specific attention : Research and advancement of knowledge through demand driven approaches; public interest driven ownership of results, access principles for health research results and innovations ; Transparent and inclusive health and care services and systems, including the social security aspect (addressing needs of vulnerable groups) ; Relevance of data, equal access to data and inter-operability of systems for better delivery and harmonisation of health care in Europe; Inter-disciplinary/cross cluster research (social sciences and humanities; social innovation; citizen science) ; Innovation uptake/ large scale uptake of solutions; importance of pan-European solutions for health systems in order to fill critical knowledge gaps and anticipate value and outcomes of the performance data they produce.

"**Unlocking the full potential of new tools, technologies and digital solutions for a healthy society**". In order to reinforce impact, Research and Innovation should cover technologies that blur the lines between the physical, digital, and biological (Hybrid Health Technologies). A stronger use of the personalised medicine approach was advocated, as well as an improved and careful use of health data and attention to cybersecurity issues, modelling (of humans, organs); Social care and support solutions for disabilities, substances of human origin (SoHOs), first in-man clinical trials.

"**Maintaining a sustainable and globally competitive health-related industry**". Impact will be ensured by granting attention to digital, support to SMEs and mid-caps, clinical trials and personalised medicine, patient and citizen acceptance of innovative health technologies, including digital ones, and suitability of these technologies to the patient's and healthcare providers' need. As for impact 3 above, consider procurements and support to Small and Medium Enterprises (SMEs) in areas of market failures and lack of private investment.

New elements

The input to the consultation did not flag any new impact as such. Interesting are the contributions where the respondents do not plead for their community. This was noted for instance, when industry representatives highlighted the need to support research on Antimicrobial resistance, or when keywords such as 'access' and 'health inequalities' regularly surfaced. Actions regarding these issues, as for many other keywords noted, are actually already clearly spelled out in the document. However, some adjustments may be consider to reinforce the listed impacts (see above).

Some of the comments covered areas that are not explicitly mentioned in (though sometimes not excluded from-) the orientation document, such as: infertility; oral diseases;

pain and cannabinoid therapies; clinical trials; alternative medicine; sports; support to caregivers; adolescence; rehabilitation.

While no additional impact emerged from the consultation, there is a perceived need to better describe how the partnerships and missions will be integrated in the overall picture of Horizon Europe, and what their role will be - highlighting the need for complementarities and synergies. The proposed partnership models should be more inclusive, providing ambitious funding and supporting flexible portfolio approaches.

How to establish bridges with the other parts of Horizon Europe and indications on possible synergies with other EU programmes?

Strategic international collaborations, interdisciplinary collaborations, synergies and better cooperation with other clusters as well as with Structural Funds should all be clarified and/or strengthened. The use of existing and new Infrastructures should be supported. Cluster 1 should also grant attention to gender inequalities and mainstreaming of social sciences and humanities as well as open data. The Cluster should also better integrate a holistic approach to health (aka "one health").

Cluster 2 (Culture, creativity and inclusive society) – Respondents largely confirmed the main lines of activities of Cluster 2 as described in the Orientations document.

Feedback on the targeted impacts

The number of responses from citizens and non-specified (other) respondents is above average indicating that the Cluster's impact objectives attract also the non-specialists. Cultural heritage and culture are seen as very important; with attention paid to: a) their role in fostering understanding; b) being the basis of a common (also European) identity; c) the need to protect and promote cultural diversity. There is equally strong support for studying democracy, in relation to current political developments and institutions, the protection of core values, human rights etc. Research on promoting fairness, social welfare and cohesion is also recognised as important, with special emphasis on the role of education and fighting inequalities. Finally, respondents also highlight the need to further analyse the social impacts of technological advancements both from an economic and an ethical perspective.

Comments call for adjusting the approach of Cluster 2 with a view to reinforcing research and innovation activities on education, youth policies, the social and human factors nurturing innovation, history and social wellbeing beyond economic growth.

Using research results in education is a recurrent theme among respondents. They ask for greater attention to be paid to research on children and youth in a greater variety of fields, including educational opportunities and poverty, migration and integration, political participation, sustainability, the digital economy, health etc.

More attention to Europe's linguistic heritage was also put forward. Respondents recommended paying more attention to preventive conservation of tangible cultural heritage and to the opportunities offered by digital humanities in the activities of Cluster 2.

Responses also stressed that development should not be understood solely on economic terms. Rather, research should adopt a more holistic understanding of development and social progress that would be in accordance with environmental and social sustainability, and would equally be conducive to individual wellbeing.

Comments also made the case for further focusing on the human and cultural factors that lead to innovations and social progress.

How to establish bridges with the other parts of Horizon Europe and indications on possible synergies with orther EU programmes?

Among the cross-cutting issues, a strong and consistent gender approach received tangible support.

Using research results in education is a recurrent theme among respondents. They ask for greater attention to be paid to research on children and youth in a greater variety of fields, including educational opportunities and poverty, migration and integration, political participation, sustainability, the digital economy, health etc.

Cluster 3 (Civil security for society) – Increased cyber-security, improved disaster risk management as well as improved security of infrastructure are the main areas where most correspondents expressed their interest.

Feedback on the targeted impacts

In particular, many comments point to the fact that the increasing digitisation of the society adds vulnerabilities. In that respect, the protection of critical infrastructures and essential services (e.g. energy grids, Internet of Things) and the need to deliver cybersecurity along with privacy and personal data protection are seen as main challenges for the future.

In addition, individual replies highlighted some specific issues including the need to develop and deploy standardised solutions; interdependencies between disaster risks; empowering citizens to cope with disasters; crowd behavior; the need to be able respond to criminal and terrorist groups' access to advanced technology; the need for a shared security culture to secure and protect Europe.

How to establish bridges with the other parts of Horizon Europe and indications on possible synergies with other EU programmes?

Replies from industry suggested using capability planning and foresight to address long-term needs while remaining flexible to meet pop-up threats, and to improve market uptake of research results including through EU funds.

Cluster 4 (Digital, industry and space) - Overall, there seems to be support for the main objectives put forward for this Cluster: achieving a Competitive edge and Autonomy of EU Industry; paving the way towards a Climate-Neutral, Circular and Clean Industry; and contributing to the development of an Inclusive Society.

The feedback received draws attention to:

- The need to adopt a lifecycle approach from technology design to implementation and deployment by considering crucial enabling factors such as: cross-disciplinarity, human-centricity, youth involvement, and upskilling and lifelong learning, in order to ensure all members of our society can reap the benefits of technological progress through a cultural/behavioural shift.

- The relevance of taking a strategic value chain approach especially in the context of an industrial and digital transformation of European industry; Technology for Sustainability as an avenue for economic growth, where Europe should lead.

- Support for research at lower technology readiness levels, promising to deliver high impact-driven solutions; and the balance and interactions between the different levels of research as crucial for renewal and long-term competitiveness.

Feedback on the targeted impacts

The need for climate-neutral, circular and clean EU industries and low-carbon technologies for energy intensive industries was most often mentioned.

EU industrial leadership in key enabling and digital technologies was also very much favoured as a targeted impact, as well as EU strategic autonomy in space and raw materials. Key Enabling Technologies (KETs) were considered fostering multidisciplinarity and transversality and those two concepts were deemed to be engrained and effectively supported in Horizon Europe. Several respondents requested to further highlight the strategic importance of the space sector for enhanced EU autonomy, security and global competitiveness, and as an enabler of technologies and services with high policy relevance such as for example, climate, environment, natural disaster monitoring, agriculture, secure and automated transport. Clean technology seemed to be often considered as a by-design requirement and the circularity principle was often recurrent.

Several respondents underlined the need for safeguarding EU industrial competitiveness and leadership vis-à-vis global competitors like the US and China through a much stronger EU presence in digital and other key enabling technologies for strategic/key value chains. European values were mentioned as a differentiating element that could lead to alternative technologies (as compared to US/Asia) where EU could be in the lead (e.g. sustainability friendly tech / ethical technology…).

Clear and strong support was also expressed for digital technologies with pointers that the associated skillset and awareness of sectorial applications was also important. Societal/human impact of digital technology was often mentioned (privacy, automation, inclusiveness, health, legal dimensions...) with calls to ensure these concerns are addressed in the entire tech lifecycle from design to implementation (cross-disciplinarity, human-centricity, youth involvement, Social Sciences and Humanities (SSH) aspects notably.

In this context, it was stressed that the EU has a major opportunity to make a policy and competitiveness shift in digital economy where the European Commission also needs to fund new technologies for key strategic topics including Digital Sovereignty, and the associated Data and Software dimensions.

The need for inclusiveness, and inclusive digital societies in particular, was frequently mentioned, along with citizen engagement, including youth, children and people with disabilities, as well as education to help achieve sustainability and a climate neutral and circular economy via a change in behaviour.

Autonomy in terms of resources and strategic importance of a secure sustainable and responsibly sourced supply raw materials often featured, with calls for a value chain approach, a strong focus on (critical) raw materials related research and innovation, and also complementary global alliances between regions. A partnership with Africa was also mentioned. The use of raw materials in clean technologies was mentioned many times.

New elements

The respondents called for openness and widening to new actors in space (e.g. New Space) to open up new possibilities in Europe , as well as a framework to support space education and public engagement to attract young talents and provide appropriate skills.

•How to establish bridges with the other parts of Horizon Europe?

Comments regarding the structure did generally not concern the structure of Cluster 4 itself, but rather related to important issues at the intersection of clusters, such as Energy and Resources, or Health and Digital, for which cross-cluster actions were suggested. Dedicated calls within each cluster supporting Responsible Research and Innovation and fostering Social Sciences and Humanities research were also put forward as suggestions.

As regards climate-neutral and circular industries, respondents often combined Cluster 4 related aspects with Cluster 5 and 6 related aspects in their comments. For example, there

were mentions of batteries, clean hydrogen, nuclear energy, waste heat recovery, the forest-based sector, plastic recycling.

EU leadership in sustainable development was linked to including Strategic Value Chains, key enabling technologies and public-private partnerships in the Horizon Europe strategic planning. Support for the related proposed partnerships and mission areas came up frequently.

Research Infrastructures were also recognized as key area for investment and digital transformation.

•Possible synergies with other EU programmes

The need for synergies with Structural Funds, InvestEU and with Digital Innovation Hubs also featured, as well as synergies with EFSI and the European Defence Fund to stimulate industrial infrastructures with high Research and Development investments.

Respondents signalled that synergies between Galileo/Copernicus, as well as the availability of space assets and data from other organizations (e.g. EUMETSAT), should be better exploited, especially for the downstream usage. They recommended highlighting some specific key applications such as EGNSS secure real-Time High-Accuracy positioning for automatic transport, Copernicus earth observation on polar research and natural disasters, EGNSS and Copernicus services for environmental monitoring systems, migration, innovation in agriculture. The role of space in quantum infrastructure and space debris mitigation were also mentioned.

There was a call for more coordination and synergies between the EU, Members States' and ESA programmes. There was support for the Strategic Research and Innovation Agenda to work on competitiveness of the space sector and access to space.

Respondents underlined the need for a Research and Innovation space programme that would permit to maintain the technological readiness of the EU-owned strategic infrastructures (EGNOS, Galileo, Copernicus), develop new components of the Space programme (SST, Govsatcom), set a common technology base for EU space systems, and ensure technology leadership to compete on open markets. They also stressed that the potential of the downstream segment of the space sector should be better exploited, in particular Galileo and Copernicus. Such applications can help tackle global challenges, create high-skilled jobs and open up new market opportunities for businesses.

Respondents also confirmed the important role of cultural and creative industries, skills, IP protection, regions, cities, clusters and smart specialisation strategies to achieve the targeted impacts for Cluster 4.

•Elements to be considered at a later stage

Several respondents pointed to the need to gain leadership in digital technologies such as Quantum, Photonics, High Performance Computing, networking and AI but also in digital infrastructure, Internet and security of digital infrastructure and services. These technologies were not only seen as enabling tools but also as core topics to focus on. It was mentioned that a strong focus on ICT was one of the key technical aspects of our society towards a sustainable and balanced society. Many comments on AI revolved around responsible AI but the ethical, legal and societal dimension of digital technologies were also highlighted.

Cluster 5 (Climate, energy and mobility)-The main impacts/objectives outlined in the 'Orientation Paper' have been broadly supported.

The respondents drew attention to the contribution that their specific areas of interest/activity can bring to the objectives of Horizon Europe; in particular as regards rail,

waterborne, aviation, hydrogen, storage, cities, buildings, and climate change (mitigation and adaptation).

Feedback on the targeted impacts

There was a general support for the structure of the document, although its difference, compared to other clusters, has been noted.

In line with the Orientations paper, many respondent emphasized the importance of a holistic approach exploiting synergies of combining different sectors/areas (e.g. in the mobility, energy, fuels or ICT area, or between them; as regards sector coupling/integration, and circular and shared economy) as a way to achieve very high impact.

Respondents drew attention to the delicate balance between long-and short-term oriented activities - there was some support to concentrate on areas where EU (still) has a competitive advantage and try to maintain/increase the leading position combined with research for long-term innovation. Few contributions remarked the absence of any reference to geoengineering technologies.

New elements

In line with the Orientations paper, many respondent emphasized the importance of a holistic approach exploiting synergies of combining different sectors/areas (e.g. in the mobility, energy, fuels or ICT area, or between them; as regards sector coupling/integration, and circular and shared economy) as a way to achieve very high impact.

How to establish bridges with the other parts of Horizon Europe?

Respondents underlined that climate change is an important overarching theme both within cluster 5 and across the various clusters.

Respondents stressed that behavioural, socio-economic and societal issues need to be an integral part of activities to generate impact for societal transformation. Citizen engagement and citizen science are considered useful in this context.

It was also highlighted that, in order to mitigate the impact of breakthrough technologies on the labour market, the skills gap should be addressed, building capacity to transform/convert productive chains towards products that are climate-neutral, fit for a circular and clean industry in an ecosystem including start-ups.

While the broad orientations and expected impacts described in the Orientation paper have been broadly supported, a number of respondents provided a more detailed description of the most pertinent challenges in their specific area of interest/activity. Taking into account the level of granularity of the Orientations paper, detailed comments on area-specific challenges are not reported here, but may be taken into account when drafting the work programme.

Cluster 6 (Food, bioeconomy, natural resources, agriculture and environment) –The results of the public online consultation for Horizon Europe confirm the relevance of the proposed mainlines for all intervention areas as well as the targeted impacts that were described in the orientation document.

To support transition to sustainability respondents call for strengthening the climate change mitigation and adaptation, and mainstreaming other environmental challenges, notably related to biodiversity and ecosystems services, including water, and concepts such as circular economy or bio-based solutions throughout all parts of Horizon Europe.

Particular attention should be given also to consumer behaviour. In addition, systemic approach and interdisciplinary as well as greater attention to issues cutting across different clusters and intervention areas (e.g., biodiversity and health, food and health, agriculture/rural areas and digital/transport, digital and ecology etc.), was recommended particularly in light of the United Nations Sustainable Development Goals (SDGs) (individuals; research associations; Non-Governmental Organisations-NGOs). Respondents

emphasise also the One Health approach, including health of humans, plants, animals and environment.

Respondents widely support Research and Innovation investments to accelerate the transition to sustainable agriculture, fisheries, aquaculture and food system. To this end, respondents provided specific research needs notably in the area of agriculture, forestry and rural areas, as well as seas and oceans. Respondents point out also to diversity of innovative solutions that are needed to address the sustainability challenges (e.g., digitalisation, agro-ecology, breeding and genetic resources, social innovation).

Feedback on the targeted impacts

The contributions largely supported the targeted impacts described in the consultation document. However, it was suggested to consider also more specific impacts such as:

- Management of microplastic in pollutants (regional government; individuals);

- Non-toxic environment strategy (Ministry of Environment);

- Sustainable energy and decarbonisation could be made more apparent, and the link to Key Enabling Technologies (KETs) leadership and cybersecurity (currently absent) can be added;

- Securing availability and access to safe drinking water should be a more explicit impact (researchers replying as individuals; umbrella organisation). Respondents pointed to the importance of water for agriculture production and call for Research and Innovation to reduce the impact of agriculture on water availability and quality. Several replies underlined that water related issues should be explicit throughout all clusters;

- Improved education on food systems challenges to better inform policy makers, industry, citizens and civil society organisations. This will help developing innovative solutions to ensure the transition of food systems and improve quality of food and environment(universities, researchers, individuals);

- Improved circularity, circular agriculture, circular food system, circular bioeconomy (umbrella organisations; researchers; individuals); zero food losses and waste (reduce, reuse and recycle);

- Better integration of the priorities of the civil society in the bioeconomy research agenda (e.g. sustainability aspects, land use, planetary boundaries, sufficiency, and assessment of the availability of biomass for the bio-economy) should be sought. Research is needed on environmental pressures related to bio-economy, for instance to critically assess life cycle assessment of biomaterials and bio-based fuels; to understand and mitigate pollutants in organic waste streams; to address the role of sufficiency in resource consumption, to integrate social innovation processes;

- One Health approach, including health of humans, plants, animals and environment.

New elements

- More systemic research, integration of environmental concerns.

There is a broad demand for a better understanding of systems and the issues they face (soil system, ecosystem, agroecosystems, food system, etc.) in urban and rural context as a basis for new actions and solutions that better balance economic, social and environmental concerns, keep us within a safe operating space, and bring new opportunities. The role of research and innovation for accelerating transition should be emphasized (individuals). More systemic research should be supported in order to achieve the Sustainable Development Goals (SDGs) all together (researchers responding as individuals; Research Institute, NGO).

A recurring theme in the responses is the unknowns of the Earths systems" (research institutes, ministries). In this regard, the role of the oceans remains the poorest understood including in the global heating process and climate crisis, and the need to better understand ecosystems function, chemical, physical and biological cycles governing earth's biogeochemical cycles in marine environments.

More research on fisheries management tools, aquaculture and ocean governance is called for as well.

Some respondents highlighted also the importance of polar research (research institutes), ocean exploration and discovery (research institutes) and investigation of deep sea (research institutes and region). According to respondents, attention should be given also to enhancing the means to fight IUU (Illegal, Unreported, Unregulated fisheries) (NGO).

- New elements to support the development of sustainable agriculture, fisheries, aquaculture and food system.

Research and innovation is needed to support sustainable livestock systems as well as protein transition by developing alternative sources of proteins for food and feed, notably based on plants and insects.

High interest was noted in plant health issues: there is a need to tackle emergence of new pests and diseases, especially in view of climate change, as well as to support pesticide-free agriculture (NGO; research association) or reduction in pesticide use (research institute) by taking an integrated approach. Respondents point to also the research needed to improve risk assessment of pesticides and their cumulative effects on health and environment. Concerning animal health: the most commonly mentioned issue was AMR. Here special focus is given to the One Health approach as well as novel homeopathic treatments, vaccines, nutraceuticals for animals.

Many respondents highlighted the need for R and I to support regional bioeconomies that promote regional businesses, including local food production and short circuit economies (Universities, associations, etc). According to respondents, it is important also to consider how to improve and develop food supply chains that support diverse agricultural systems, e.g., organic, permaculture, agroecology (Research Institutes, individuals). Besides, respondents highlighted also the role of R and I in improving the logistics in fresh food supply chain, in such a way that quality standards will be met, while losses minimized.

Moreover, R and I should also enable the true price of food: fair remuneration, including all environmental and social externalities such as impact of packaging, pesticides, transport on environment, etc. (individuals).

Respondents highlighted the need for better quality of the education and information on food for consumers (Universities, individuals). In the same vein, consumer trust should be supported by innovative solutions to improve food transparency, traceability and authenticity from farm to fork (representative of a Member State Public Authority).

Focus should be given also on the transition towards carbon neutral solutions through ocean energy and adaptation to sea level rise especially through nature-based solutions.

- **How to establish bridges with the other parts of Horizon Europe?**

Circular economy should be more a cross-sectoral issue, not only across Cluster 6 but also across other clusters of Horizon Europe. Consider circularity as an indicator of sustainability and competitiveness. The important role of circular economy in achieving sustainability, finding solutions to the depletion of raw materials of all kinds, bio or not, fighting against climate change and developing more equal societies was underlined as well as for the EU to become a climate neutral economy by 2050. Respondents also stressed that circular economy related actions should not only look at technological solutions but also consider the systemic dimension of it, including financing and organisational aspects. The

need to support systemic solutions for circular economy at a regional and local level was also stressed as well as the opportunity to leverage the potential of the circular economy to help the EU to become a climate neutral economy by 2050. A suggestion was made to focus on giving grants to projects that can have maximum outcome on circular economy based scientific research.

Some respondents called to better link bio-economy and circular economy, to create synergies and co-operation with the Open Innovation - Pillar by the implementation of the European Innovation Council (EIC), and to foster a collaborative and market-oriented innovation ecosystem that turns ideas into impact-driven and value-creating applications.

According to respondents, Marine/inland water cross-cutting Research and Innovation should also be supported in other parts of Horizon Europe. These include within Cluster 6, in particular in areas of intervention "Environmental Observation" and "Biodiversity and Natural Capital". Beyond Cluster 6,Support marine/inland water research and innovation should be addressed in is also in referred to in other clusters such as Cluster 5 - Climate, Energy and Mobility with focus on of Research and Innovation on adaptation to extreme natural events as well as ocean energy and decarbonisation of the maritime sector. Several respondents expressed strong support on giving high priority to maritime security (Cluster 3 - Civil Security for Society) while a few are of the opinion that Horizon Europe should not deal with maritime security. In relation to the structure, to note a comment on the need to improve the links between Cluster 4 – Digital, Industry and Space, Cluster 5 - Climate, Energy and Mobility and Cluster 6 – Food, Bioeconomy, Natural Resources, Agriculture and Environment.

According to respondents the role of SMEs, SSH, gender issues (e.g., empowerment of women in agriculture, considering gender in dietary recommendations, etc.), multi-actor approach, place-based innovation ecosystems should be strengthened in the Cluster 6 orientations. Respondents propose improving the innovation ecosystem across Europe with emphasis on participation of diverse actors (e.g. farmers, consumers, SMEs, NGOs, communities and youth); and strengthen investment in socially engaged research, which increases the likelihood of finding socially desirable and disruptive solutions.

According to respondents there is also a need for more harmonisation and balance in the description of the content between the different clusters. Respondents see the need to continue supporting both basic research (Pillar I: Excellent Science) as well as research and innovation to develop new goods and services as well as innovative and perhaps disruptive technologies (Pillar III: Innovative Europe). It is also important to more explicitly highlight the impacts that cross across intervention areas and clusters.

- **Possible synergies with other EU programmes**

References to synergies with other EU financial programmes are driven by complementary policy objectives: for instance promoting a place-based innovation and supporting the dynamism of innovation ecosystems through a multi-actor approach.

As for the importance of place based innovation, the involvement of regions in research and innovation is key. Synergies with EU regional investment programmes should be designed to facilitate the uptake of solutions created through Horizon Europe activities. As for improving the dynamism of European innovation ecosystems, in order to facilitate participation of diverse actors (e.g., farmers, consumers, SMEs, Non Governmental Organisations (NGOs), communities and youth) , synergies should be sought with other EU programmes offering solutions to improve soft skills and networking opportunities, such as ERASMUS or the European Social Fund.

Respondents mentioned as well possible synergies opportunities with EU's external action programmes. On topics such as climate change, water availability, Horizon Europe may fund projects in deprived areas, possibly in partnership with locals, contributing to country and regional stabilisation.

- **Elements to be considered at a later stage**

Respondents pointed out to diversity of innovative solutions – technological, social, etc. – that are needed to address the sustainability challenges:

- Digital technologies, in particular precision farming, Internet of Things (IoT), blockchain, Artificial Intelligence (AI) , robotics (research institute), including research into their impact on the society and ensuring secure and fair data management.

- Multivariable 'global sensing system' fin environmental observations (researcher replying as an individual)

- Enabling biotech, nanotech and photonics technologies in agriculture and food production, including for example in plant protection strategies (Farmers' Unions, private companies) or for the substitution of animal food products by plant and cell based products (NGOs,businesses).

- Innovation in sustainable packaging, including through developing new bio-based materials.

- Look into minimising the environmental impact of exploration, construction and decommissioning of oil fields.

- Novel animal vaccines and nutraceuticals, automatic detection systems for livestock diseases.

- Probiotics

- New business models, social innovation

Other relevant activities

Commission's proposal for Research Infrastructures (RIs) is well accepted and supported. RIs activities are recognised as providing a strong EU added value, measured notably by the fact that its activities are not covered by any other Horizon Europe component nor by national programmes.

In general, there is a strong plea to continue our effort to integrate RI services at EU level, to reduce fragmentation of the EU RI ecosystem, and to coordinate the development of the next generation of research infrastructures, the upgrade of existing ones, their use and accessibility, including in all MS and AC, avoiding duplication of efforts. Support should cover all the different phases of the RIs lifecycle. Coordination at EU level to upgrade RIs to the next generation is seen as a prerequisite for Europe to maintain its leading role in science and technology as well as its attractiveness its community users, including researchers.

Europe hosts a number of top level Research Infrastructures and should consolidate its attractiveness at global level by strengthen and optimise its portfolio of existing RIs and add new capabilities. For that to happen, policy priorities for RIs, including those developed by and with ESFRI, should be increasingly aligned to the societal challenges to be addressed.

Research infrastructures and research infrastructure services, whose development is fostered under Pillar I, can effectively contribute to each Horizon Europe Pillar activities:

- Research infrastructures are key platforms to facilitate international cooperation and interdisciplinary research activities for effectively tackling global challenges;

- RIs should provide services to address cyber-security issues, i.e.: detection of cyber-related vulnerabilities of technologies and services (hardware and software);

- Research Infrastructures can also effectively support the activities implemented by the ERC and MSCA components. Activities to support careers advancements, training and education should be strengthened, including for the development of industrial curricula as well as digital skills for data-intensive R and I. The RI actions, including the activities for data infrastructures, play a key role for advancing the open science and open innovation agendas.

- RIs are also critical to organise and structure a scientific field. The role and use of established European RIs is accordingly transversal.

- The continuation of the support to the EOSC, and further coordination of e-infrastructure service developments and provision at national and the European level will help consolidating and defragmenting the data infrastructure landscape. The importance of establishing long-term sustainable financing schemes for data infrastructures is acknowledged.

To reap the benefits of the data revolution in various scientific fields, it is crucial to address the following key issues: data stewardships and analysis; development of suitable common and agreed standards and applications to foster the implementation of FAIR principles by research infrastructures; data interoperability and data exchange together with a wider engagement of RIs in addressing interoperability issues.

Synergies can be well exploited with ESIF and other EU programmes. This applies in particular for HPC and digital skills, as these are prioritised in many EU programmes.

The following tables present examples of the appreciation shown so far to different targeted impacts as published in the Orientations document.

For each cluster, the preferences of three groups of respondents are disclosed:

- The respondents that declared their interest to one of the six clusters, to understand the views of the stakeholders more directly interested in the activities of each cluster;

- All respondents interested to any of the six clusters, to measure the views of the stakeholders interested more broadly in Horizon Europe activities;

- The respondents that declared not to intend submitting a proposal or participating in a EU research andinnovation framework programme funded project, to understand the preferences of the stakeholders more interested in Horizon Europe outcomes.

The results substantiate a broad support to the targeted impacts coming from all respondents, irrespective of their background. Nevertheless, the intensity of support is directly linked to the interest shown to each cluster.

Cluster 1 - Targeted impacts indications

Targeted impact	Strong support (4+5) All respondents (*n=6806*)	Strong Support Respondents interested in cluster 1 (*n=2442*)	Strong Support Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (*n=369*)
Healthy citizens in a rapidly changing society	67.7%	82.1%	63.1%
Healthy or even health-promoting living and working environments	68.9%	81.4%	65.8%
Effective health services to tackle diseases and reduce the burden of diseases	68.0%	82.5%	64.5%
Improve access to innovative, sustainable and high-quality health care	69.5%	81.9%	64.2%
New tools, technologies and digital solutions for a healthy society	70.9%	84.0%	63.1%
A sustainable and globally competitive health-related industry in the EU	61.8%	72.4%	55.2%

Cluster 2 - Targeted impacts indications

Targeted impact	Strong support (4+5) All respondents (*n=6806*)	Strong Support Respondents interested in cluster 2 (*n=1772*)	Strong Support Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (*n=369*)
Enhanced democracy and governance	55.7%	72.8%	52.0%
Better approaches to tackle political extremism and polarisation	50.1%	65.7%	49.0%
Reversing socio-economic and gender inequalities	53.6%	70.0%	49.0%
Improved understanding of societal – including political, ethical and economic - effects of technological advancements and the impact of drivers of change	58.4%	72.7%	55.2%
Novel growth model	52.9%	61.3%	46.9%
Increased use of evidence-based strategies in the management of mobility and migration and the integration of migrants in European societies	52.9%	66.6%	48.2%
Better valorisation of European cultural heritage	46.9%	64.8%	38.4%

Cluster 3 - Targeted impacts indications

Targeted impact	Strong support (4+5) All respondents (*n=6806*)	Strong Support Respondents interested in cluster 3 (*n=881*)	Strong Support Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (*n=369*)
Improved security and resilience of infrastructure and vital societal functions	54.0%	75.3%	52.8%
Improved management of EU external borders	33.6%	46.4%	32.8%
Better protection of public spaces	38.5%	54.0%	36.5%
Increased cybersecurity and security of online environments	67.4%	79.4%	62.0%
Improved disaster risk management and societal resilience	58.7%	74.4%	54.5%
More effective terrorism and crime prevention	41.1%	58.9%	37.3%
Improved maritime security	31.7%	48.2%	30.3%

Cluster 4 - Targeted impacts indications

Targeted impact	Strong support (4+5) All respondents (*n=6806*)	Strong Support Respondents interested in cluster 4 (*n=2221*)	Strong Support Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (*n=369*)
More appealing and creative jobs in Europe	62.9%	67.5%	52.3%
Increased autonomy in critical raw materials	54.1%	60.9%	50.6%
Increased industrial leadership in key enabling technologies and uptake of new technologies	71.9%	83.0%	66.3%
Help achieve climate-neutral, circular and clean EU industries	79.9%	83.7%	78.8%
Low carbon and competitive transport solutions across all modes	76.4%	80.1%	77.2%
Increased inclusiveness	55.3%	56.1%	50.4%
Climate neutral, circular and clean industries	78.6%	82.2%	77.7%

Cluster 5 - Targeted impacts indications

Targeted impact	Strong support (4+5) All respondents (*n=6806*)	Strong Support Respondents interested in cluster 5 (*n=2564*)	Strong Support Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (*n=369*)
Advanced climate science and solutions	80.9%	88.9%	78.5%
Novel competitive cross-sectoral solutions for decarbonisation	74.5%	85.1%	70.7%
Novel energy system	78.9%	86.6%	74.5%
New demand side solutions to decarbonise the energy and transport systems	72.4%	82.1%	72.3%
Increased adaptation of production systems	64.9%	73.5%	63.4%
Reinforced supply of sustainable biomaterials and bio economy	67.7	72.5%	65.8%
Reduction of greenhouse gas emissions	77.0%	84.3%	76.1%

Cluster 6 - Targeted impacts indications

Targeted impact	Strong support (4+5) All respondents (*n=6806*)	Strong Support Respondents interested in cluster 6 (*n=2226*)	Strong Support Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (*n=369*)
Reduction of greenhouse gas emissions	77.03%	84.2%	76.1%
More sustainable management of natural resources, prevention and removal of pollution	79.2%	87.5%	79.4%
Halt of biodiversity decline and restoration of ecosystems	72.3%	81.4%	69.9%
Establishment of new primary production and food systems	56.5%	74.8%	52.5%
Establishment of new governance models enabling sustainability	64.5%	71.3%	60.9%
A built Environment better fit for EU citizens	60.5%	65.7%	55.7%

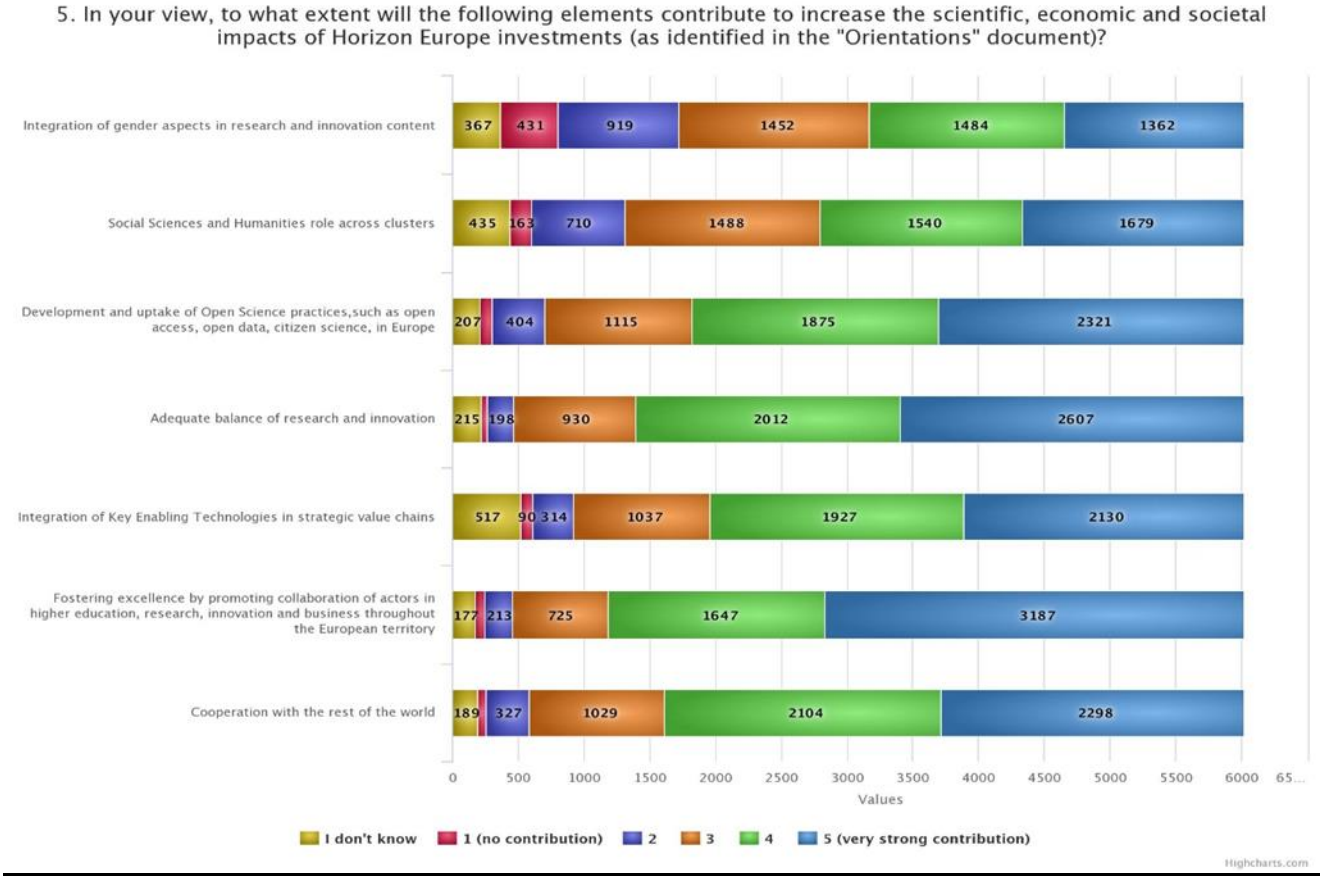
3.3. Main Indications given on Horizon Europe cross-cutting issues

This section takes into consideration only answers given to section - B (*where Horizon Europe should play its major role?*) of the questionnaire.

The replies provide an indication about: (i) the appropriate policy mix to optimise Horizon Europe objectives, (ii) the possible contributions of Horizon Europe to EU political priorities.

i) Appreciation shown to different possible cross cutting issues of Horizon Europe

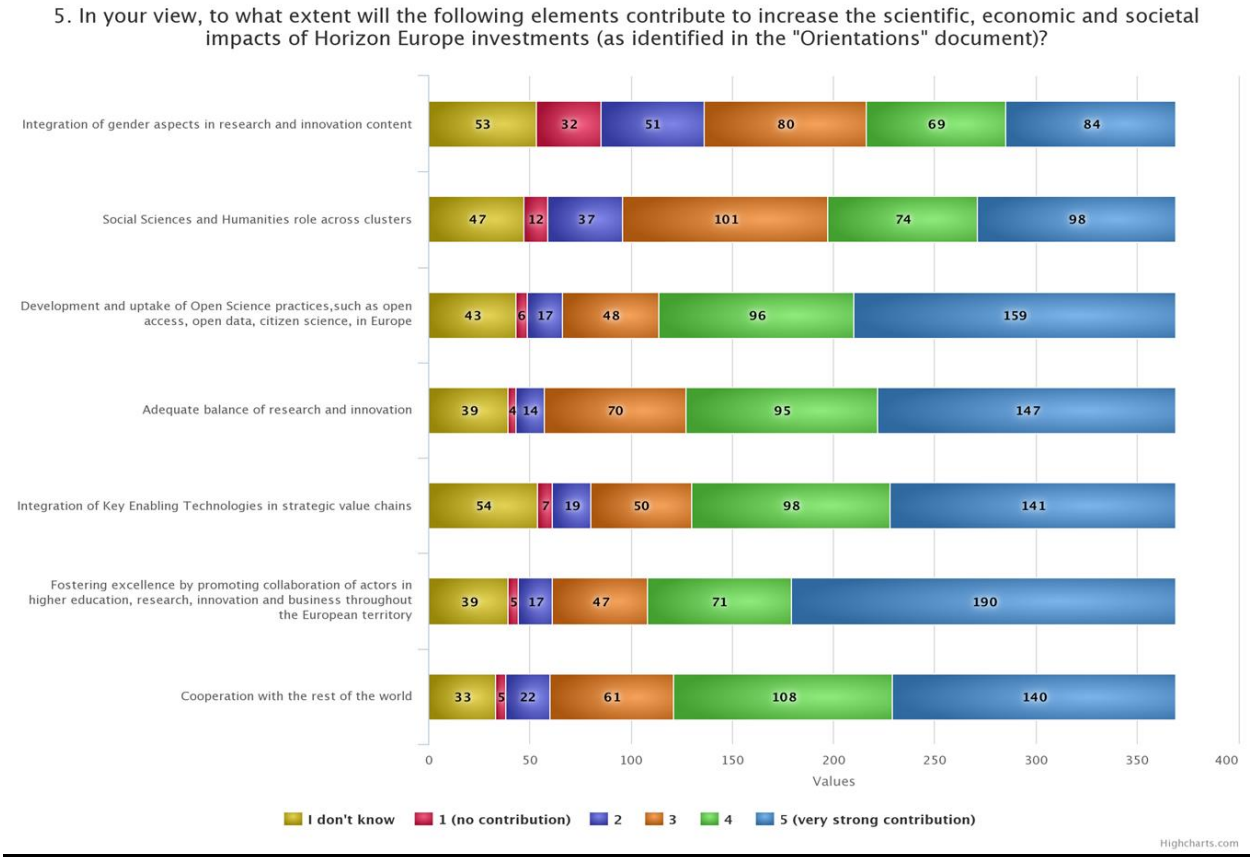
All respondents



- All the specific issues relevant for the preparation of the strategic plan mentioned by the legal basis are supported by all respondents, especially the pursuit of the Open science policy, the adequate balance of research and innovation activities, and the cooperation with the rest of the world;

- In addition, the promotion of collaboration of actors in higher education, research, innovation and business throughout the European territory is widely supported, indicating a strong interest on the development of synergies with the other European Union programmes;

Respondents that do not intend to propose and/or participate to in projects funded by European Union research and innovation framework programmes (but that may be interested in the results of the projects/programme).



- The support to the specific issues is irrespective of the background of the respondents, establishing a possible satisfactory ownership and indicating them as possible elements to favour a wider participation of new comers;

- In addition to those issues mentioned in the questions, the respondents have highlighted as well citizen participation as a relevant specific issue for all parts of Horizon Europe (1399 mentions among the answers to the open questions).

In addition to those preferences, respondents suggested additional comments on those issues:

- **On international cooperation:**

The vast majority of replies are in line with the elements described in the 'Orientations towards the first Strategic Plan', thereby overall confirming the policy objectives.

In particular, several respondents stressed the importance of strengthening international cooperation to effectively address global challenges such as those related to climate change, framed by the Sustainable Development Goals and when possible, coordinated by multilateral initiatives for more coherent and joint action.

The need to further support and facilitate the mobility of researchers and international knowledge production and exchange, including in bottom-up research, was stressed in several replies.

Support to industrial leadership and achieving sovereignty in key technologies was also stressed, notably through strategic partnerships with partner countries, participation in global innovation value chains and development of international standards, as well as through more insistently pursuing effective protection and enforcement of intellectual property rights in third countries.

Science diplomacy was also highlighted as an effective instrument that can positively influence our overall relations with partner countries.

A significant number of respondents underlined the need to promote shared values and principles in our scientific and technological relations with other countries, including the respect of human rights, non-discrimination and gender equality, ethical standards, open science as well as social and ecological values. The EU should seek reciprocity, ensuring a fair and level international playing field. According to several respondents, the EU should lead by example, providing a distinct inspiring reference model to the world. Several respondents suggested that strengthening cooperation in areas related to social sciences and humanities could be an effective way to increase impact towards a more influential Europe.

Several respondents remarked that in order for Europe to become more influential, it should speak with a single and coherent voice in the global fora, thereby calling for increased intra-EU coherence, including coordination with other EU policies. Some respondents remarked that the EU should invest in better communicating our actions, both internally and to the world.

Respondents express an overall support to gender equality being set as a cross-cutting priority in Horizon Europe.

- **On gender integration in research and innovation contents:**

There were close to 500 open text comments addressing gender. The quasi-totality of these respondents call for a stronger emphasis on the cross-cutting gender equality objective of Horizon Europe, with more explicit mentions of the need to integrate the sex and gender dimensions within each programme part under Horizon Europe, as an indispensable strategy for having long-lasting positive social, economic and scientific impacts on citizens' lives in Europe and globally.

The main new elements regarding gender equality and the integration of the gender dimension in research and innovation contents, with respect for the different programme parts, are as follows:

-**Cluster 1** (and the mission on cancer): an important number of respondents insist on the imperative of integrating sex and gender analysis in all six health-related challenges, and developing gender medicine as a core component of personalised medicine, exploring biological, cultural and psychological differences between men and women which can affect both health and disease and their perception.

- **Cluster 2**: a considerable amount of respondents wishes to see gender studies better supported, and gender stereotypes and unconscious biases better investigated. While some call for more studies on violence against women and how it affects society and the economy I addition to women's health, others also stress that women need to be considered beyond the role of victims of gender inequalities, exploring and supporting the important role women play in social and economic transformations and enhancing democracy.

- **Cluster 3**: respondents underline that gender should be mentioned when referring to security (in public spaces, cybersecurity, vulnerability in migrants, etc.) and sexual cyber-violence is put forward in particular by several participants as a key topic to be addressed

- **Cluster 4**: respondents call for addressing potentially gender-discriminatory technology (and not only gender bias in Artificial Intelligence); and different needs of women and men in target groups when formulating problems and solutions in nanotechnologies, advanced materials, manufacturing technologies, etc.

- **Cluster 5**: respondents call for considering the gendered aspects of climate change drivers, impacts, mitigation solutions and adaptation patterns, including behavioural ones; taking into consideration differences between women's and men's energy needs, choices and consumption patterns when designing energy plans; responding to the complexities of

women's and men's needs regarding mobility and transport solutions for communities and cities.

- **Cluster 6**: respondents call for giving explicit attention to the empowerment of women in agriculture as well as the different conditions facing women and men in rural areas and the impact of evolving gender roles on activities in the primary sector; addressing the nutrition status of women and men when developing sustainable and healthy diets. Integrating sex/gender analysis on the effects of pesticides, antibiotics and antimicrobial resistance.

- **Pillar I**: several respondents call for harmonised provisions to incentivise gender equality policies in the hosting institutions (for the European Research Council-ERC and Marie Skłodowska-Curie Actions-MSCA) regarding work-life balance measures, protection against sexual and sexist harassment, integration of the sex/gender analysis into Research and Innovation content. Some respondents suggest that funding should be given to institutions that do not infringe on gender-based or racial discrimination and that EU should enforce that institutions benefiting from its resources follow minimum guidelines; Research infrastructures also need to mainstream gender in their core activities, governance systems and research and innovation procedures.

- **Pillar III**: a number of respondents call for involving more women and sex/gender analysis methods in the process of innovation to facilitate more competitive products not only designed for a male consumer as a default model, and to address gender equality in the EIC

- **Part Widening/European Research Area** : concrete measures/actions to incentivise the widening countries to develop gender equality policies in research and innovation institutions are called for.

-There is also significant support to an intersectional approach to gender equality within Horizon Europe, taking into consideration in particular ethnicity, disability, sexual orientation, and age.

- **On citizen science**:

  A significant number of responses stated that high levels of citizen participation in co-design (e.g. agenda setting) and co-creation (e.g. citizen science, user-led innovation) are required to meet the United Nation's Sustainable Development Goals. They stressed that research and innovation must take into account the needs, values and expectations of citizens, in line with Responsible Research and Innovation (RRI) and seek to go beyond technological solutions to those that encompass social, economic and governance issues. These responses called for high levels of inclusion of society in research and innovation, specific actions to improve science education (e.g. working closely with schools and other educational establishments), the joint involvement in actions of researchers, businesses, policy makers and citizens ("quadruple helix") to arrive at solutions that are adapted to societal needs, and interactive and innovative approaches to communicating and deliberating about innovation and science. Finally, these responses reminded that there is a large body of knowledge and existing networks that have developed from the Science and Society (FP6), Science in Society (FP7) and Science with and for Society (Horizon 2020) programmes, which should be leveraged and valorised to help ensure Horizon Europe's success.

ii) The possible contribution of Horizon Europe to EU political priorities.

This questionnaire has been elaborated prior to the appointment of Dr Ursula von der Leyen as President of the European Commission.

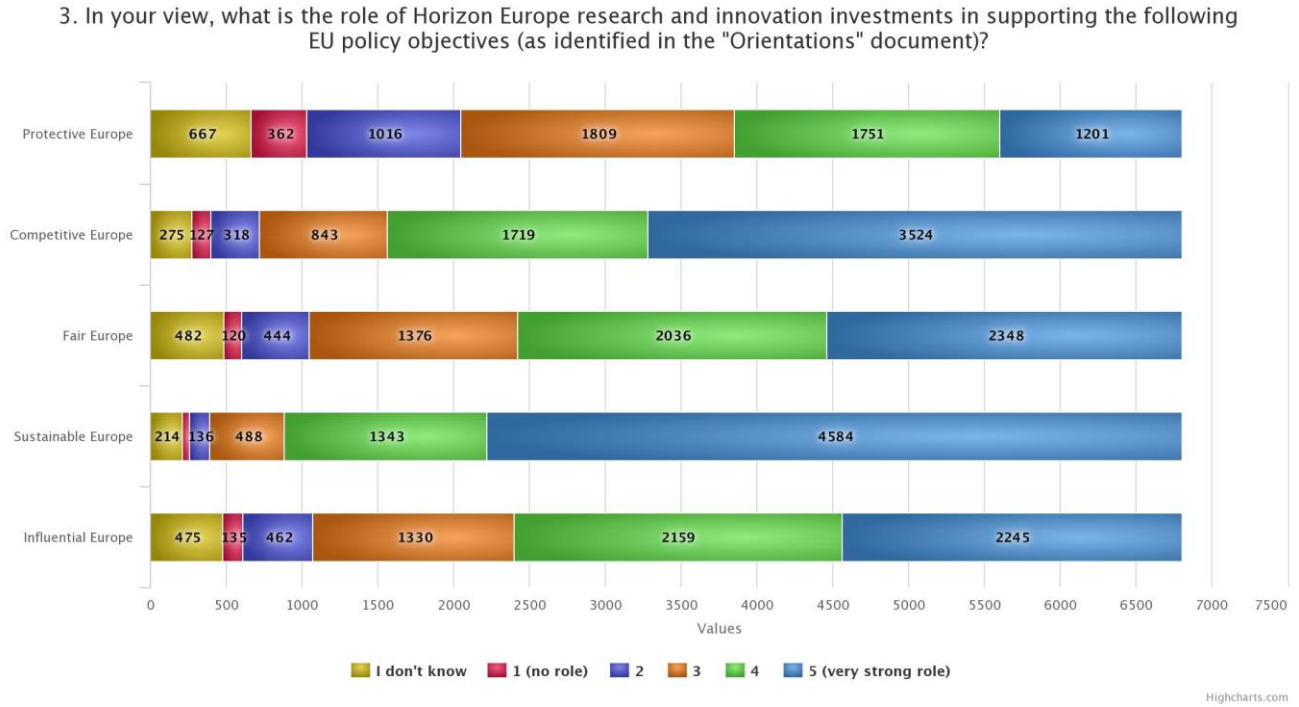
Horizon Europe targeted impacts presented in the Orientations document have been elaborated according to the political guidelines of President-elect Ursula von der Leyen.

Respondents have been asked to express their view on the expected contribution of Horizon Europe activities to the EU policy objectives highlighted in the European Commission's contribution to the informal EU27 leaders' meeting in Sibiu on 9 May 2019[5].

It is reminded that the Orientations document has been drafted taking into account the United Nations Sustainable Development Goals (SDGs).

[5] https://ec.europa.eu/commission/sites/beta-political/files/comm_sibiu_06-05_en.pdf

The expected contribution of Horizon Europe activities to the EU policy objectives highlighted in the European Commission's contribution to the informal EU27 leaders' meeting in Sibiu on 9 May 2019[6].



- The respondents views echo other findings of the questionnaire already mentioned:
  - All groups of respondents highlight that Horizon Europe is most important for addressing the challenges related to sustainability
  - The contribution of research and innovation activities as a significant enabler of public policies is shared among the respondents.

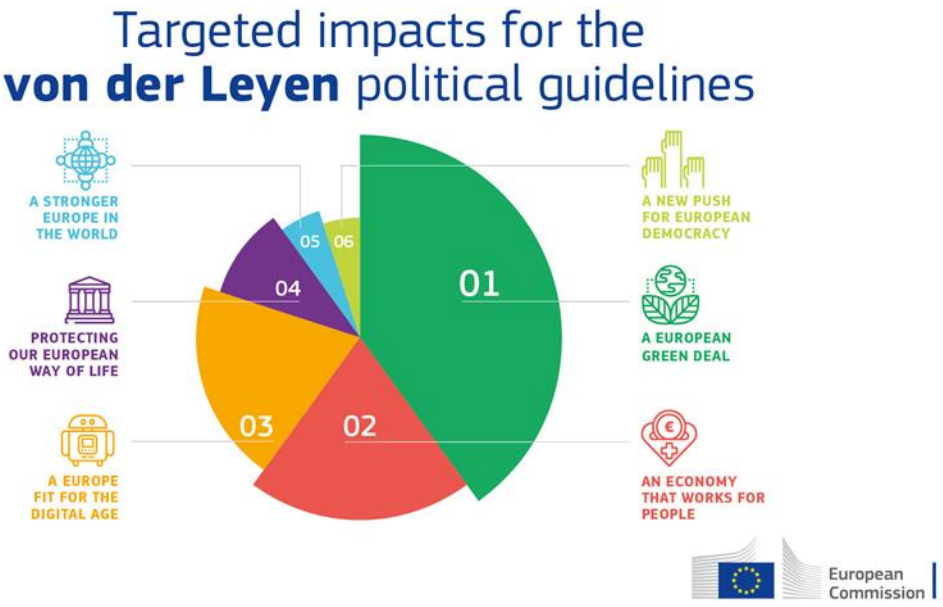
[6] https://ec.europa.eu/commission/sites/beta-political/files/comm_sibiu_06-05_en.pdf

3.4. The political guidelines of President-elect Ursula von der Leyen

The answers of the respondents echo positively the focus of the Political Guidelines of President-elect von der Leyen on six headline ambitions for Europe:

- A European Green Deal;
- An economy that works for people;
- A Europe fit for the digital age;
- Protecting our European way of life;
- A stronger Europe in the world;
- A new push for European democracy.

Through their cross-cutting thematic and organisational approach, the missions to emerge from the five missions areas of Horizon Europe (Adaptation to Climate Change, including Societal Transformation; Healthy Oceans, Seas, Coastal and Inland Waters; Climate-neutral and Smart Cities; Soil Health and Food) will interact with all six headlines ambitions.



The following section presents examples of targeted impacts that will contribute the most to each of these six headline ambitions, with a reference to the Horizon Europe Clusters as well as candidate European partnerships:

1. A European Green Deal

Cluster 4

- Climate-neutral, circular and clean EU industries by, for instance, creating plants in several regions with zero emissions and zero waste in the fight against climate change and the protection of the environment by helping to develop the necessary breakthrough technologies and solutions.

Cluster 5

- Advanced climate science and solutions;

- Novel competitive cross-sectoral solutions for decarbonisation such as batteries, hydrogen, sustainable infrastructure enabling low carbon solutions and other break-through technologies;

- A novel energy system centred on renewables and ensuring cost-efficient, greenhouse gas neutrality;

- New demand side solutions to decarbonise the energy and transport systems.

Clusters 5 and 6

- Reinforced bio-economy to supply sustainable biomaterials and bio-energy whilst staying within ecological boundaries;

- Reduction of greenhouse gas emissions;

- Increased adaptation of ecosystems and production systems as well as rural, coastal and urban areas to climate change.

Cluster 6

- Halt of biodiversity decline and restoration of ecosystems;

- Sustainable and circular management and use of natural resources; prevention and removal of pollution; healthy soils and clean water and air for all; attractive jobs, enhanced value creation and competitiveness;

- Establishment of new primary production, food and bio-based systems based on sustainability, inclusiveness, health and safety; food and nutrition security for all;

- Behavioural, socio-economic and demographic change are well understood and drive sustainability; a balanced development of vibrant rural, coastal, peri-urban and urban areas;

- Establishment of new governance models enabling sustainability.

Candidate European Partnerships:

- Transforming Europe’s rail system;

- Integrated Air Traffic Management;

- Circular bio-based Europe;
- Clean Hydrogen;
- Clean Aviation;
- Safe and Automated Road Transport.

2. An economy that works for people

Cluster 1

- Healthy citizens in a rapidly changing society: citizens stay healthier throughout the life course due to improved health promotion and disease prevention, and supported by healthier behaviours and lifestyles;
- Healthy and health-promoting living and working environments: policy-makers and industry take better account of the environmental factors for health and well-being and promote and support healthy and health-promoting living and working environments;
- Effective health services to tackle diseases and reduce the burden of diseases: patients can rely on effective health services to tackle their diseases, as well as to reduce the burden of diseases on them, their families and communities;
- Improved access to innovative, sustainable and high-quality health care: health systems are able to provide timely access to affordable health care services of high-quality to everybody while being environmentally and fiscally sustainable;
- Unlocking the full potential of new tools, technologies and digital solutions for a healthy society (also contributing to A Europe fit for the digital age);
- An innovative, sustainable and globally competitive health-related industry in the EU (also contributing to A Europe fit for the digital age).

Cluster 2

- Reversing socio-economic and gender inequalities via strategies of inclusion, non-discrimination, social protection and social investment;
- Improved understanding of societal – including political, ethical and economic - effects of technological advancements and the impact of drivers of change on jobs, skills, productivity, income, welfare and inequalities;
- A novel growth model respectful of inclusiveness and upward socio-economic convergence and resilient to economic, social, and financial shocks;
- Better valorisation of European cultural heritage by promoting the value, protection, access to and sustainable use of European cultural heritage and its contribution to the cultural and creative sectors.

Cluster 4

- Increased inclusiveness by making a two-way engagement in the development of technologies a reality, and by helping foster the skills agenda in, for instance, the digital area or advanced manufacturing area.

Candidate European Partnerships:

- Innovative Small and Medium-Sized Enterprises;

- EU-Africa research partnership on health security to tackle infectious diseases (Global Health);

- Innovative Health Initiative;

- European Metrology.

3. A Europe fit for the digital age

Cluster 1

- Unlocking the full potential of new tools, technologies and digital solutions for a healthy society: new tools, technologies and digital solutions provide significant gains in health outcomes, address unmet medical needs and inform regulatory standards and requirements;

- An innovative, sustainable and globally competitive health-related industry in the EU: health industries, including SMEs, increase their productivity and sustainability in developing health innovation due to the potential of data-enabled research and development, the related convergence of pharmaceutical, digital and medical technologies, and the prospect of the digital transformation of health and care supported by data-driven manufacturing of tailor-made products and the delivery of personalized services.

Cluster 4

- More appealing and creative jobs in Europe, by way of an industrial and digital transformation;

- Increased autonomy in critical raw materials through substitution, efficiency and recycling and primary production;

- Increased industrial leadership in key enabling and digital technologies and uptake of new technologies through technology infrastructures and autonomy in strategic value chains;

Candidate European Partnerships:

- Key Digital Technologies;

- Smart Networks and Services.

4. Protecting our European way of life

Cluster 2

- Increased use of evidence-based strategies in the management of mobility and migration and the integration of migrants in European society.

Cluster 3

- Improved disaster risk management and societal resilience through better understanding of natural and man-made disasters and by the development of novel concepts and technologies to counter these risks;

- Improved management of EU external borders (air, land and sea) by the development of tools and concepts towards an Integrated Border Management, including better knowledge of societal factors with regards to border security;

- Better protection of public spaces through novel methods to detect weapons, explosives and other dangerous items and by quicker response to threats without changing the open character of public spaces in the EU;

- Improved security and resilience of infrastructure and vital societal functions enabled by improved risk assessments and more efficient response to disruptions with a view of quickly restoring performance levels;

- Improved maritime security based on the EU Maritime Security Research Agenda to counter threats such as trafficking, piracy as well as cyber and hybrid threats;

- More effective fight against crime and terrorism through better understanding of societal factors leading to radicalisation and crime and by developing state of the art capabilities for Law Enforcement Agencies in the EU, notably against cybercrime;

- Increased cybersecurity based on more effective use of digital technologies, strong orientation on privacy and fundamental rights and a robust digital infrastructure to counter cyber-attacks.

5. A stronger Europe in the world

Cluster 1

- Engage in international cooperation to tackle exposures to environmental stressors of relevance to human health more effectively, including by cooperating with international actors like the WHO, the UN and OECD and with actors in third countries.

- Pooling the best expertise and know-how available worldwide, and enabling a better alignment with actions in the rest of the world, including through multilateral initiatives, to reduce disease burden and to protect people against cross-border health threats including the rise and spread of AMR and (re)emerging epidemics.

- Improving innovative, sustainable and high-quality health care in Europe by learning and sharing practices and good models with international actors such as World Health Organization and public health institutes in third countries.

- Contribute to deepening EU's relations with Africa through the proposed partnership "EU-Africa global health partnership to tackle infectious diseases", succeeding the current EDCTP2 partnership.

Cluster 2

- Gain contextual insight and increase knowledge flow and innovative capacity by working with strategically targeted international partners on issues such as multilateral governance, the drivers and governance of migration, the democratic governance of cultural diversity, and the crises in the EU neighbourhood.

- More effective tackling of global trends in democratic governance and intercultural relations as well as cooperation on cultural heritage, inclusive growth, and decent work and fair working conditions in the context of globalisation.

Cluster 3

- Gain access to and exchange know-how in the areas of disaster resilience and response, and border management.

Cluster 4

- Promote adoption of principles and global standards to ensure fair and ethical approaches to the development of technologies.

Cluster 5

- Contribute to key international assessments such as the Intergovernmental Panel on Climate Change and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services

- Engage internationally to improve the worldwide sustainability of the batteries value chain.

- Improve access and sharing of knowledge for developing innovative solutions for decarbonisation, through joint actions with other technology leaders, including through multilateral initiatives such as Mission Innovation.

- Enhance the EU energy and climate diplomacy by cooperation with other technology leaders as well as with carbon-intensive technology followers.

Cluster 6

- Strengthening access to and sharing of environmental observation and data with the rest of the world in order to underpin environmental policies and global commitments such as the United Nations Sustainable Development Goals (SDGs), the Sendai Framework and the Paris Agreement.

- Improve coordination with international partners following global commitments related to global warming, sustainable development and biodiversity.

- Scaling up cooperation both bilaterally (among others by building up current cooperation with Africa, China and Brazil) and multilaterally, to tackle more effectively global challenges such as food and nutrition security, animal health, soil, sustainable agriculture, climate change, water management, ecosystem restoration, nature-based solutions and forest management.

- Better support water diplomacy and other EU policies and strategic objectives by focused international actions in the area of water, including the All-Atlantic cooperation and cooperation for the Mediterranean and the Black Sea.

6. A new push for European democracy

Cluster 2:

- Enhanced democracy and governance through bolstering the accountability, legitimacy, transparency and effectiveness of democratic systems and the protection of the rule of law;

- Better approaches to tackling political extremism and polarisation by strengthening democratic participation and active citizenship, fostering awareness and exercise of democratic rights, and understanding the role of media in fostering or inhibiting political dialogue.

4. THE EUROPEAN RESEARCH AND INNOVATION DAYS

The European Research and Innovation Days gathered 3.874 participants for the policy conference and 3.222 citizens for the "Science is Wonderful!" exhibition. The mobile app was used by 1.317 participants on site, who leveraged it to exchange 821 messages and to book 256 meetings. About 50 journalists attended the event and published about 135 news pieces on it. During the event 23.126 visited the European Research and Innovation Days website, 10.680 connected remotely through web streaming, and 4.039 used the hashtag #RiDaysEU on Twitter, for a total of 11.322 unique posts and 54.445.122 impressions.

Two different streams of co-design activities have taken place during the research and innovation Days:

- The bottom up discussions in the village, composed of 21 spaces corresponding to Horizon Europe parts relevant for the Strategic Planning Process;

- The 43 co-design sessions, organised around key issues especially relevant for the targeted impacts and cross cutting issues that underpin the Orientations.

This way of co-designing is a novel approach for the implementation of Horizon Europe. It has been warmly welcomed by all participants. It has been a welcomed novelty also in the Commission.

Commission services are, and will be, working together ever more closely also to ensure coherence and synergies between programmes, which is receiving high expectations from stakeholders.

This report aims at providing a direct glimpse on the ideas and insights discussed in the village and in the co design sessions. They have been reported in the following pages as directly as possible. The qualitative conclusions to be drawn will be integrated in the updated Orientations document that will be published online in early November 2019.

Overall, the main conclusions can be summarized as follow:

1/ In order to optimise the impacts of EU research and innovation investments, we need to resolutely embrace a more systemic approach in Research and Innovation - across sectors and disciplines, across policies and along value chains with the contribution of stakeholdersall over Europe.

- Break silos and develop links (e.g. between the environment and health research areas, with the Horizon Europe missions);

- create ecosystems and value chains around societal challenges, complemented by appropriate experimental regulatory frameworks, such as innovation deals and regulatory testbeds, also during pilot stages at EU level;

- ensure coverage of both long-term and shorter term topics for bringing forward the transformation agenda necessary to orientate Europe towards “the future we want”;

- align transition strategies and priorities, within the EU, together with Member States and the Regions: not duplication but complementarity;

- ensure simple and timely funding opportunities for all appropriate stakeholders at all stages of the research and innovation cycles.

2/ It is essential to ground Research and Innovation in concrete use cases and experiment pilots solutions in a flexible approach, to cover demonstration projects for technologies, business models and innovative governance models conducive to the transformations we need.

- Focus on key use cases to speed up the deployment in our daily lives;

- Support large-scale pilots to bridge research and deployment, including business models.

3/ The public sector has a critical role to play

- To promote inclusiveness, by engaging citizens and stakeholders in the different processes of Research and Innovation policy: from co-designing to implementing, including validating and scaling-up of innovative solutions;

- To better communicate and engage citizens and all the appropriate stakeholders, especially end users, with regard to the key role of Research and Innovation in the ongoing transitions, in particular in the missions;

- To stimulate, initiate, request interdisciplinary cooperation, beyond boundaries: linking research disciplines, bringing stakeholders together who do not normally work together (scientists, civil society, administrations, including regulatory agencies);

- To ensure the appropriate balance between curiosity-driven research and targeted Research and Innovation. To quote some of the participants:

  - "We should give direction without prescribing solutions but also give more space for creativity";

  - "Technologies should have a purpose (sustainability, SDGs) but space should also be given to 'dreaming' and creativity to explore a potential of new technologies";

  - "We should balance curiosity and purpose orientation; understand the dreams of researchers, combine them with knowledge and experience in other areas – find ways to bring something new to the different teams"

4/ Another key role for the public sector is to ensure that Smart Regulations are in place

- For innovation to drive the ongoing transitions, we need to combine ambitious Research and Innovation goals with smart regulatory measures that are innovation- and sustainability- friendly, and involve civil society at every step. This will be a key aspect in the future European Green Deal.

5/ The importance of better integrating Social Sciences and Humanities and the gender dimension

- To successfully achieve the Sustainable Development Goals (SDGs), we need behavioural change and social innovation to alter consumption and production patterns/processes and to make adaptation solutions affordable for everyone. This requires to better integrate behavioural sciences (i.e. sociology, psychology) with other disciplines;

- Horizon Europe should serve as an example on gender mainstreaming for other EU programmes, in particular those technology-centred, along with synergies that should be developed for systemic impact.

4.1. The Research and Innovation Days village

- **Pillar 1 Marie Skłodowska-Curie Actions (MSCA)**

  In line with the findings in the open consultation exercise, there was generally very positive feedback on the Marie Skłodowska-Curie Actions (MSCA) and specific proposals for Horizon Europe. It was widely accepted that MSCA contributes to the need for a strong, resilient and creative human resource base for research and innovation in Europe.

  Stakeholders confirmed as core principles the bottom-up nature of the programme, the competition for excellence and the support for curiosity driven research. They highlighted the focus on equipping fellows with a broad range of skills to prepare them for the labour market and to tackle societal challenges and the positive structuring effect on host organisations. MSCA's role in integrating Research and Innovation activities with education and training, and supporting activities for knowledge exchange and transfer across sectors was also underlined.

  Feedback related largely to issues of simplification and implementation of the future MSC actions. This included suggestions on how to better manage demand in light of oversubscription, how to ensure more exposure for fellows to non-academia, and how to improve synergies with widening initiatives, , European Investment and Structural Funds (ESIFs), Erasmus, etc.

  All these suggestions were noted and will be reviewed during the preparation of the work programme 2021-22.

There was some support for more synergies between pillar 1 and other parts of Horizon Europe, in particular for big data, in order to create a direct link between fundamental science and industry. It was also recalled that the MSCA provides considerable support to important topics such as Artificial Intelligence (AI) and that this should be made much clearer to the relevant communities, through participation of the MSCA or MSCA fellows in dedicated conferences, as this will facilitate transfer of MSCA generated knowledge to innovation.

- It was also suggested that the skills needs of the Missions could be taken up through MSCA projects on a voluntary basis while respecting the bottom-up approach.

- **Pillar 1 Infrastructures**

A lot of interest was shown, in particular from the bio-medical community.

The bio-medical community called for projects to (1) support consolidation and integration of back offices among Research Infrastructures in similar domains and (2) support for improving the methodology of bio-medical research in order to make the results more reproducible. In particular, by involving bio RIs in the study design to ensure it is patient-centric.

Similar demand for one-stop-shops for Research Infrastructures was expressed from other communities, with the goal of serving better Pillar 2 and the clusters targeted impacts. Our stakeholders expressed concern that the classical 'Integrating Activities' (INFRAIA) calls will be transformed into a co-funding scheme.

Furthermore, a lot of interest in the activities of the European Strategy Forum on Research Infrastructures ESFRI and its future strategic orientation, notably from stakeholders based in Third Countries, currently associated to Horizon 2020.

- **Pillar 2 Cluster 1**

Visitors witnessed broad agreement to the Orientations towards Horizon Europe, especially on the targeted impacts structuring the clusters orientations even though some (sometimes very specific) communities would like to have their own interests more self-evident in the text. Some expressed concerns of having less and less basic collaborative research in cluster 1 (ERC activities are not immediately answering this preference);

The feedback received was on outstanding Research and Innovation policy related issues, taking into consideration preferences shown by participants and new ideas, and to support networking among Research and Innovation stakeholders for the sake of a vibrant European Research and Innovation community. Different stakeholders from Associated Third Countries to Horizon 2020 made the case to further integrate respective roadmaps and to step up the communication and outreach efforts towards these countries.

- harmonization of data and their interoperability, and also for harmonization on legal frameworks (including on international/global level)
- advanced drug delivery technologies, biomaterials, 3D-printing

- cross-cluster calls namely between cluster 1 and cluster 2 (migration, health literacy, organizational change and human behaviour were some of the topics
- SMEs: Questions of financing of start-ups/SMEs, and also how to involve them more in collaborative projects (rather than taking care of the administration of the projects)
- involvement with regulators appears as a priority for some very scientifical/technological communities (in-silico)
- Lack of understanding on how research results will reach citizens and what measures the European Commission is having to ensure that there is an impact of research in society;
- Plea for an opportunity to fund research in Horizon Europe on the positive impact of animals (pets) on physical and mental health in healthcare settings, communities, workplaces and the private setting.
- Keep in mind machine learning and e-surgery in the upcoming Horizon Europe programme.
- Microbiota-related research is mentioned as a cross-cutting topic but mainly in the context of nutrition and less visible in the health part.
- Plea for specific calls for proposals towards the development of vaccines targeting specific populations (in particular the elderly); more personalized medicine focus with patient stratification, for better and more targeted interventions and targeted impact of cost reduction, better quality of life for populations and fight against AMR spread in European secondary care settings. Also, in general, the development and use of novel methods and/or technologies should not be overlooked in the future Horizon Europe programme (i.e microfluidics solutions applied to risk of infection prognosis, innovative in vitro assays as alternatives to animal testing).

- **Pillar 2 Cluster 2**

Positive comments were received on the main lines of activities of Cluster 2.

There was general interest on studies in the Social Sciences and the Humanities (SSH), especially in the area of inclusion, social dialogue, as well as the integration of youth into society. Contributors also called for more studies on discrimination and inequalities (including gender dimension), and the integration of migrants. Some respondents made the case for better integrating the Humanities in research topics.

A lot comments focused on cultural heritage challenges, with particular attention on the importance of technological transformations for cultural heritage (including its benefits and drawbacks) and the linkages with socio-economic development.

Skills, education and lifelong training were also among the areas extensively discussed in the village.

A number of participants asked for research focus to be given on the benefits and challenges associated to disruptive technologies.

Others made the case for better reaching out and including civil society organisations in Horizon Europe activities and also promote synergies with other European Union programmes, especially those aiming at supporting European cultural ecosystems, such as Creative Europe.

Finally contributors argued that research should promote a more holistic approach in terms of individual and societal well-being (not solely economic growth oriented).

- **Pillar 2 Cluster 3**

The main lines of the Orientations document for Cluster 3, to the extent they were covered by the discussions, were confirmed.

Though, different elements could be better spelled out in the text: the importance of citizen awareness and engagement as well as the role of SSH in security research.

Visitors mentioned the importance for civil security research of the following, notably:

- citizen awareness and engagement;
- need to stimulate a stakeholder community (bringing together researchers/end-users/ industry);
- need to change the wrong perception that security research is only about technology;
- the value of SSH;
- importance of social innovation and not only technological innovation;
- value of security-by-design and privacy-by-design.

Visitors mentioned inter alia the following as areas on which to focus:

- scenario modelling, notably so as to assess comparative cost/benefit of different possible security-enhancing interventions;
- improved cross-border comparability of data, e.g. risk assessments;
- disasters: mobile networking units to re-establish communications if networks go down;
- seismic risks and resilience thereto;
- impact of AI and other technology;
- tackling disinformation;
- technology-enabled terrorist threats;
- standards.

- **Pillar 2 Cluster 4**

The stakeholders confirmed the three high-level objectives of the cluster: competitiveness and autonomy; a carbon-neutral, circular and clean industry; and inclusiveness

The interactions between applied and longer-term research and innovation will be developed further, including in the area of emerging enabling technologies, with the purpose of exploring new technology development opportunities emerging at the boundary between and across different disciplines and sectors, that would be of benefit to European industry and in particular to innovative SMEs.

The valorisation of knowledge and technology transfer have been confirmed as important factors for success, and need to be stressed more; the importance of technology infrastructures or innovation hubs has also been highlighted along with the need to integrate them in projects.

In addition to the already identified research and innovation orientations, most sessions highlighted the importance of related policy initiatives: the development of skills; youth; the role of living labs; and that of standardisation, especially in the context of the circular economy; new business models; and the deciding role that regions and cities can play in all these areas, notably when it comes to supporting digital industry hub and other technology related infrastructures.

International cooperation was highlighted and would need to be developed further; a recurring theme was global leadership in sustainability.

Questions about the functioning of the intervention area on emerging enabling technologies and its interactions with the European Innovation Council (EIC);

Research for future emerging technologies is critical and Europe needs to stay in the front, so public money is essential.

Several discussions revolved around partnerships and the respective roles of industry and Member States, including leverage and IP. Response: industry needs to ensure commitment and engage with national governments with regard to programme budget.

An important factor for success is to address ethical principles ('ethical by design') and meet needs for privacy and control. The competences to implement these principles are important; examples are EU General Data Protection Regulation and eID as regulatory principles to balance the purely commercial vision.

Public money is needed for some of the necessary infrastructure (e.g. 5G); partnerships with industry are important.

Foster ecosystems of innovation that include both small and large organisations, especially for market access by SMEs through larger industry partners.

- **Pillar 2** **Cluster 5**

  - How to better fund green techs (gap between research and upscale /commercialization);

  - How to ensure real 'new ideas' from peer-review that is generally 'business as usual' (e.g. off-shore Wind platforms);

  - Mobility e-infrastructure should be promoted in Europe;

  - The link between H2020 and the other instruments like Connecting European Facility and InvestEU is **not optimal.**

  - The Commission proposal to merge Climate, energy and mobility is highly welcome. Now, we should foster cooperation among these stakeholders.

  - Opportunities for Renewable energy projects in Africa;

  - Energy efficiency in buildings should be extended to the construction phase;

- Forest-based products could be more exploited as fuels;

- Why success rates of calls for proposals are not published?

- Link the new HE calls for proposals in Cluster 5 to the Trans-European Networks (energy and transport), i.e. the real EU requirements;

- How research funds should be used to have the highest impact for achieving the EU carbon-neutral target by 2050?

- **Pillar 2** **Cluster 6**

The Orientation documents was welcomed by visitors. Participants suggested to precise and reinforce some elements: circular bioeconomy , Forestry, One Health approach.

Participants highlighted the need for more place-based innovation and continuation of multi-actor approach.

Participants also asked to facilitate establishing bridges between the Orientations and the update of the smart specialization strategies by the responsible managing authorities.

In relation to the intervention area seas, oceans and inland waters participants asked questions and provided input in the healthy oceans mission, where the name more clearly states that it concerns marine and maritime aspects than the name of the cluster.

- **Pillar 2** **JRC (Joint Research Centre)**

Most of the participants did not come to discuss the Orientations document. Only one participant (Shift2Rail JU States Representatives Group) suggested that the new Horizon Europe programme should provide stronger synergies between different funding programmes (especially Connecting Europe Facility and Horizon Europe) for enabling investments in building the infrastructure for new railway testing facilities. In his view, such facilities are necessary for railway and equipment manufacturers and operators to carry out testing, maintenance and training of new type of locomotives, which would be more environmentally friendly. He also mentioned that these facilities should be placed in some of the Central Eastern European countries for helping to decrease the regional disparities. He also mentioned that the railway transport in general is underrepresented in the Strategic Plan, so he would appreciate more types of activities helping the railway industry actors in the next programing period.

In general, stakeholders valued the Commission's in-house research facilities. They also appreciated the collaboration and cooperation opportunities with our research centres and are very keen to actively contribute to the collective intelligence.

- **Pillar-2-centred Mission Climate**

Good discussions and ideas for the Mission, including:

-upscale and go to the Market -> Financial instruments that are fit for purpose and can accommodate higher risk levels (EIB)

-Improve processes and methods to better engage citizens in Climate Action

-Involve the social sciences (Education and Behavioural change) to change the current way the economy works (new economic models)

-Fight deforestation/support sustainable forest management to preserve biodiversity, carbon capture, anti-erosion, recreation

- truly involve citizens in the mission orientation. Experiment with public engagement to have correct power balances.

- **Pillar-2-centred Mission Cancer**

- Participants with very different backgrounds (patient organisations, academia, nurse associations, SMEs, governmental offices, etc) liked the fact that the Commission is determined to tackle a complex disease such as cancer.

- A personal touch: one visitor who came to the research and innovation Days for non-health related sessions was a cancer survivor. Came to the cancer mission booth as she was touched by the fact there is a cancer mission in place. She expressed her hopes and gratitude for this endeavour.

- Most of the questions were about the next steps in the development of the cancer mission.

- **Pillar-2-centred Mission Healthy Oceans, Seas, Coastal and Inland Water**

Discussions focused on the different institutional and programming challenges of the mission area to map how a mission could lead to the constitution of a global public good as well as the activation of citizen participation(the same questions of the session dedicated to this mission area, were used to discuss and get feedback from the participants).

1. What would be a major challenge that a mission could solve?

   Supporting knowledge creation needed to provide solutions and integrate them in policy agendas

   - European Research Platform from Abyssal perspective
   - Observation of Bowhead whales in the Arctic
   - Plastics and their interactions on marine life, Life in oceans (for instance map the marine microbiome, acidification and eutrophication), Climate Cycles
   - Technological, recycling and cleaning water membranes micro organisms
   - Coastal area resilience against sea level rise.

   Possible policy actions and goals

- As a matter of principle, developing a solid science evidence-based approach to clean oceans
- Support innovative start-ups - entrepreneurs that help to keep the ocean healthy
- Protecting with regulation the seafloor
- Close the loop, water management or rivers and oceans
- Biodegradable (PHA), Bioplastic produced from VFA in WWTP's-circular economy, rivers and clean oceans
- Nutrient recovery from WWTP, less algae bloom, circular economy, less depletion and phosphorus
- Address greenhouses producing activities at sea: for instance cruise ships
- Maritime spatial planning for healthy oceans
- Secure life in the oceans (for instance addressing fish species extinction by stopping bycatch or zero catch of wild species)

2. a) Why is the mission so far from public perception?
   - Out of sight out of mind: not much mobilization for plastic from citizens because they don't think of oceans every day
   - It is complex to explain how it impacts biodiversity and especially humans
   - Ocean was always split, they miss the link with the inland waters

   b) How to best engage citizens?
   - Internationalization of Blue Economy
   - Local (regional) involvement – citizens engagement mindset change
   - Change behavior of citizens by regulation or public communication
   - Make people aware of their impact on the ocean
   - To find solutions we need to figure out the way people think and to discuss the problems with them
   - Education matters – starts educating workers and citizens
   - Work with the innovation quadruple helix
   - Education and awareness rising
   - Sailing show to raise attention
   - Real time experiments with people to see change
   - TV shows
   - Visualise the "sick" sea
   - Involve citizens in developing scenarios of the future "what if", show future scenarios to make people understand what's at stake
   - Emotional education
   - RRI
   - Give voice to young people(teenagers and early 20s) and the elderly (who have time and knowledge)
   - Involve adults, because they make the decisions

- Build on existing platforms

3. How to make the mission a European Public Good?
    - Europe should lead the conversation on the oceans
    - Clean drinking water for all
    - Scalability
    - Highlight the economic societal value of the oceans
    - Joyful celebration not gloom
    - Atlantic Youth Ambassadors – GoBlue
    - Clear and robust intervention logic
    - Ownership from the full Commission, not just DG Research and Innovation
    - Make funding work better between scientists, industry and citizens
    - Define and quantify ecosystem goods and use as basis to quantify public good
    - Involve Member States at right level to mobilise resources
    - Make people aware of the importance of the ocean health to human health

Additional Questions / Problematics

- Complicated to find a title that combines seas and rivers
- Timing

- **Pillar-2-centred Mission Smart Cities**

The open session led to the beginning of a brainstorming, to launch a lasting co-design process. Even when most of the ideas, observations and actions have been identified in policy/research reports, the enthusiasm and reactions of the participants were very positive with the listening approach by all the Commission services.

- **Pillar-2-centred Mission Soil/Food**

Participants were supportive of a future mission in the area of Soil health and Food.

Their comments touched upon the various functions of soils, i.e. productivity (food and non-food), biodiversity, climate regulation, water purification and nutrient cycling

Particular themes raised included notably:

- need to have data and tools for soil monitoring; geosurveys
- incentives for sustainable soil and land management, e.g. through policies such as the Common Agriculture Policy (CAP)
- role of soils and land use in climate change mitigation;
- agronomic methods and technologies for carbon sequestration; market development for new solutions
- Soil contamination, pollution (incl. from cities), pesticides, plastics in soils
- Role of soil biodiversity, in particular microbial diversity (the microbiome) in various soil processes and for food quality; the holobiome as the link between soils and food

- Comparing differently managed soils (e.g. organic vs conventional) and promote good practices, such as rotations, soil cover, low tillage
- Nutrients: use efficiency (incl. through plant root architecture), cycling and circularity
- Water: water retention capacity of soils; manure management and water quality

Some visitors noted the need to link up with other missions, emphasising the role of healthy soils for healthy oceans, human health and climate adaptation and mitigation.

Ideas for specific mission objectives put forward included: "Halt desertification", "Increase the amount of productive land and improve soil quality", "Increase or maintain biodiversity of the soil", "Enhance the capacity of soils to capture carbon, reducing greenhouse gas emissions and buffering the impacts of climate change".

On the mission structure and governance, visitors suggested establishing citizens' panels, one per mission, to work in parallel with mission board and support citizen engagement.

- **Pillar-2-centred Partnerships**

Full support from all visitors for the new policy approach for European Partnerships. None of the 44 European Partnership candidates has been put into question. Some inquires about the additional partnership candidates still under discussion.

Only update is needed for the list of the current 44 European Partnership candidates.

Generally a very busy booth with a large interest for European Partnerships. Heterogeneous group of visiting stakeholders:

- Partners involved in the preparation of the foreseen 44
- Regions interested in joining existing / upcoming European Partnerships
- SME representatives interested in funding from / joining European Partnerships

- Member State representatives interested in the process / timeline for European Partnerships
- Universities interested in participating in European Partnerships
- General public interested in European Partnerships

Key topics discussed:

- Many representatives of partnerships candidates, all extremely happy to receive the guidance document for the immediate next steps of preparation
- Visitors in relation to FET Flagship preparatory actions under H2020
- Details on the timeline for European Partnerships
- Additional information on the 44 candidates for European Partnerships
- Information on the process to select any new candidates (8+1) in the Shadow Strategic Programme Committee. Two candidates are considered mature enough to be considered now. Further discussion on the remaining seven
- Clarification on the three types of implementation modes
- Requests for contacts with Commission services that support the preparation of individual European Partnership candidates
- Large infrastructures interested in connecting with partnerships (batteries)
- Enquiries from private partners concerning the reorganisation of DG RTD and the changing responsibilities of COM colleagues
- Member State representatives interested in the timing and form of commitments for European Partnerships
- Call for simplification of the current model for Institutionalised Partnership, with a need to take strategic priorities of countries into account. Proposal for MS workshops to look into possibilities to realise central management of financial contributions
- Need for cross-links with other pillars
- Japanese funding agency – interested in the overall European Partnership landscape (Horizon 2020 and Horizon Europe)

3. More detailed feedback on the targeted impacts (including comments on the relevance of the targeted impacts as presented in the Orientations and on their possible fine tuning, on the possible synergies with other EU programmes, on the activities supporting the delivering of the targeted impacts)

Not directly applicable for partnerships.

- **Pillar 3 European Innovation Council**

a) Pathfinder

The Pathfinder received a high level of interest, in particular due to the current expressed need of funding for high risk research-related projects. The budget should also be kept on a reasonable level. It was suggested that the FET Proactive Transition Activities to Innovation should be continued in Horizon Europe together with all FET Programmes. There are some contradictory request of bottom-up and top-down approach for FET Open.
Recommendations:

- ERC research should also be given the possibility of transition activities to innovation.

- Better information shall be broadly share on how FET Flagships will continue under Horizon Europe. The integration of research should be maintained in the visionary/interdisciplinary excellent research.

- Swiss stakeholders (i.e. a Swiss public research organisations and universities, public sector) strongly encouraged continuation of FET Open programme as it is now would be appreciated (using current gatekeepers and not from lower Technology Readiness Level-TRL- up).

- The role of Programme managers should be well defined, mainly to contribute to 'transition' between the Pathfinder and the Accelerator. It could be useful to integrate within the co-creation process associated countries and Member States to define their role – as some gap could be filled when compared to national programmes (e.g. the Swiss "Bridge programme.

- Importance of sharing best practises among stakeholders and Member States to peer-up with programme managers is crucial – this could be implemented during the workshop for defining the programme managers' role planned for spring 2020.

- It is currently difficult to define the disruptive technology required by the FET programmes. In the next Horizon Europe, a clearer description of what is meant by "disruptive technology" should be foreseen.

- It is crucial to keep the interdisciplinary approach of the EIC Pathfinder also in the Horizon Europe, as this is the way technology can be connected to society and market.

Synergies

- Horizon Europe Pillar 2 should also channel innovation through a bottom up approach. For example, a SMEs which develops a technology for health should also be able to get funds from the programmes in the cluster health.

- Missions, Partnerships and clusters should be aligned about Innovation. Specifically, the bottom up approach, which comes from the co-creation, should merge and converge with the top down approach of missions. This is what brings innovation.

- Stronger synergies should be foreseen between the ERC and the EIC. There should be support for beneficiaries of ERC programmes to access to the EIC funding. It could be foreseen a more specific program for those who successfully completed a research project in ERC towards a program to support the development of the results from the idea to the proof-of-concept.

- There should be a more specific bridge to support individuals and companies participating to the FET Flagships initiatives to develop further the achieved results. In particular, it should be avoid that relevant results are used to feed initiatives outside Europe (e.g. in the United States).

- It could be foreseen the possibility for those involved in FET Flagship to have a preferred support to access further funding.

b) Accelerator

The Accelerator with the EIC Fund creation is very well perceived, both by public entities and by companies. It responds to the needs of Innovative SMEs, due to the existing private funding gap, even when funded by other Instruments (FTI, SMEI Phase 1 and Phase 2). Some questions were raised on the SME Instrument. Comments were positive towards the end of the SME Instrument Phase 1, which was "only for consultancy salaries").

Recommendations:

- Horizon Europe should provide support to UK companies, despite political decisions.

- Evaluation: guidance for evaluators should be improved, especially vis-à-vis feedback to rejected applicants. The EC should be more transparent about the selection of Jury members (why and how have they been selected) and whether the EC addresses conflict of interest. Also the existing remote process by evaluators for the grant part is inefficient, where decimals are accountable, and were experts are required after 30min brief, to assess superficially proposals (4 a day). These both guidance and process should be improved.

- Reporting requirements: the reporting process is too heavy and sometimes put SMEs into financial difficulty. (quote from a Danish SME). Therefore, some simplification could be envisaged.

- Transparency should be improved, including access to data on companies and outcomes of the EIC. If data from the EIC processes were made available researcher could be supporting continued development.

- EIC could benefit from a broader interaction with microeconomic and business/finance research insights.

- A better support at national level could be improved to enable companies to access to this specific funding scheme. Foe e.g. Slovakia has some spin-offs with great scale-up potential but companies do not manage to access the funding due to lack of information and to lack of training to access to them. Training could be envisaged for these particular countries. The search of partners and investors as well as the entire requirement from the EU funding schemes (reporting, financial data to provide) are their key structural bottlenecks.

Synergies:

- EC should ensure that successful projects, particularly those with high innovation value make their way to other EU programmes (i.e. ensure synergies between EIC and other programmes such as Innovation Fund, InvestEU), strengthen internal communication within EC services.

- A more collaborative best practises exchanges and support should be given to projects /companies that are already involved in some Missions (like Oceans) to emphasize their activities and get access to the Accelerator.

c) Innovation Ecosystems

The European Innovation Council (EIC) Forum is very well perceived. However many questions and comments are related to its concrete implementation and the lack/insufficient level of information towards stakeholders. Regulatory barriers remain major problems for innovation, including IP and licensing rules, preventing technology to access market.

Recommendations:

- The European Innovation Council (EIC) Forum design and the future organisation should be communicate to existing network at regional and national levels.

- Access to the EIC Forum for regional actors and their involvement is important.

- Interaction at regional level: There is a need to connect regional innovation ecosystems at EU level, especially involving businesses / start-ups / or ideas from the lab (TRL: 5-9) in order to look for solutions to their problems. They identify a gap in the activities of the regional ecosystems at EU level (e.g. creating synergies with investors, scaling up in a region and sharing knowledge with other EU regions, peer-to-peer exchanges, etc.).

- Selection of actors within the EIC Forum will be essential. The most important element is to connect enthusiastic drivers of small innovative ecosystems.

- There are many existing platforms in Europe on innovation, but they are not well connected and also quite confusing to navigate. The EIC Forum is to ensure equal access to information and best practises exchanges.

- There is a need to raise awareness about the new EIC instruments. Researchers are not aware of the new challenges and opportunities. The need is also to link research with EU policies and priorities and the market needs. The impact criterion of H2020 programme is problematic and should be revised (proposers copy-paste it in their proposals with no realistic data).

- Complementarity of actions between the Digital Innovation Hubs, Cluster Excellence Programme and future EIC should be envisaged. . It could be useful to present good practice by appointing regional coordinators for different topics, which may be in line with Smart Specialisation strategies (although she notes that the smart specialization topics are too broad).

Synergies:

- Structural funds should be used for regional actors for innovation

- The European Innovation Council- European Institute of Innovation and Technology (EIC-EIT) cooperation should be intensified and change character. It involves mostly academics, innovators/companies and civil society is missing and should be in. Diversity of key players should be ensured. The EIC council advisory board does not represent civil society and other ways to communicate with them needs to be ensured. Right expertise exist (via various organisations) on supporting this link with citizens (instruments, ways, tools) but EC needs to consider them and establish closer cooperation with them towards coming closer to end-users based on their needs on the ground. (User-friendly new technologies, etc.). For example, NL has great expertise on the area and the present organisation is willing to assist EC in its actions and policies.

- How the Innovation ecosystem integration with the component 5 and more generally, how the IE would achieve synergies with other EU programme to reduce confusion for the end user remain essential. Christophe Clergeau, the Rapporteur for Horizon Europe, could be a good source of information and recommendation on this particular synergy.

- **Pillar 3 European Institute of Technology**

  - Opportunities offered by the EIT's pan-European innovation eco-systems;

  - Opportunities to join existing EIT Innovation Communities

  - Future KIC - Cultural and Creative Industries (CCI) and the sector potential within EIT Community; measuring the success of CCI;

  - Expanding EIT entrepreneurship education offerings to bachelor, vocational and professional training

  - Capacity development of Higher Education Institutions (to become more entrepreneurial and innovative) through EIT activities

- Relations between the EIT and the European University Networks;
- Cooperation between the EIT and EIC
- Enforcing connections between local and regional innovation ecosystems
- Innovation Brokerage and ecosystems
- Innovation in water managements
- Financial sustainability, in particular, related to education activities
- Raising awareness about the EIT and its innovation model
- Opportunities for start-ups and scale-ups to access EIT acceleration services and ecosystems
- Multi-annual grants
- regional outreach and more opportunities across Europe are needed; links to local/regional issues important (strategies, enterprises, knowledge)
- Increased support to social innovation through EIT is important

- **Horizontal European Research Area/Widening**

  Open Science

  Discussion on horizontal issues in Horizon Europe. The public consultation on the orientations for how to implement Horizon Europe was focused on cluster priorities and impacts. Whereas there were little opportunity to comment on cross-cutting issues and policy support for aspects such as open science including citizen science and modernisation of universities**.**

- **Horizontal Implementation**

  - Praise for the Funding and Tenders Portal and the fully electronic grant management; detailed suggestions for further improvement (notifications, search for calls and topics). Welcoming the extension of the approach to other EU programmes.
  - Request to provide a space in the portal for internal consortium management (not visible to the Commission)
  - Request for improving National Contact Points (NCPs) services; and possibility to have direct advice from Commission/Agency Project Officers
  - Suggestion to create liaison between thematic NCPs and related thematic European Research and Innovation associations
  - Concern over lump sum project funding: Maybe it is suitable for small and/or standardised projects, but less for bigger
  - Doubts about the idea of a daily rate for personnel costs – possible discrepancies with usual accounting practices

- Concerns on re-submission rules for proposals, particularly under the SME instruments/EIC, and inconsistent Eearly Summary Reports (ESRs)

- Question about the evaluation of management structures in proposals, and our idea to downplay this aspect

- Selection of evaluation experts needs to be more transparent, too many of the usual suspects are selected every time again;

- Request to better cater for multidisciplinarity, more IP and innovation expertise in evaluation panels

- Simplification efforts by the Commission are sometimes foiled by strict internal rules in the consortium, imposed by coordinators

- Call topics need to be broad, in order to allow addressing rapid scientific and technological evolutions

- Quality problems in outsourced audits (audit firms send junior staff that needs to be educated by the auditees)

- Praise for the organisation of the national stakeholder events on HE implementation, and for the spirit of co-creation in general

- Acknowledgment of the need to keep links with the Commission after the end of projects (dissemination and exploitation, reporting of results, impact)

- Synergies: positive remarks on the pilot call with Interreg; question from a third country participant on how to create synergies with foreign policy instruments

- **Horizontal International**

A wide range of stakeholders from EU and Third Countries came for discussion: Ministerial representatives, Embassy representatives, European Parliament staff, press, international funding agencies, funding agencies, platform representatives, representatives of public-public partnerships (JPI, art.185), countries, liaison offices, universities, research performing organisations, NCPs, speakers from other sessions, industrial representatives (including SMEs), coordinators/beneficiaries of H2020 projects, COST, JRC colleagues, other Commission/Agencies representatives from the Research and Innovation family.

Dedicated meetings led by 11 EU Scientific Counsellors took place on possibilities for Research and Innovation cooperation with Australia, Japan, US, Canada, Brazil, India, Israel, South Korea, South Mediterranean, Russia and China.

Participants appreciated the possibility to interact in person in the International Home with EU staff, in particular the Scientific Counsellors coming from 11 EU Delegations around the world. Their role is highly valued and could be further strengthened under Horizon Europe.

The importance of the international Research and Innovation dimension and its support under Horizon Europe was stressed by the majority of the participant/stakeholders.

Different stakeholders, above all from developed countries, expressed interest in understanding the dynamics of the Association model to Horizon Europe, including the possibilities for either partial or full Association.

The participants/stakeholders asked for the availability of the instrument/s supporting/facilitating International Cooperation under Horizon Europe.

Some suggestions on how to facilitate cooperation with third countries arose from the meetings:

- need to identify clear areas of common EU- Third countries interest
- possibility to have a dedicated fund to support cooperation between existing projects
- keep learning from best practices and co-funding mechanisms
- possibility to have multilateral/ multinational 'joint funds' on mutually agreed topics of global concern, to fund research anywhere for the good of the whole ('Global Research Area')
- increase awareness about COST as an interesting way to build a network
- continue with bilateral initiates (e.g. flagships) having a positive impact on Research and Innovation cooperation
- define how international cooperation will be addressed under different clusters and missions
- understand the possibility for international cooperation under public-public and public-private partnerships.

All the participants were enthusiast about the Research and Innovation Days concept, including the sessions, the possibility to have bilateral meetings in the Village area, and the opportunity to network. They felt welcomed and liked the genuine attitude to listen to them. They are all very much looking forward to the next edition of the Research and Innovation Days!

4.2. The co-design sessions

4.2.1. Co design sessions scheduled on 24 September 2019

- **Breakthrough Tech – back to the future**

  While not directly discussing the Orientations document as such, key aspects of it were directly or indirectly confirmed at the session

  The next version of the Orientations document could put stronger emphasis or should be more specific on particular aspects that were highlighted in the discussion (see below and next points).

  There was overall support to the spirit of the Horizon Scanning workshop (Oslo, 2-3 July 2019) that was reported on in this session. The report "Horizon scanning – future technologies for prosperity" especially highlights the value and importance of foresight towards technologies with a clear purpose. This goes beyond a specific application but focuses on the intended effect on, for instance, sustainability, SDGs, prosperity, etc. The panel members all endorsed this orientation as a rich alternative impact framework that goes beyond a singular focus on economic growth and jobs.

  The specific technology areas and technologies listed in the report were not discussed. The panel members agreed that these need to be complemented by others, some of which 'beyond the horizon', like those explored in programmes like Future and Emerging Technologies. Participants also agreed on the importance of combining different perspectives and time-scales, cross-fertilisation of ideas across sectors, research silos, actors, drivers (industry and society) and time-scales, with ample space for "dreaming" and creativity to explore the potential of new technologies. They also acknowledged the importance of current and emerging digital technologies as horizontal enablers for future deep-tech. Foresight practices highlighted for different stakeholders: There are different types and purposes of technology foresight. For industry, it is important to identify the transformative potential and impact of emerging technologies on their business, a task that can be supported by Research and Technology Organisations (RTOs). A funding agency has different aims such as nudging industry to change and to further develop existing competences to meet new challenges and to succeed in new markets. It can also focus on identifying new technologies that are still too high risk for companies to invest in, or for citizens to embrace. For RTOs, technology foresight is "in their DNA" as they need it to serve and assist their clients in making strategic choices and for filling in knowledge gaps in industry.

  Recommendations for Horizon Europe: Technologies yes, but driven by "purpose" (e.g. Sustainable Development Goals) and specific attention to targeting "process", i.e. facilitation of cross-boundary, interdisciplinary cooperation and creativity. While making clear strategic choices, also look for things that are under-explored and may have a transformative impact.

  - Technologies should have a purpose ("why would we need such technologies?") and a clear potential to contribute to societal needs and challenges. This was stressed by all panellists, regardless their different affiliation (national funding agency, industry, RTO, SME support organisation).

  - "Purpose" is defined differently for different players (e.g. industry: to enable/facilitate development of marketable products and services, government agency: to solve societal challenges), but the basic targets as sustainability, prosperity or contribution to Sustainable Development Goals (SDGs) are shared by all.

- However, there must be space for creativity ("dreams") of researchers - we need to balance curiosity and purpose orientation, and strive to combine them early on in order to inspire industry (and society at large) to take new routes..

- Research and Technology Organisations and other intermediates can help to engage industry in emerging technologies of low Technological Readiness Levels, and also to adapt existing solutions to new sectors (e.g., batteries into aviation).

- Economic growth as a marker for success should be replaced by broader indicators including societal benefits such as the Sustainable Development Goals (SDGs). Prosperity is a useful term.

- Long-term commitment (including financing) is needed to bring promising technologies to the market. Foresighting has to be followed by choosing and committing to priorities over long time-spans, while keeping an eye on potentially disruptive new possibilities that may in the end better fit the intended purposes.

Horizon Europe has a crucial role for:

- Incentivising people and organisations to cooperate across boundaries (sectors, disciplines, geography, hard and soft skills, development and application, incumbents/newcomers, etc.); Interdisciplinarity does not usually happen by itself but needs to be stimulated and focused towards purpose.

- Balancing and connecting curiosity and purpose oriented research and innovation; understand the dreams of researchers, combine them with knowledge and experience in other areas – find ways to bring something new to the different teams in order to inspire new directions (including for companies in established value chains or declining sectors to use their assets for crossing-over into different areas);

- Combining in an agile way the heavy long-term investment on industry-driven priorities with the exploration of radically new and potentially disruptive possibilities. While it is crucial to engage high-tech SMEs (for their speed and agility), big industry is also needed for the "drive" to take developments further.

- It should not just finance projects but also:

    - o providing/facilitating platforms for creative people from very different background to meet/inspire/cooperate/develop together innovative ideas; including with citizens.

    - o providing structures and infrastructures to reduce risk for small and large companies to de-risk, develop, test and upscale potential breakthrough technologies;

    - o helping companies and RTOs to navigate within rapidly changing environments, for instance by actively transferring ideas and technologies between actors that would normally not interact, or by combinations of different foresight activities (short-term, long-term, sectorial) to priorities strategic directions while avoiding 'tunnel vision'.

- **Technological leadership in renewables and energy efficiency**

  The event will present the EU as a worldwide technological leader on renewables and energy efficiency. This leadership is not only crucial in terms of cutting energy cost, but also in relation to creating jobs, competitive industries and a positive commercial balance.

  The event will mark the importance of investing in research and technology development to stay ahead of the international competition by technological leadership.

  We intend to show in particular to policy makers that investing in Research and Innovation is critical to keep EU's technological leadership and hence reap the co-benefits associated with it.

  Policy Objectives and Expected Outcome

  Show, in particular to policy makers, that investing in Research and Innovation is critical to keep EU's technological leadership and hence all the co-benefits associated with it.

  Stress the importance of working together on Research and Innovation and the development of Research and Innovation agendas.

  Present examples of EU technological leadership in renewables and energy efficiency.

  Increase the knowledge about innovative clean energy technologies and gather support to higher investment in Research and Innovation in the sector.

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  Key messages from the session

  From the discussion at the session it emerged that there was substantial consensus among the speakers and the audience on the main challenges and targeted impacts presented in the Orientations Paper (in particular Annex 5).

  The main message was that Research and Innovation work should encompass the whole value chain, from e.g. material research, through the higher levels of technological readiness and up until market uptake, in the framework of a smart industrial policy that benefits European competitiveness (the example of PV was mentioned as a counter-example, while that of batteries was cited as good practice). Also, solutions should be 'localised' to meet the needs of specific contexts, markets and regulatory environments.

  Further feedback from the session is that the current societal mobilization against climate change and the European Green Deal proposed by President-elect von der Leyen were mentioned several times.

  It was emphasised that a circular economy approach should be applied when designing the technologies that are used in the renewable energy and energy efficiency sectors.

Several areas were specifically mentioned as important, e.g. sector coupling; heating and cooling; hydropower; energy efficiency; low-tech innovation; socio-economic research; etc.

Energy cooperatives were mentioned as a very good European asset when it comes to developing and testing on the ground innovative solutions, and aggregating small projects to a scale that is bankable, but it was also mentioned as a shortcoming that the results often remain property of the industrial players.

Synergies between EU and regional instruments were mentioned as an effective instrument to advance research and create 'innovation ecosystems' at the local scale.

With our carbon budget shrinking every day, greater energy efficiency was mentioned as being critical to act fast enough against climate change.

It was stressed that the power and the heat/cool sectors should 'talk to each other' much more in order to promote integrated solutions.

The importance of being able to adapt in third countries the solutions developed for the European geographical conditions was mentioned.

It was also highlighted that many renewable energy and energy efficiency solutions are already developed and available to decarbonise the system, but their adoption is lagging behind because of market barriers, including the absence of adequate regulatory and financial incentives. There is also a lack of trained installers of these technologies.

- Substantial consensus on the main challenges and targeted impacts presented in the orientations document.
- research and innovation work should encompass the whole value chain, from e.g. material research, through the higher levels of technological readiness and up until market uptake, in the framework of a smart industrial policy that benefits European competitiveness. Need for a circular economy approach when designing the technologies that are used in the renewable energy and energy efficiency sectors.
- Energy cooperatives are a very good European asset when it comes to developing and testing on the ground innovative solutions, and aggregating small projects to a scale that is bankable.
- Synergies between EU and regional instruments can be an effective instrument to advance 'innovation ecosystems' at the local scale.
- Power and the heat/cool sectors should 'talk to each other' much more in order to promote integrated solutions.
- Many renewable energy and energy efficiency solutions are already developed and available to decarbonise the system, but their adoption is lagging behind because of market barriers, including the absence of adequate regulatory and financial incentives and a lack of trained installers of these technologies.

- **Healthy environment, healthy people**

  The main lines of the orientations document have been confirmed. Ensuring a healthy environment for healthy people is close to the heart of many of the participants; it is considered an important area for research and innovation.

  Fighting climate change and pollution shouldgo hand in hand.

  Anticipatory governance of research that considers health impacts from the start across sectors and projects should be promoted more strongly across Horizon Europe. Health impacts need to be part of cost estimates of innovation. The principle of 'polluter pays' should be kept in mind.

  Digitalisation will offer new opportunities for improving healthcare but its impact on society and health also needs to be taken into account.

  A more holistic approach to chemical contamination is needed, integrating ecosystem and human health aspects. The impact of mixtures on human and ecosystems needs to be better understood and fed into legislation. Human biomonitoring can be an important tool for this.

  Environmental influences can impact our genome and physiology in a way that can even be transmitted to future generations.

  The focus should not be only on pollution but also on the health promoting environments. This will also contribute to reducing societal inequalities.

  Trust building is important among all players. This requires open communication between citizens, scientists and governments; also on risks. Participatory research such ascitizen science, is a good way to build trust. Today's pilot projects are too technical and need to be wider and more holistic and include both the socio-economic dimension and societal equality aspects. Living Labs are good examples of this. Consumers can influence policies through their personal behaviours.

  Multi-sectoral, systemic approaches are needed as many activities are interrelated. There are clear links between the environment and health research area and the Horizon Europe missions. Silos need to be broken between sectors.

- **It's a bio World**

  The main lines of the Orientations documents have been confirmed

  Main novelties to possibly integrate in the next version of the Orientations:

  a) huge opportunity to use principles of biological systems for new type of solutions;

  b) capturing increasing scope of biotechnology;

  c) convergence 2.0 (to consider);

  d) one European metabolism concept (biology must be central to the European metabolism);

  The need for precisions on the targeted impacts of the Orientations were as well discussed:

  a) biology as a template to build non biological devices;

  b) process intensification, improving efficiency and sustainability. Clever methods to "make" cells produce single products with high efficiency;

c) the future should not be limited by the offer of nature but can mimic biological cells themselves;

d) more decentralization of processes;

New elements raised during the discussion:

a) combine successful biotechnology + more investment in things we do not yet understand;

b) gather contributions from multi-disciplines and avoid replication of innovation;

c) main changes in education for the game-changing technologies are needed. Digital training;

d) bioinspired robotics: how to make a complex system work smoothly. Service robots that have a human side. Robots that can evolve and adapt. Next generation of robots: energy efficient, more ethical, more amenable to social needs.

- **Tomorrow's technologies for today's health**

The following elements were discussed in view of the preparation of an updated version of the Orientations:

- Science, technology and data should be blended in order to achieve cognitive healthcare.

- Prevention / eHealth for chronic disease is high gain low risk.

- Creation of secure and reliable data, taking into account the ethical dimension.

- Build upon existing infrastructures and collaborations to ensure sustainability (incl. ideas on circular economy) and develop new methods for new technology delivery.

- Convergence of technologies, sectors and stakeholders (including end-users such as healthcare providers, citizens and regulators) to create a continuum that ensures rapid uptake of innovation.

- Focus for this targeted impact should not solely be on methods on analysing data but also on how to create new data that is reliable, reusable and AI worthy.

- Support method development to combine different types of data in order to facilitate individualised phenotyping/medicine.

- Support societal awareness of what new technologies exist.

More detailed general feedback (including comments on the overall structure of the Orientations document and/ or on the contents)

- More translational interdisciplinary, cross-sectorial research is needed.

- Co-create with the end users to facilitate uptake of results.

- Need to include more specialisation e.g. terms like "technology" is too broad.

In addition to the main novelties mentioned above, there were concerns about the process of adoption of innovation, the ethical dimension of research and data, the involvement and development of regulatory sciences and smooth validation of new technologies, involvement of end users.

- **Internet of the future: preserving EU values while harnessing digital progress**

The discussions confirmed the importance for Europe to take the lead in the evolution of the Internet as proposed for Horizon Europe, since it is increasingly a cornerstoneof our society and economy.

More detailed general feedback: Smart Networks and Services Partnership

In order to reach the objectives of the Next Generation Internet initiative, and in order particularly to provide the platform on which an open and human-centric internet can thrive, a new partnership is essential for Europe to ensure our strategic capability and freedom of choice. The new Smart Networks and Services partnership should focus on topics that have a strong impact on the future economic and societal development of Europe. It will be critical for addressing key political and societal challenges and enabling digital transformation. It will also be a strategic element for ensuring sufficient digital sovereignty and autonomy in the global context. Such a partnership must bring together industry, government, academia and other key stakeholders across 5G/connectivity, Cloud and Internet of Things and it must establish clear links with lead application areas.

The partnership should cover both longer term enabling research such as 6G, intelligent devices and edge computing, as well as applied research and innovation to accelerate validation and deployment of new service infrastructures required, for example real-time services and critical applications such as autonomous driving and smart cities. The partnership should also help to mobilise investments to ensure that such infrastructures and services will notably become available for all citizens and regions of Europe to prevent further digital divide.

More detailed feedback on the targeted impacts: Wider perspectives for Next Generation of Identification Addressing societal challenges will help public organizations to function as launching customers and catalysts. This will also ensure that public interest and trust, which are required for data sharing in many domains, are incorporated from the start.

It is also important to have a choice of technologies which meet privacy, control and ethical principles and to ensure the competences to implement them. There is also a need for an appropriate regulatory framework, examples are GDPR and eID, that balances a purely commercial vision.

Working outside of the partnership, and in light of previous research efforts addressing the Internet and Internet technologies, it is also vital to encourage bottom-up initiatives that encapsulate the human-centric vision of NGI.

It is crucial to facilitate timely experimentation and scaling across Europe driven by lead applications, e.g. building on regional Digital Innovation Hubs and testing and deployment facilities across supply and demand. A common vision and strategy across Europe as well as national and regional levels should bring together all relevant investment instruments from industry (including creative), national initiatives and Regional Smart Specialization policies.

More details on the new elements

There is a need to: ensure that we have the necessary infrastructure (involving public money, not just a commercial issue); accelerate speed of adaptation and scalability of markets and user acceptance, partnerships (5G requires big investments); enable research for future technologies; bring the main vertical applications and users on-board in addition to the supply side offers; create ecosystems and value chains around societal challenges, support initiatives such as STARTS, complemented by appropriate regulatory frameworks; help large scale pilots building on efforts at EU, national and regional levels in order to bridge

research and scalable deployment, including commercial transition and business models.

- **Me and My Society – Integrating Social Sciences and Humanities**

  A relatively significant number of participants have pointed out to the necessity of including SSH even more prominently in the missions and to some extent also in the future partnerships, as there is yet no SSH centred mission as such (e.g. on socio-economic inequalities). They see this improvement as a pre-requisite for a comprehensive and multi and/or inter-disciplinary approach.

  The main new elements are as follows regarding social sciences and humanities (SSH integration):

  - A call to foster more the presence of the arts in the programme under the AHSS motto (Arts, Humanities and Social Sciences) advocated by the SHAPE-ID Project;

  - Interest in exploring and spreading good practices of social sciences and humanities (SSH) integration, based on successful ventures and examples from the Member States research and science programmes, as well as individual H2020 projects;

  - Stress on the key notion of future development of more far-reaching interdisciplinary, combining Science, Technology, Engineering and Mathematics (STEM) and social sciences and humanities (SSH) research fields, particularly learning lessons from the past (e.g. historical and geographical conditions), in order to address emerging societal challenges of the future and ensuring a more cohesive society;

  - Emphasis on more human centric and less technology centric focus in Horizon Europe, e.g. in relation to cluster 1 and a patient centric approach to health Research and Innovation;

  - Relevance and importance of social innovation which is closely related to social sciences and humanities (SSH), especially in terms of socio-economic novel solutions for integration and inclusion;

  - Addressing societal challenges, e.g. such as climate adaptation needs, will require a more intense the use of behavioural sciences (i.e. sociology, psychology).

  A number of participants clearly stressed the need to gradually move away from a monitoring of SSH integration into the current programme to a more meaningful and societal impact based approach in the future for Horizon Europe in order to assess the imprint of SSH.

  In general, terms a large number of relevant respondents call for an enhanced role of social sciences and humanities (SSH) in Horizon Europe in comparison to Horizon 2020. They would like to make the presence of social sciences and humanities (SSH) related elements more visible and more systematic, e.g. in all work programmes and all calls for proposals under Horizon Europe. They also a mention of the need for the strengthening of the existing SSH stakeholder communities through structured networking and capacity building activities. Finally, a significant number of participants advocate a novel and broader approach to interdisciplinarity in order to modernise the research agenda and make Horizon Europe a more innovative and creative programme in this respect.

- **Sustainable built environment**

In view of the next version of the Orientations, participants hinted at different possible improvements such as promoting links within common topics belonging to holistic research and innovation orientation areas (e.g. cities and built environment) should be better described. This is crucial for maximizing impact and avoiding duplications.

- It was pointed out that by definition "Built environment" goes beyond buildings as it comprises all human-made space and not only buildings (e.g. parks, infrastructures, buildings, etc) therefore the partnership should reflect this definition;

- Built environment features strongly in the New Green Deal, with strong focus on Circular Economy, resource flows, decarbonisation;

- There was a long discussion on how to grasp citizen needs, and a recommendation to not only look at them but to integrate citizen's parameters and social innovation means at all steps of the partnership;

- Digitalisation has helped to rationalise the use of materials in construction and to reduce tapping into real resources;

-The EU should encourage new business models, their scale up, development and deployment, and maintain the European know how in the EU market. Strategic Public procurement can also support innovative solutions;

- There is a call to the EU to take action, put stakeholders together, engage the cities and regions, and avoid increasing social gap including all citizens and looking at everyone's needs.

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- There is a call to the EU to take action, put stakeholders together, engage the cities and regions, and avoid increasing social gap including all citizens and looking at everyone's needs.

- **Materials enabling carbon neutrality**

The main lines of the document are confirmed.

The challenge is systemic and need a systemic solution. This includes the integration with industrial value chains and investment. The scale of the problem is at the moment not visible (we need to store 3 Billions tons of CO2 per year just to meet zero emission target). A lot of research on materials is essential to speed up and bring technology to the market. Renewable energy as commodity to store electricity and chemically. We need to move from local to global production and consumption as there is not enough landspace in Europe to meet our energy needs. At the moment we import 80% of our energy and it is not realistic that this can be completely changed. There is a major element as concerns costing in the technology transformation.

Policy makers and public to make aware of the options of synfuels and Carbon Capture and Utilization (CCU). Cluster needed to cross-link scientists and engineers in order to facilitate and accelerate the scaling up. Integration of society to enable accepting new technologies and solutions. We need to look at the cost of not substitute fossil fuels, which is estimated at 400 Eur/ton. Integrate nano to macroscale in the technology. This needs conceptually new catalyst systems (electrocatalysis and photocatalysis) implemented on a large industrial scale.

Costing of Carbon Capture and Storage (CCS), capture and CO2 storage are key to efficiently reach carbon neutrality. Various technologies will be used, including battery technologies. Integrating materials modelling and high resolution characterisation is considered key. Game changers are considered to be materials modelling at the atomic scale as well as the linking with 3D printing.

Need for 55 M tons/year of low carbon hydrogen is needed of which at the moment 63% is used for ammonia.

Materials science is a natural disruptor and is fundamental for any new technology solution.

In order for the Circular economy to work it is necessary to limit the number of new materials to make the recycling efficient (very important for plastics of all types). Often the amount of recycled materials is not sufficient to make it economically viable especially in sufficiently high quality.

- **Together we are cleaner: Industry for a zero waste economy**

The main lines of the Orientations have been confirmed:

- Industrial symbiosis and the establishments of hubs for circularity (zero waste, zero emissions clusters/regions/municipalities) which are mentioned in the strategic planning have been confirmed as major objectives for HE. Industrial symbiosis has been widely recognised as an enabler for circular economy, with the potential to lower emissions significantly and enable a more efficient use of resources.

- Partnerships are seen as an efficient instrument to enhance Industrial Symbiosis.

- Symbiosis readiness level (SRL) can be a useful indicator in understanding the maturity of processes and technologies when applied in cross-sectorial settings.

- Human factors and human machine interactions will remain critical even in a digital era (AI, cognitive plants, big data, etc.). So the use of these novel, complex technologies to facilitate decision making and complex process controls should be accompanied by appropriate training, education and development actions so that workers will use these technologies.

In addition to the discussion on the relevant targeted impacts of the Orientations,participants raised as well those points:

- A specific number of hub for circularity should be targeted by 2030, to provide proof of concept that zero emission zero waste is achievable and replicable.

- Pilot facilities and relevant infrastructures are crucial, first of a kind demonstrators remain a major milestone in leading to deployment (investors have to see that something works before they invest money). Large first of a kind demonstrators should be targeted.

- In Industrial Symbiosis, business drivers are a barrier. When translating the Industrial Symbiosis example from one country to another, it is usually not possible because the business drivers and the regulation is not the same in one country to another.

- Industrial Symbiosis needs facilitation since the 80% of opportunities are coming from outside a specific industry sector.

- Industrial Symbiosis should be included in Education, part of the training for engineers and business development managers. Industrial Symbiosis should be included in the university curricula.

- Augmented reality can be a powerful support to present data in an ergonomic way, as well as to elaborate information to maximise the profitability of the data.

- Cognitive plants can learn from data and adapt. Hubs can process and elaborate data but the final decision is human.

- **Changing societies: tackling the socio-economic transformations in Europe**

In addition to the appreciation shown to the relevant targeted impacts of the Orientations, participants raised as well those points:

A stronger role for studies on institutions, behaviour and attitudes, social integration, polarisation, and skills needs for the economy - including soft skills. Attention should also be paid on the multidimensional impacts of technological change (e.g. lack of information about the application of new technologies, the use of cloud services, digital literacy and how data are used).

- A lot of emphasis was put on issues pertaining to the "beyond GDP" agenda. Including improving our statistics and addressing gaps that might exist between current statistics and activities of social and economic actors;

- Attention to inequalities, in all possible forms (beyond income);

- Skills are one of the most important tools to keep up with the changes in our societies. Education and training should continue along the lifespan of a person. Skills forecasting and skills provision mechanism should be updated. We need to better understanding the wage premium set by digital skills and its impact on labour markets;

- Well-being was highlighted in several interventions, and a link with health was present in some remarks;

- A lot of emphasis was given to institutions, and interactions between different actors (social partners, work councils, but also connections between regional-national-European bodies);

- Issues of privacy were raised as regards the use of data by private companies;

- Experts proposed examining the consequences of the dominance that certain digital companies exercise over markets.

- Consider what skills are needed over lifetime;

- More SSH should be present horizontally across all clusters and pillars, although SSH should not be financed as a goal per se, but should rather be tilted towards more impact;

- More forecasts, especially linked to labour market needs and migration;
- Emphasis should be put on ethics with respect to the use of AI and data;

- **Smart electric mobility**

  Key messages

  - EU very successful in e-mobility, with all manufacturers having ambitious plans for present and future (as also seen in IAA in Frankfurt), also thanks to EU and MS support and funding. Introduction in the market still limited.

  - research and innovation can provide strong support improving vehicle and infrastructure systemic approach and fast deployment. 3 levels of activities: fundamental research, integration into vehicle, and wide dissemination including deployment of physical and digital infrastructure.

  - Grid integration is not an issue due to the limited share of energy needed: e-mobility is an opportunity if managed with system approach and smart grids. Recharging system configuration has to be optimised based on demographics, users needs and capacity to find correct balance by area/MS.

  - Access barriers to consumer/user to be tackled by Research and Innovation to improve acceptance on 3 levels: infrastructures, vehicle performance and cost, data access and privacy. "Charging shall become as easy as recharging your mobile phone"

  - EU is very successful in e-mobility, with all manufacturers having ambitious plans for present and future, but introduction in the market is still limited.
  - Research and Innovation can provide strong support for improving a systemic approach and fast deployment of vehicles and infrastructure. Three levels of activities: Fundamental research; Integration into vehicle; wide dissemination including deployment of physical and digital infrastructure.

  - Grid integration is not an issue due to the limited percentage of energy needed: e-mobility is an opportunity if managed with system approach and smart grids. Recharging system configuration has to be optimised based on demographics, user's needs and capacity to find correct balance by area/Member State.

  - Access barriers to consumer/user must be tackled by Research and Innovation to improve acceptance on 3 levels: Infrastructures; Vehicle performance and cost; Data access and privacy.

- **Staying healthy in a fast-moving world**

  In general there is good agreement with the impacts set out in the orientation paper and not many gaps have been identified.

  Some points for further reflection include the following:

  More should be done for the health and wellbeing of children and youth, creating solid foundations for their healthy lives.

  The elderly should not only be seen as a burden but as an asset and a resource, building on their positive experiences and best practices for staying healthy.

  Turning evidence into action requires behavioural changes and science-policy dialogues.

The following gaps have been identified in view of the preparation of the next version of the Orientations:

The need to discriminate between "natural" and "built" environments and to study their respective impacts on health (this includes also the working environment at large and the study of the possibilities of Nature for health).

The uptake of medicinal products throughout life and their leakage in the environment.

Recognizing that light, noise, and screens are sources of pollution.

The concept of "work ability" as a (new) clinical indicator measuring the capability of a person to

The need to overcome the stereotypes about older workers, such as lack of access to proper training and the dimension of burden on societies and negative effects on health expenditures.

There is a high demand on policy for societal challenges and co-creation ("joint thinking" as it was mentioned in the session) is important. Responses to societal challenges need to be multi-sectorial. Research and Innovation are key to provide the needed evidence basis to address societal challenges and while there is wide consensus for a life-course approach to tackle the challenge of Staying Healthy, risk assessment emerge as an important element, together with the need to maintain the gender specific and holistic dimension. Environmental effects on humans are different according to gender and so are the effects of chemicals: considering gender when studying the health effects of the environment and of pollutants is hence also important.

Several policy fields conducive to synergies have been identified such as:

- healthy lives and healthy environments
- healthy lives and healthy foods
- healthy lives and early health prevention and education
- healthy lives and healthy work places and work patterns

The concept of "work ability" as a (new) is considered as important and needing further research attention.

Economic growth and wellbeing are interdependent and so are the wellbeing of people and a safe environment. The health status and the health risks of the population can be influenced by their socio-economic position and health risks: this is why an "Economy of Wellbeing" should be promoted and a reflection started on how investments today can generate future wellbeing.

Technology is very important for health and the environment. Health Apps are very helpful, but we should be able to use these data in a larger context, especially for designing policies that impact on peoples' health, for example: using Artificial Intelligence.

The environment where we live and work should have a more central role in research strategies, especially in relation to chronic diseases (musculoskeletal disorders are the first reason why workers are absent from work; psychological risks, depression, and stress represent the second reason).

The more we age, the more medicines we take, and the more pollutants we leak in the environment.

Light, noise, screens pollutions. It is not healthy not to have proper darkness and not seeing the stars in the cities.

- **Connected Automated mobility**

There was broad support for the research and innovation challenges as outlined in the orientation document.

There was general consensus that the potential benefits of connected and automated mobility to society are immense and automated vehicle technologies are likely to help solve problems but could also create new ones, such as cyber-security threats, overreliance on, and misuse of technology, which could hinder the public acceptance and deployment of these technologies. Acceptance of these vehicles will depend on resolving challenges (including safety and security) and managing public perception and expectations.

The following main Research and Innovation challenges were mentioned:

- Social acceptance and trust in automated vehicles technology and in CCAM in general
- User Centred, all Inclusive Mobility by design
- Validation of the safe functioning of connected and automated vehicles
- Interaction between the automated vehicles and physical and digital infrastructure
- Smooth and safe coexistence of automated vehicles with all other road users
- Evolution from standalone vehicles towards cooperative connected and automated transport systems (and services)
- Smooth integration of Next Generation Networks and Connectivity, IoT, Data access and analytics, Cloud and Edge computing, Cybersecurity

The speakers and stakeholders in the room have expressed their support for a European partnership on Safe and Automated Mobility. It was stated, that the partnership is essential to give a long-term framework for the strategic planning of Research and Innovation and large-scale testing activities in Europe, making sure that investments at local, regional and national level, both of public and private nature, are complementing each other more effectively.

- Main Research and Innovation challenges:
    - Social acceptance and trust in automated vehicles technology and in CCAM in general;
    - User Centred, all Inclusive Mobility by design;
    - Validation of the safe functioning of connected and automated vehicles;
    - Interaction between the automated vehicles and physical and digital infrastructure;
    - Smooth and safe coexistence of automated vehicles with all other road users;
    - Evolution from standalone vehicles towards cooperative connected and automated transport systems (and services);
    - Integration of new Networks and Connectivity, Internet of Things, Data access and analytics, Cloud and Edge tech, Cybersecurity.
- Support for a European Partnership on Safe and Automated Mobility to give a long-term framework for the strategic planning of Research and Innovation and large-scale testing activities in Europe.

4.2.2. Co-design sessions scheduled on 25 September

- **Horizon Europe Mission on Cancer**

The cancer co-design session was well attended with around 125 participants from different backgrounds. After introductory words by Irene Norstedt, acting director Research and Innovation, and the vice-chair of the cancer mission board, Christine Chomienne, the participants split in 6 groups around three themes: aetiology and prevention; improved cancer therapies, and survivorship.

A lively discussion took place in the different groups, moderated by the 6 other member of the mission board present. The members of the mission board reported shortly on the results of the discussion in their respective group, and key messages were summarised for a sli.do vote open to all. The following appeared as top priorities for action for the three themes:

- Aetiology and prevention: screening and early detection

- Improved cancer therapies: integration of research and treatment effort across Europe

- Survivorship: quality of life; side effects; avoid label of patients and stigma

The session was closed with an open question on what other main issues needed to be taken into account. A total of 49 proposals were received via sli.do, that will be evaluated carefully by the Commission together with the results of the vote.

In summary, a successful session taking place in an open and collaborative spirit, in which a maximum of input from participants was collected in a limited timeframe.

- **Climate Science**

- 'We need to understand fundamental science better'. There are massive 'known unknowns' in climate science: potentially big risks that we still do not know about.
- There is no choice anymore between mitigation and adaptation.
- How to scale up the technology and practical arrangements for negative emissions?
- Systems transition is the solution, but theoretical advice and solutions need to become real over the next 5-10 years.
- Smarter action needs better information - more relevant, more local, and ready-to-use in the short term.

We need to understand fundamental science better

- There are massive "known unknowns" in climate science: potentially big risks that we still do not know about. We already know we need to drastically reduce CO2 but...

o how will Earth system feedbacks play out? What are the irreversible impacts (e.g. ice sheet loss and sea level rise)? How much of these changes have we committed to already (e.g. permafrost thaw releasing even more greenhouse gases?

o how quickly will GHG emissions translate into temperature change? Could we reach +2°C by 2070? Or already by 2040?

There is no choice anymore between mitigation and adaptation: transformation is needed across industry, governance and our way of life

- We need to reduce emissions dramatically and adapt to climate change. There is no choice between the two.
- We know we need negative emissions starting yesterday: but how to scale up the technology (enhancing natural sinks in a changing climate, developing carbon capture technologies) and practical arrangements for how they might be deployed in real life (incentive systems)?

We need to cope better, already now, with our changing global and local climates

- We have to get prepared for a more variable climate at the local level. Already in Europe regions can face drought one year, yet it can be too wet for farmers to harvest the next. This variability is increasing.
- Systems transition is the solution, but how to do it? Theoretical advice and solutions need to become real over the next 5-10 years. New decarbonised models for each industry need to be demonstrated and scaled up. New business models need to be developed across agriculture, forestry and renovation.
- We need institutional and social innovation, to deploy both new technologies and those we already have, and to turn science-based advice into practical action.

Smarter action needs better information. So continued investment in monitoring and user-relevant climate services is needed

- We have a lot of knowledge from observations, but this needs to get better as conditions on the ground are changing more rapidly.
- Better knowledge means it should be more relevant, more local, and ready-to-use in the short term.
    - how should I renovate my house over the next 5-years?
    - or climate proof my business?
    - how do we design the arrangements to deliver negative emissions at a granular level? (not just an offset market)

- **Innovative, smart, vibrant and circular rural areas**

The discussion broadly confirmed the orientation document that proposes to:

- Improve the understanding of behavioural, socio-economic and demographic change as drivers of sustainability and catalysts for a balanced development of vibrant rural […] areas (tracking mechanisms, engagement on natural capital/Biodiversity);
- contribute to developing new value chains and to a balanced development of rural areas, based on implementation of effective, evidence-based policies;
- by better linking rural, peri-urban and urban resource flows to gain value from residues and by-products, unlock the potential of the circular economy, and hence create attractive jobs in rural communities, in particular by promoting small-scale, bio-based solutions (in cooperation with IA6) and innovations in farming at the interface between various rural sectors;
- provide solutions for rural communities to mitigate and adapt to changing climatic conditions, in particular by introducing innovations in the areas of renewable energy, mobility and natural disaster prevention ;

- feed into strategies and policies to close the divide between rural and urban areas and benefit vulnerable groups, rural dwellers (in line with Cork 2.0 Declaration) and generational renewal in farming and rural communities;

- develop digital services and skills to enhance connectivity of often remote rural areas and support smart rural communities and businesses (in cooperation with Smart Villages and POSEI, and Cluster 4);

- Develop a better understanding of social networks, social capital and social innovation processes and allow for innovations in rural communities which valorise local and regional assets as well as improve well-being of people living in rural areas (in synergy with the LEADER programme);

- To develop governance models for sustainability, through the delivery of the necessary data and knowledge base for improving monitoring and evaluation of EU policies addressing rural areas in the period 2021-2027 and beyond (foresights, tools, assessment of lock-ins and transition pathways);

- Build on Agricultural knowledge and innovation systems (AKIS) as well as social innovation as key drivers to speed up the take-up of Research and Innovation results, including promoting place-based innovations and reinforcing the multi-actor approach;

- Consider Information and Communication Technologies (ICT) as an enabler, allowing to build an open digital environment and supporting bottom-up innovation in agriculture, forestry, related value chains and rural areas, in line with the recent declaration of EU Member States on "Smart and sustainable digital future for European agriculture and rural areas";

During the session, the orientations were summarized as follows: the key orientations are to explore how rural communities can take their part in the sustainability and climate transition agenda. We intend to do that in three ways:

- top down: launch research activities that will

o i) improve understanding of drivers, processes and issues on which there are still knowledge gaps, with a strong focus on issues at the interface of environmental and social;

o ii) develop the technologies that we still miss to respond to some of the challenges in a specific rural context;

- bottom-up: launch innovation activities that will empower rural communities to co-create themselves solutions to their own problems, to implement the Sustainable Development Goals (SDGs) in their local contexts, thanks to open rural innovation ecosystems. There will be a strong focus on social innovation.

In view of the preparation of the next version of the Orientations, the several elements were deemed relevant:

- Need to pay attention to the risks of perverse effects (or Jevons effect) that could come from exploiting waste or losses that could still be reduced (bioeconomy, food waste), leading to increased resource use instead of decrease. He pleaded that only unavoidable waste should serve as a basis for bio-based processes;

- Need to work on rural innovation ecosystems: see how the AKIS concept could be enlarged to embrace rural development issues + build on synergies between funds;

- People need to be at the centre of technological development processes, the benefits and added value of which must remain with rural communities, thanks to effective business models;

- Research and innovation must engage with existing community-led initiatives to have an impact on the ground;

The session highlighted the following aspects of importance for rural research and innovation:

- People need to be at the centre of the digital transformation process. Technologies are a mean to an end, not an end in themselves. They need to be developed with and for people. More research is needed on how to engage people in this digital transformation;
- Research should help adapting digital technologies to rural areas. This could contribute to developing business models that add value for rural communities and avoid benefits of new technologies being captured by urban centres. Rural communities could be used as hubs to welcome start-ups but provided local communities and decision-makers are trained and involved;
- Need to explore the boundaries of rural change in the future in relation with megatrends (work of the Organisation of Economical Cooperation and Development-OECD). Research can add a lot on how the different technologies could be applied an add value locally;
- There are gaps in how rural innovation is supported. Need to look at how innovation ecosystems for rural communities could look like and if there is space for agricultural and rural knowledge and innovation systems in the future;
- Need to think globally, not locally. Food production cannot be "only" local as it was in XIXth century. The issue with farming is to produce food more efficiently with a lower impact, and for that we should consider where on the planet the products can be produced more efficiently;
- The circular economy closely connects sectors altogether;
- Precision farming and digital technologies has a potential to make farming more efficient. However, it has failed to deliver against expectations for the moment;
- Consumer is king. Changing people's mindset is as important as technological development;
- Social innovation is a process of social change driven by collective action;
- The social condition of rural population, despite efforts made by the European Union, remains unsatisfactory. 25% of the rural population is at risk of poverty and social exclusion. 4% have unmet needs for health care - 12% are early school leavers. The most marginalised communities are those where state and market struggle to provide services;
- Agriculture is the foundation of the rural economy and it is struggling in most areas in Europe. It also needs a lot of technological and social innovation to improve its condition. Profitability of farming is a cornerstone of rural development;
- Rural innovation should further enhance social capital. SI arises because of strong leadership and cooperation skills. Providing the communities with capacity to be engaged and address societal challenges;
- Rural innovation should design processes that engage local people within decision-making processes, embedding local understanding in policy design. Empower local people to design measures designed to address their problems;
- Rural innovation outcomes should better understand market obstacles to social innovation as well as supporting and hindering policies. SI best supported by good open policies that enable social innovation to happen;
- Rural innovation activities should make funding opportunities more accessible on the ground and better communicate research results at policy levels;
- Rural and innovation should take seriously the condition of the women, young farmers, vulnerable groups and migrants and offer the same opportunities to rural people as to urban people;

- How to engage citizens in these rural innovation processes? All across Europe, there are already actors and thousands of community-led initiatives (e.g. Ecovillages) that can act as a catalyst for change and hubs or bridges to EU/global initiatives. Research and innovation needs to engage with these actors to have an impact on the ground;
- Community-led initiatives have shown capacity to create local revolutions and their cumulative impact can be very important on food systems, fixing population, creating jobs;
- Initiatives that link up rural and urban (e.g. European capitals of culture) can also help reconnect and build new decision-making processes;
- Digitalisation of vertical farming for vegetables in urban areas will also create pressure on farmers;
- It is important to keep in mind the potential of small-scale initiative to contribute to big projects: do these small scale initiatives really matter? ECOLISE do the research on these iniiatives: beyond the shadow of a doubt, all local initiatives have huge impact. Local cohesion, ssustainable food systems. Fix population, create green jobs. There are existing partners in rural areas who can act as catalysts for change;
- Technical solutions are very important and relevant but we must also think of social innovation, of rebuilding communities, empowering communities, making people feel pride, a sense of place, making young people want to stay and revitalise their rural areas;
- There is a need to work on the links between Horizon EU and other EU programmes, especially considering the horizontal character of rural development. Social innovation should also be better linked to social funds. Good experience from European Innovation Partnership-AGRI linking Horizon 2020 and the CAP needs to be extended;
- Measuring impact is a key question. Social Innovation in Marginalised Rural has developed an evaluation framework on the impacts of Social innovation on economy, society and governance;

Targeted impacts should be reviewed in order to enhance:

- The importance of social innovation;
- The need to minimise resource use and not only to increase efficiency;
- The importance of rural people, beyond producers and consumers and the need to engage them and foster social capital;
- The fact technology should be developed with and for rural communities;
- The importance of community-led innovations;

More details on the new elements (including comments on possible additional impacts to target, on any additional cross cutting dimension calling for more emphasis).

- **Security research: Ensuring security and privacy in a digitising world**

The panellists represented key stakeholder groups: research, industry and policy-makers, and therefore the discussed subjects were approached from multiple angles.

The main messages of views exchanges were in line with the Orientation paper. There was a common agreement of the future orientations for Cluster 3 on approaches basing on security by design / privacy by design, taking into account new and emerging technologies like Artificial Intelligence and Quantum Technologies such as key distribution.

More emphasis to put on EU based standards and certification, as well as involvement of EU citizens in ensuring security while preserving privacy, for a transparent, open and secure society.

The lively interventions circled around balancing different values and objectives in the design and implementation process, e.g. building strong secure environments versus openness of the society and transparency. It is clear that security needs to support an open society. Building more resilient digital solutions should not be an excuse to neglect users' education, as reinforcing the EU citizens' involvement in the process and winning their support for the digital agenda is of utmost importance.

With Quantum technologies as the starting point, a debate on European leadership took place. Recognising that that both Quantum and AI are at the same time a threat and a chance for the current status quo, responsible planning and investments for future must happen now. Interventions called for stronger protection of existing EU Critical Infrastructure, development of new infrastructure in Europe for research and testing and continued funding of high risk/high gain projects like the ERC does today. The most notable difference among EU competitors marked on this occasion were funding sources for R and D private (business) in US and state-controlled in China. One of the possible ways to improve the EU's standing in this race was support for independent and agile start-ups willing to take the risk of introducing new products into the market.

The above remark was in line with another conclusion of the panel that we cannot expect all researchers to be good entrepreneurs as they are driven by different factors and thus another mechanism of collaboration is necessary here. On the margin of this discussion, there were also voices encouraging further administrational simplifications in Framework Programmes. Over detailed topics/requirements/preconditions in the calls may force the consortia to spend their time and creativity on building 'cover stories' while it should be spent on finding excellent and innovative solutions.

In the later discussion, some opinions indicated that standardising and certification issues at the union level, is exactly where Europe is missing ground and needs urgently standards for equipment and products. Today EU customers are often facing in fact US standards.

- **Horizon Europe Mission on Climate Adaptation**

The session was very lively, with stimulating exchanges and explorations of the topic of adaptation to climate change and societal transformation. Brief presentations of the policy and scientific context within which the mission would operate set the scene, leaving the audience fully free to explore any particular dimension of adaptation in a truly open and participatory co-creation space. The audience was divided into 13 discussion groups, each moderated by a Mission Board member or by EC officials, and discussions were guided by two questions: what should the Mission objectives be and how do we measure success?

Despite a considerable degree of heterogeneity, the many original ideas and brainstorming feedback from the group discussions had some converging messages:

- A strong need for more and better data, and in general a better understanding of the adaptation needs, including local knowledge (and local testing)

- The powerful role that research and innovation play in developing solutions to the challenges of adaption (both of the technological and nature-based type)

- The importance of broad engagement with citizens and stakeholders, and the use of governance and behavioural change as leverage points for success

- Establish the basis for an improvement of our behaviour based on more/better information; develop a carbon-neutral lifestyle and set an example to other global partners

- Facilitate the transformation of our economy/ industry to adapt to climate change; one example is the need to enhancing coastal protection to prepare for sea-level rise

- Solutions should preferably be nature-based, without intending to be prescriptive

- New technologies needed (but also greener cities) and new data – one key sector in need of preparation is health, in particular concerning vulnerable groups

- Work with test-cities to enable them to adapt to climate change; solutions range from early warning systems to, embedding/building a prevention culture

- Important role for high tech, but also smart policies (including on education) and digital solutions; infrastructure will be our main ally to ensure resilience

- Behaviour change must start from shifting the perception of adaptation as a "sacrifice" and into an "opportunity" for better health, better lives, better future

- Both land and sea to be addressed within the mission.

Among the specific topics raised in the discussion groups were: citizen engagement, with a focus on youth involvement; education; health ; linkages/co-benefits with climate change mitigation and other environmental objectives; local and regional aspects; resilient infrastructure; digital solutions; local knowledge; and testing solutions in cities/regions.

- **Horizon Europe Mission on Soil, Health and Food**

The session was a participatory event bringing together members of the mission board Soil Health and Food, the European Commission and a wide range of stakeholders.

It was opened by Commissioner Hogan (Agriculture and Rural Development) who stressed the manifold, vital functions of soils and the importance of soils for humankind. He highlighted the particular role of farmers and foresters in carbon sequestration and in ensuring that soils are healthy. Referring to the members of the mission board, he recalled that implementation of the mission Soil Health and Food would be a joint endeavour between various stakeholders and with strong societal engagement.

Discussions took place around 10 groups structure around the following (wider) five soil functions: productivity (food/non-food), climate regulation, biodiversity, water regulation and nutrient cycling. Discussions took well into account the fact that the various soil functions are tightly connected.

The ten discussion groups identified (1) the main challenges in relation to the specific soil function and (2) the main impacts that were expected from a successful mission in the area of soil health and food. At the end of the session, each group came up with up to three challenges and up to three expected impacts.

<u>Question 1: what are the most important challenges and related research priorities in relation to soil health and the five soil functions?</u>

- ✓ Definition of healthy soils (macro category)
- ✓ Quantity and quality of data, knowledge, mapping tools regarding soil health and soil quality (including soil biodiversity indicators);
- ✓ Need for enhanced capacities for monitoring, benchmarking and reporting;
- ✓ "Soil literacy" to be embedded in society;
- ✓ Understanding motivation for change of practices; role of policy instruments as driver for incentives;
- ✓ Increase knowledge on ecosystems services provided by soils (soil organic carbon, soil structure, economic value) amongst others for policy makers
- ✓ Effective guidance for farmers; test demonstration and living labs;
- ✓ Access to information for farmers regarding soil management options (technological options, economic issues)
- ✓ Competing interests of different sectors with regard to the use of soils
- ✓ Soil degradation (e.g. sealing, compaction, erosion, run-off)
- ✓ Low organic matter in soils; nutrient balance and nutrient cycling
- ✓ Soil compaction (hampers rooting depth)
- ✓ Role of soil biodiversity for soil regeneration and soil functions
- ✓ Better understand the relationship between microbiome, plants, land use
- ✓ Emphasis on nutritional quality vs quantity of food
- ✓ Food value chain: enhance producer- consumer relationships
- ✓ (Soil) water management (e.g. leaching) and extremes;
- ✓ Need for a water catchment scale (collective) approach;
- ✓ Better management of soils for water quality and quantity (agricultural and urban water policies)
- ✓ Pollution of soils through human activities, reduce harmful substances
- ✓ Increase circularity of resource flows; adopt a systemic approach to nutrient use and management

Question 2: what would success (impact) of a specific mission look like?

- ✓ A clear framework, objectives and incentives (e.g. policies) are in place to undertake wide action on soil health and food;
- ✓ Effective communication is established, allowing for co-creation and knowledge exchange;
- ✓ Land managers are well informed to act in a tailored way;
- ✓ Solutions identified and developed through the mission have led to change of practices and a change in mind-set at the level of farmers, foresters, consumers and all members of the value chain.
- ✓ Farmers are part of the solution to ensure sustainable soil management
- ✓ Farmers are using more diverse rotations and soil cover in time and space
- ✓ Healthy soils have resulted in increased productivity in a balanced ecosystem
- ✓ Increased food and nutrition security (in close cooperation with other missions)
- ✓ Healthy, affordable diet by 2030 (20% more people can be fed by xx)

- ✓ Soils contribute to achieving climate targets:
  - land systems to become net Carbon negative by 2030/2035
  - net zero emissions from peatlands
- ✓ Technologies and tools are available to support climate smart agriculture; a new generation of agricultural machinery is available (lighter, greener, smarter)
- ✓ Increased resilience through healthy soils: reverse disaster situations into opportunities
- ✓ Nutrient use efficiency of production systems has doubled
- ✓ Practices identified allow to diversify production and increase productivity
- ✓ Local communities are engaged in (re-)using nutrients in a cascading logic
- ✓ Clean water to swim in and to drink

- **Think gender, think different**

  Speakers and participants in the "Think Gender, Think Different" session and inputs received in the Horizon Village strongly called for a strengthening of gender as cross-cutting priority throughout Horizon Europe, with more explicit references to be included in the Orientations document which is felt to not have properly integrated the gender dimension.

  Concrete examples of relevant integration of the gender dimension in Research and Innovation content in areas covered by Pillar II Clusters were given by speakers and participants, and it was strongly requested that all Missions, due to their very nature, also explicitly integrate the gender dimension in their content, and that a cross-Mission Boards group on gender be created (and possibly a Mission on SDG5-Gender Equality, or on inequalities more broadly) to ensure that women and men citizens in Europe get the solutions that they need and want. The need to consider the gender dimension in Partnerships as well was underlined.

  The intersectional approach (between gender and other social categories, such as disability, sexual orientation or ethnicity) put forward in the Orientations paper under "Social and Economic Transformations" in Cluster 2 was strongly supported, with several participants calling for this inclusive gender integration to be developed across all Clusters.

  Speakers and participants underlined that the EU a responsibility in particular for sticking up for gender studies, supporting their development in universities, as a matter of fighting inequalities and defending academic freedom.

  Participants insisted on the need to really strengthen the implementation level, with respect to Horizon 2020, e.g: real trainings on gender for applicants and evaluators, mandatory inclusion in projects unless duly justified, explicit evaluation criteria (with proposals not passing the threshold if gender not addressed), stronger monitoring with set targets (such as dedicated tasks/deliverables/work package, or else a target – as for climate – on the distribution of resources to the integration of the gender dimension in projects), but also developing gender blind evaluations, providing guidance and support for involving gender scholars in STEM-oriented projects.

  The continued need to address gender stereotypes through cultural/educational projects was put forward, as well as the need to offer support for novel actions

bridging between schools, universities, companies and NGOs to promote women in STEM and as innovators, and encourage investors to place their money in women innovators' businesses.

Participants insisted that the EC had been a beacon at world level on the promotion of gender in Research and Innovation and must continue to lead the way within Horizon Europe and in a revitalised European Research Area (ERA), especially under a new Commission President-Elect putting an increased focus on promoting a Union of Equality. Strengthening the support to gender equality in the Research and Innovation system under the Horizon Europe "Widening Participation and Strengthening the ERA" Part, was also put forward, the EC having acting as a catalyser for action in many EU Member States, especially from the widening countries, where further action is very much needed.

- **Tackling non-communicable diseases**

The main lines of the Orientation Document have been indirectly confirmed, as the discussion didn't reveal any objection regarding the document.

In view of the the next version of the Orientations, the following elements should be considered:

Patients and Carers Involvement

We need to involve more patients and carers in the co-creation of research design and implementation, and it would be more efficient to build on their expertise.

Health Inequalities

On health inequalities we have to improve existing methodologies for health impact assessment (HIA), and develop new methodologies for health equity impact assessment (HeIA). This requires that research applicants highlight how their research might contribute to mitigate the health gradient.

Role of Law and need of evidence

We have to reposition the role of law on addressing risks factors (taxation, product labelling, regulating marketing) and in relation to the social determinants of health (living conditions, employment status, income, education...). We need to engage law on implementation, and international Human Rights law is especially useful to address health inequalities. More evidence may be provided through research on risk factors.

All in all, the feedback received was on outstanding Research and Innovation policy related issues, taking into consideration preferences shown by participants and new ideas. In that sense, there were no more detailed general feedback provided.

We need to strike the balance between researching into "specific prevention for targeted populations" vs. "life course approaches". This means that research efforts need to focus more on people with lower socio-economic advantages, and people with multi-morbidities. As these people live longer in poor health, they are significant 'users' of the health and care systems. We also need more research into factors that hinder and help implementation, including political and policy factors and also cooperation with WHO (migration, different regions) with particular focus tobacco. This includes universal health coverage; access and affordability of services, user-friendly services and technology; methods to increasing health literacy. The need for research on primary prevention and research that integrates data from other sectors (food and nutrition, microbioma…) have been highlighted.

On patient management, we need research that increases our understanding of integrated service provision (and what helps and hinders this), including 'employment'. From a patient perspective, cure and care need to connect with reintegration, back to work programs, access issues, etc.

Protecting mental health should be supported through research in various sectors not only technological. Models of multidisciplinary research should be encouraged, as well as comparing options for treatment in order to increase the healthcare systems sustainability.

Many determinants that lead to health inequalities lie outside the health sector. We need more cross-sector, cross-disciplinary research that increase our understanding of the health impact of other socio-economic factors such as education, work, income, housing. We need to build on other sectors knowledge and experience on how to improve health, what interventions are effective, and how we can implement changes with specific directionality.

- **Key digital technologies and strategic supply chains: EU in a global context**

The session addressed the strategic importance of Key Digital Technologies as well as Advanced Computing, supporting the main lines of the 'Orientation towards the first strategic plan'. Of particular interest the emphasis on electronics, photonics and software and their key role in supporting the progress of applications and services.

The strong link between digital technologies and the applications they serve was a constant across the various interventions and in the questions from the audience. Also the extended impact of digital beyond economic: social acceptance, energy efficiency, environmental protection, secure and safe functioning, etc. This was illustrated with examples on automotive/mobility and health.

Interventions from speakers and participants addressed the need to exploit synergies across themes. A prominent example is the one on computing heterogeneity supporting specific applications. The case of weather prediction was used to illustrate the use of complementary approaches (high-performance, cloud, edge computing) across themes.

. More detailed feedback on the targeted impacts

Most strategic target was the EU independence on key digital technologies from other world regions.

References were made to impact of digital technologies to economic growth, job creation and a greener planet without mentioning of quantitative targets.

More details on the new elements

As mentioned above, synergies across thematic partnerships and extended impact on social, environmental and economic were addressed in the session.

- **Safe journey!**

- New fuels/energy systems pose new risks. The trend towards deeper decarbonisation and automation requires also more resources for Research and Innovation dedicated to safety (and security), both per transport mode and across modes.
- Address human factors and automation together, not separately. Full automation (level 5) is much more challenging than initially foreseen. Just adding automation will not make it safer and secure.

- A smooth interaction between all users, their vehicles and infrastructure in a safe system approach applies to all transport modes. Safety for users must be considered in the infrastructures as well.

- The traditional long cycle of Research and Innovation (from ideas to entry into service) is not suitable anymore. Acceleration is needed. Regulators need closer involvement on what Research and Innovation is doing, and also on validation.

- More emphasis needed on Safety Risk Management. For Safety Risk Management all stakeholders must be involved. More synergies with security programme, in particular with cyber-security, are needed.

- More cross-modal research needed. Cross-modal priorities are: safety culture, data for safety, and cybersecurity.

- **Horizon Europe Mission on Cities**

Question 1: Inspirational challenges for the Mission on 'Climate-Neutral and Smart-Cities'

- All together in all tables the discussion stayed at very high level of granularity: i.e. quality of life, inclusiveness, better ecosystem. Only one interesting slogan to report: "One car=one tree".

Question 2: Citizens and stakeholders engagement, examples:

- Here as well we detected a number of ideas going beyond the scope of the Mission 'Climate-Neutral and Smart-Cities', but some practical ideas were proposed:

  - Platforms and apps for communication between citizens (already existing);

  - Citizens mobilized through contests/games in one month (as an example) a family reducing more its waste (i.e. "Citizens Carbon Budget": incentive for volunteers willing to reduce their carbon footprint); and

  - Information and data on air pollution available for citizens online and live.

The open session led to the beginning of a brainstorming and 'co-creation' process. Even when most of the ideas, observations and actions have been identified in policy/research reports, the enthusiasm and reactions of the participants were very positive: 'the Commission was really listening'.

- **Tackling Rare diseases**

The main lines of the Orientations document for the Cluster 1 - Health have been confirmed for the rare diseases area, notably in terms of the following impacts:

- Effective health services to tackle diseases and reduce the burden of diseases;
- Improved access to innovative, sustainable and high-quality health care;

Key research and innovation orientations for rare diseases include:

- The use of novel technologies such as artificial intelligence to identify new biomarkers and to optimise diagnosis in rare diseases;
- The development of scientifically robust multicentre and multinational clinical trials;
- Providing solid evidence for regulatory science;

The area of rare diseases has been long recognised as a field where collaboration is a condition sine qua non to progress. The EU rare diseases ecosystem is a reality, as a result of previous fruitful coordination and collaboration between stakeholders at national and international levels.

Which are the new elements and main novelties to be considered for the next version of the document? What needs to be changed?

- Better integrate and exploit the results of excellent basic research in the rare diseases ecosystem

In addition to the discussions on the current version of the Orientations, other elements were discussed: • Enhance data connectivity and accessibility for sharing clinical (including electronic health records) and research data, addressing issues such as standardisation of data, existence of various legislations etc.

- Many more rare disease patients still remain undiagnosed and there is a need for faster and accurate diagnosis, e.g. via implementation of next generation sequencing and other -omics technologies.
- Support the development of new therapies for rare diseases
- Develop better animal models for understanding the disease mechanisms
- Support additional research to inform and review criteria for newborn screening programmes (e.g. socioeconomic analysis, new technologies), so as to reduce inequalities across Europe
- Further strengthen the active involvement of patients in research and innovation
- Ensure long-term sustainability of infrastructures, such as registries and biobanks
- Further support the European Reference Networks (ERNs) and strengthen their research capacities
- Investigate new pricing and financing models for drug development
- Ensure everyone is on board, for instance by strengthening the widening concept

- **Tomorrow's aviation**

Conclusions – Recommendations

1. Decarbonisation of aviation passes through a coherent roadmap of technological, operational and fuel solutions. Different aircraft platforms require different solutions. An impact-driven EU aviation research policy requires a consensus between flexibility and timely delivery of key enabling demonstrators (e.g. MW electric systems, hybrid electric architectures, development and integration to allow new energy carriers).

2. Disruptive aviation technologies require adequate funding for exploration and further development in order to accelerate their maturity at high technology, manufacturing and integration readiness levels (TRL, MRL, IRL respectively). Long-lasting commitment by all stakeholders (industry, RTO, academia, Member States and European Commission) as well as alignment with National programs is deemed necessary.

3. An ecosystem approach is recommended for the next EU research FP, that includes Air-Traffic management (ATM), Maintenance-Repair-Overhaul (MRO) and new certification approaches. Synergies should be exploited. Future needs for airport infrastructures, in particular for new energy options and mix (drop-in fuels, non-drop-in-fuels, electrification) should be in-line with the technological and operational roadmaps.

4. European leadership depends on the development of advanced methods and tools (e.g. simulation, digitalization, AI, safety and certification by design) as well as cost-effective manufacturing technologies that will accelerate and enable a clean aviation paradigm.

- Decarbonisation of aviation passes through a coherent roadmap of technological, operational and fuel solutions. Different aircraft platforms require different solutions.
- An impact-driven EU aviation research policy requires a consensus between flexibility and timely delivery of key enabling demonstrators.
- Disruptive aviation technologies require long-term commitment by all stakeholders and adequate funding for exploration and further development.
- An ecosystem approach is recommended for Horizon Europe, that includes Air-Traffic management (ATM), Maintenance-Repair-Overhaul (MRO) and new certification approaches. Synergies should be exploited. Future needs for airport infrastructures, in particular for new energy options and mix (drop-in fuels, non-drop-in-fuels, electrification) should be in-line with the technological and operational roadmaps.

- **My neighbour the factory**

The main lines of the Orientations documents have been confirmed

In view of the next version of the Orientations:

Occupational health should be considered when referring to new manufacturing techniques, e.g. 3D printing.

Digital Innovation Hubs (DIHs) should not be made from scratch; we want to build on what is already functioning well. MSs should assist the Commission reach out to regions. The orchestration of DIHs is important. For now the term is a bit loose and they seem to be a bit closed for a specific group, should be more open to start-ups

Other relevant elements were discussed as well:

Companies are moving closer to residential areas to be closer to skilled workforce.

People do not want to wait for weeks for their product to be shipped from China, they want to buy products produced by someone they know or directly by themselves.

The introduction of new methods will enable industries to reduce their environmental footprint. For example replacing iron soldering with laser soldering.

Environmental footprint is a key element for the acceptance of manufacturing units by its neighbours.

Poll Question: Which aspect of future distributed manufacturing systems or urban manufacturing is most important to focus on at EU level?

- 32% technologies and their uptake for small-scale personalised production
- 24% new business models
- 24% environmental footprint
- 16% reindustrialisation of regions
- 4% creation of jobs

Occupational health is an important aspect. Automation and human-robot interaction is important; there are safety aspects there as well. Industries have to fulfil safety regulations. We should not kill technologies with too many regulations, but test them in a controlled evironment.

- **The future of shipping starts now!**

Main message of this session: Greening and decarbonisation of shipping (inland and marine) is the big challenge, there are potential solutions, Research and Innovation is needed to make this a reality, wide cooperation is needed. To deploy, sometime more costly solutions, must be reinforced by ambitious regulation and incentives.

Other elements were also discussed, notably:

- Zero emission shipping is possible, first short distance, inland, Europe, later intercontinental.
- Smart and digital technology is important to improve efficiency also safety and other efficiency measures are needed.
- Having the technological capability is an essential precursor to speed up regulation. Lack of regulation should not be an excuse preventing deployment. Can use alternate design rules and dedicated safety cases to deploy innovative ships on the market.
- Need to bring stakeholders together, including from outside of the waterborne sector and including wider operators, ports and infrastructure providers.
- Zero carbon fuels for maritime were widely identified as being essential for long distance shipping and need to be addressed by Research and Innovation; including their production. In this respect Hydrogen and Ammonia as maritime fuels were raised (apparently ammonia as a maritime fuel was also raised in the alternative fuels Technology session). Secretaries note: Potentially the link between energy and transport synthetic shipping fuel production could be reinforced within the strategic planning for Horizon Europe orientation paper.

- Potentially, the link between energy and transport synthetic shipping fuel production could be reinforced within the strategic planning for Horizon Europe orientation paper.

- In line with the orientation paper priorities, strong links towards to EU Green Deal and agenda for the new commission such as ETS for shipping.

- All stakeholders should be brought together in systemic Research and Innovation approach to achieve decarbonisation and clean shipping (cf. carbon neutral Europe and global shipping carbon reduction targets by 2050) thanks to the proposed Zero Emission Waterborne Transport co-programmed partnership in Horizon Europe.

- **Horizon Europe Mission on Oceans**

The twelve Mission Board members then each moderated a discussion among 10-15 stakeholders around the following three questions and a list of the thematics on ideas proposed by the participants in the interactive discussion.

1. What would be a major challenge our oceans, seas, coasts and inland waters are facing that a mission could contribute to solve through R and I or other EU programmes?

<u>Reducing pollution</u>

- plastics and other pollutants
- nutrients from agriculture and other run-off from land and rivers

<u>Supporting the recovery of the oceans, seas, coastal and inland waters</u>

- biodiversity loss, sea level rise, climate change, acidification

<u>Sustainably exploiting the ocean</u>

- extracting food and biomass from the oceans, clean transport and shipping, boosting marine renewable energy, regulating deep-sea mining

<u>Taking a holistic approach</u>

- a source-to-sea approach, link policies (CAP and CFP) and ensure synergies across missions

2. Why are these challenges so far removed from public perception and discourse and how could a mission best engage European citizens in tackling these?

<u>Creating a connection and providing solutions</u>

- society disconnected on ocean issues, "out of sight - out of mind"
- competitions between schools or local communities to come up with solutions as a way to engage
- use proxies or sympathy carriers such as marine mammals or seals can engage the emotions of citizens
- link human behaviour to ocean health, "healthy fish for healthy people"
- the mission should inspire a dream, not a nightmare

<u>Raising awareness</u>

- create "ocean literate" public, target kids

- promote citizen science and ocean observation at local level

1. How should the mission be designed to create a European public good?

Clear, ambitious and achievable targets - impact oriented

- define what is maximally achievable and go for it, create direct actions with tangible and visible results

Relevance to the people

- what comes out of your tap is something that you care because it concerns your health
- relate to the Sustainable Development Goals, not just SDG 14 on Life below Water

Open to all and involving all

- space for bottom-up solutions and the possibility for all to join in, including "ocean champions"

Clear and simple communication, positive wording

- simplified messaging and catchy titles, . "Clean water for all"; "To drink, to eat, to swim in all waters."; "Stop putting plastics in the ocean."

- **Future generations of sustainable batteries**

Europe's objective is to develop a world-class R and I ecosystem on next generation of batteries, with a view towards European industrial leadership underpinned by a sustainable European value chain. R and I Partnership is fundamental in delivering results for advanced and future emerging battery technologies. In fact, Europe is committed to delivering on the Paris Agreement. Electrification is one key technological pathway to decarbonise transport, energy, and industry. In a world that is increasingly electrified, batteries will become a key technological component of a low-carbon economy. From a competitiveness perspective, batteries are becoming a crucial component with high added value, notably in the automotive sector, and large scale battery manufacturing will drive major employment opportunities. A world-class R and I ecosystem that can deliver next generations of sustainable battery technologies for different types of applications and sectors is essential for European industry to come back in this sector. Building on what has already been done (cf. previous framework programmes, SET-Plan, STRIA), the session's round table tackled the following issues: EU strategy on batteries and electrification; R and I on batteries so far and rationale to the future partnership; R and I challenges and priorities on batteries; Circular economy of batteries – how? Industrial Projects focusing on R and I aspects; Role of industry within the co-programmed partnership – what are the specific commitments?

Policy framework

To discuss the 'Consultation Document towards the Strategic Plan', taking account of the results of the public consultation. The discussion has been structured around a few defined questions, with public directly participating and voting. The session gathered views on the design of the future partnership, regarding the scope, linking research to industry, and aligning national and regional priorities and plans to EU research.

Key Messages

- All key points made by speakers were fully in line with the cluster 5 proposals for the new partnership on batteries; value chain approach (cradle to cradle), importance of sustainability and recyclability, combine short term needs that support fast industrialisation and long term research, need for cooperation between researchers and industry, work on improving Li-ion as well as working on new chemistries; and work on advanced production processes. Many applications are important with automotive the key and the driver.

- How should the success of the partnership be measured? Facing tough competition, ambition is a must in terms of technological leadership by EU companies, in the battery value chain and building a substantial global market share.

- EU initiatives like the 'Battery alliance' or the 'Partnership' are very welcome. There is a need to build bridges with other partnerships, e.g. with Clean Sky.
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- **Tackling infectious diseases and anti-microbial resistance**

During the session, there was good agreement with the impacts set out in the orientation paper.

Although not many gaps were identified, the open consultation revealed some interesting points that warrant further reflection:

- Progress towards the achievement of the Strategic Development Goals require a holistic and transdisciplinary approach to ensure a leading role for the EU.

- AMR is a critical global problem and Horizon Europe could support the development of novel therapies in a way that delivery of the products is ensured in all settings.

- Prevention and integrated multidisciplinary research are the most important factors to decrease the burden of infectious diseases

- Other important factors include education, health literacy, policy coherence and tackling misinformation

During the session three questions were discussed. These could provide new elements for the next version of theOrientations document :

1. What type of research and innovation should be prioritised to enhance efficient prevention in order to decrease the burden of infectious diseases in Europe and globally? Three main answers were: access to technologies, usage of social sciences, and early diagnosis.

2. What are the most important and urgent Research and Innovation activities to address inequalities caused by for instance the burden and spread of infectious diseases and build healthy and fair communities in Europe and globally? Three main answers were: access to technologies, data for prevention and access, and the development of products for specific groups of patients (e.g. child friendly).

3. What are the trends and novel technologies that research should capitalise on/prioritise to develop novel tools and solutions to tackle infectious diseases and AMR? Three main answers were: i) making sure there is ethical use of data samples, ii) ecological vector control, and iii) nanotechnology and material science.

An open question on whether we had missed any important points related to infectious diseases and AMR received 43 answers. These answers emphasised poverty related and neglected infectious diseases, metagenomics, clinical trials such as those within the European and Developing Countries Clinical Trials Partnership, and the integration of different technologies. Several different novel technologies

can have a real impact on diagnosis and treatment such as artificial intelligence (e.g. for data analysis), experimental diseases models, lab/organ on a chip etc.

- **Industry working for people and planet**

  - The session brought together a wide range of stakeholders (e.g. policy makers, NGOs, industry, research centre etc).
  - None of the main lines for this Cluster have been called into question and the questions from the audience all concerned specific aspects of these main lines.

  In view of the update of the Orientations, the following indications have been given by participants:

  - To enhance industry participation in Cluster 4, a participant recommended a bottom up approach rather than top down. Keep the partnerships and trust industry to do the drafting; this is how you get the buy-in. COM reply: Public-private partnerships are key to ensure and encourage industry participation, see ECSEL Joint Undertaking. They allow industry to detect quicker what key emerging research areas are. Further simplification can also help, less prescriptive topics.
  - To ensure a proper balance between enabling technologies and space, the Commission does not want to set things in stone and preserve flexibility. To keep in mind also, there are two aims of Space in this Cluster: R and I needs for the Space Programme and space as an enabler that can provide solutions for a cleaner and smarter industry and for global challenges.

  We received also these questions that did not specifically relate to Cluster 4:

  - With regard to the inclusion of SSH expertise, a lot will depend on how the expected impacts are formulated.
  - Place of frugal innovation (low-tech) in Horizon Europe? Commission staff replied as follows: There are actions in Horizon 2020, there is a session at the R and I Days so it will definitely play a role in HE.
  - Clarifications of the link between this Cluster and the five mission areas were requested. All mission areas will depend on the enabling technologies and solutions developed in this Cluster.
  - Word cloud on key takeaways of the discussion: Inclusiveness and skills mentioned the most. Other words that came up were: 35% climate action target, global competition, industry, SMEs, scale up, digital, KETs, societal impact, fairness, good jobs, missions, environmental, prosperity, recycling, value chains, collaboration. Commission staff replied as follows: interesting to see societal dimension and skills coming out so strongly.
  - More detailed feedback on the targeted impacts
  - Competitiveness/autonomy: How will you support SMEs? Panel reply: important to include SMEs in the value chains. Especially important to ensure they are up to date with digital technologies. In Digital Europe Programme: digital innovation hubs will help SMEs uptake technologies like AI. Technology infrastructures for upscaling will also be very useful for SMEs.
  - Sustainability:
    - Place of Circular Economy in Horizon Europe/this Cluster? Commission staff replied as follows: Horizon Europe is one part of a broader Circular Economy (CE) strategy. See Green Deal component: CE action plan 2.0.
    - A Member of the European Parliament, former shadow rapporteur on Horizon Europe legislative package: in Horizon 2020 we had climate action target 35%; it is still to be achieved. How will the criteria in Horizon Europebe changed, to ensure that we do achieve it? Commission staff

replied as follows: We will develop, on the basis of the already good experience from Horizon 2020, an updated methodology on how to steer proposals and how to measure progress towards the target.

- Inclusiveness:
  - How to (re-)train the workforce in view of digitisation? Commission staff replied as follows: important to ensure inclusiveness also in the preparation of the work programme and the projects. Panel reply: Important to mobilise all players. Vocational training is also key, besides education.
- The links to policy and other activities were highlighted repeatedly, for example industrial policy, circular economy and (digital) skills were mentioned frequently.

4.2.3. Co design sessions scheduled on 26 September 2019

- **Quality health care for all**

The main lines of the Orientations documents have been generally confirmed.

The scope of the session itself focused primarily on the targeted impact "Ensuring access to innovative, sustainable and high-quality health care in the EU", but it proved the cross-sectoral dimension of health by addressing a number of elements covered by other cluster 1 targeted impacts (see especially cluster 1 targeted impacts3.1, 3.2, 3.3, 3.5, and 3.6). Therefore, though no critical changes are needed after the co-design session, it might be worth strengthening the emphasis on cross-sectoral dimension of health and increased importance of prevention in comparison with classical curative approach.

Overall, the participants' feed-back supported the targeted impacts and emphasised the cross-sectoral dimension of health, which needs coordinated actions from different sectors impacting the determinants of health. This is a complex landscape, with Member States being responsible for the organisation of their national/regional health systems, and the European Union influencing relevant non-health areas like environment, food safety, and occupational health. It was overall agreed that there is much potential for improved health outcomes as a result of interventions in non-health sectors.

Key concluding points of the session:

-• Prevention as a priority area for research;

-• Health systems are open for co-creation;

-• Research on effective communication and information of population on health issues;

-• Breaking of data silos and using evidence generated in other sectors;

-• Research on socio-economic determinants of health and inequalities;

-• Research on health workforce, including skill-mix, new ways of working, task shifting;

-• Research on medicines and medical technologies, including digital; their impact, understanding and addressing issues as safety, data security;

-• Importance of involving the Member States and the industry;

-• Health has a global dimension without boundaries;

The participants acknowledged the relevance of health for both individuals and society, and emphasised the contribution of Research and Innovation activities to improved health outcomes. However, it was pointed that inequalities increase in Europe and health is still considered as a societal cost rather than investment. Therefore, the participants underlined the need for changing the paradigm of health interventions in general, including Research and Innovation activities. A shift from the disease-based to the systems approach is necessary, while keeping population's wellbeing at centre. It was advocated for an increased role of prevention and health promotion, with citizens' empowerment and greater involvement of non-health sectors directly impacting the determinants of health, including environment, food safety, occupational health. The global dimension of health was also mentioned, with health threats spreading around the world and having great potential to penetrate through the EU borders. The participants voiced the need for breaking the silos, data inter-operability, and evidence-based policymaking, which is as important as policy-

informed research. Last but not least, the collaboration between the public and private sectors in Research and Innovation was advocated for.

- **Me and My Society - Cultural Heritage**

The session "Me and My Society - Cultural Heritage" has confirmed the main lines of the Orientations document. Both the five speakers' interventions and the discussion with the audience during the session, as well as the comments received through Sli.do and the bilateral meetings held in the Village, were in line with the main objectives of Cultural Heritage related Research and Innovation activities envisaged in Horizon Europe.

In general, the received comments on the Orientations document's structure and content were positive. Participants welcomed/acknowledged the prominent place reserved to Cultural Heritage as an Intervention Area in Cluster 2. They highlighted that this is an important momentum for Cultural Heritage research and underlined the need to strengthen interdisciplinary, cross-sectorial cooperation across all EU programmes to promote a holistic research on Cultural Heritage and the Cultural and Creative Sectors;

- Several participants tackled as main topics the access, conservation, restoration of cultural assets, data exploitation and management, valorisation of creation and use of generated content and the relationship between digitisation and Cultural Heritage. Unleashing the potential of big data from the past by digitizing archives and libraries should be one of the digitisation activities. Evaluating the impact of digitisation on Cultural Heritage and the social effects of virtual reality should also be among the objectives;

- A recurrent topic was the impact of climate and environment on Cultural Heritage and the need to focus more on the preventive conservation of tangible Cultural Heritage, with a view to be more cost-effective and expand the cultural objects' life. In this frame, research is required to develop new tools, mitigate risk factors and map training possibilities on new skills. Research in this area should also explore the impact of Cultural Heritage experiences in our environment, health and wellbeing;

- Cultural Heritage as resource of sustainable economic development with emphasis on cultural tourism came up several times in the participants' input and the following discussion. Research should explore new ways and tools to promote sustainable cultural tourism with respect to natural and cultural landscapes, urban life and local economies;

- The role of museums in preserving Cultural Heritage but also disseminating culture was an important topic too: we need more research on how museums can become more innovative in finding new funding mechanisms, engaging people and contributing to socio-economic growth and development;

- Some participants consider that Cultural and Creative Sectors are not sufficiently addressed in the Orientations' document and that more precise description of activities should be given. Also, some participants raised also the issue of the visibility and awareness on Cultural Heritage at political level as well as the need for inter-sectorial cooperation and synergies with other Clusters (e.g. Climate, Health);

New elements proposed by participants:

- Role and accessibility of museums: participants stressed the need for research on new ways of access to museums and cultural goods through

digitisation; museums should become less funding-oriented and more focused in disseminating culture in an innovative and participatory approach;

- Role of games (virtual, digital): "game as culture" and the influence of games in shaping identities, (re)producing of or fighting stereotypes (national, gender, ethical etc.), developing art and creativity; need for more critical and applied research to understand how individual identity is constructed and group culture and communities are being born in these virtual environments; research should also help conservation of the digital cultural heritage through recording of the cultural production taking place in these environments;

- Cultural and Creative Sectors (CCS): need to be more clearly mentioned in HE; research should aim to define creativity per se, but also explore the links between creative design and smart specialisation on local and regional level;

- Relation between culture, education and democratisation should come out more clearly in the Orientations document; need to explore how culture and cultural heritage should be linked with education to fight disinformation, foster critical thinking and promote democracy;

- **Me and my society - Democracy and Governance**

The session "Me and My Society – Democracy and Governance" confirmed the main lines of the Orientations document. The speakers' interventions and the discussion with the audience during the session were in line with the main objectives and Research and Innovation activities envisaged in the Orientations document.

Speakers drew attention to the need to sustain democratic consent in the face of big scale transitions like climate change, digitalisation of the society and economy etc., which create political, economic and social challenges. In particular, they raised doubts as regards the capacity of current systems of representative democracy, and political parties as traditional intermediaries, to flexibly and efficiently respond to modern challenges. In that sense they made the case for models of deeper, decentralised democratic engagement and citizen participation. These should be based on participatory mechanisms and experiments, which can assist in boosting citizens' interest and belief in the policy making process. At the same time, a deeper engagement with democracy would familiarise citizens with expertise and could lead to greater trust to evidence. In general, participants emphasised that trusting evidence and expert knowledge is a prerequisite for a well-functioning democracy.

Furthermore, various interventions referred to the challenges raised by the digital revolution and in particular its social impacts. They noted that it would be Important to focus on issues of transparency, the use of personal data, accountability and the protection of citizens' rights as cornerstones of democratic trust.

Another major issue concerned the privatisation and platformisation/commodification of public infrastructures (like for example those pertaining to access to information, transport, healthcare, news etc.) and the impacts it can have on public goods, fairness, transparency and utlimately democracy. Interventions also stressed the role of new media in influencing political debates, frequently negatively via disinformation and polarising material, and the need to uphold processes of accountability and verification etc.

Challenges to democracy are complex and require long-term, multidimensional responses. It would be good therefore to have a Mission on Democracy in the frame of Horizon Europe. It would aim to understand the impact of mega-trends on democracies and to sketch out policy responses.

Participatory experiments need the backing of solid research if they are to function well.

It would be important to link democracy issues (and Cluster 2 issues in general) to the other Clusters of Horizon Europe.

Education is important for democracy and a crosscutting issue.

- **Industries: Global players on a clean planet**

The main lines of the orientations documents been confirmed:

- Climate Change was seen a key challenge of our time and requests to act with urgency.

- Industrial transformation is urgently needed to support the transition to a climate neutral economy. Energy intensive industries are the main focus for their heavy environmental footprint.

- Partnerships involving industry have been confirmed as effective instruments for tackling climate change (a partnership on clean steel was mentioned to support the industrial transformation in this domain).

- Technologies to store and convert carbon emissions (CCU, CCS) can represent viable approaches to cut emissions, and can self-sufficiency for strategic commodities.

- Beyond carbon, sustainable hydrogen production was also recognised as a necessary strategic feedstock. The need to enhance and support recycling and valorisation has been highlighted, waste plastics could be sustainable sources of carbon and hydrogen.

- The proposed European Clean Steel Partnership has been mentioned as an helpful tool to share risks, resources and knowledge between the private and public enabling the private sector to move faster towards scaling up of the most promising technologies to reduce CO2 emissions.

To enable the industrial transformation strategic development in the energy intensive industry will be needed, acting at different levels:

o Novel green cracking technologies in the chemical industry could allow decreasing Greenhouses Gases (GHG) emissions by 70 per cent (Greening up the 10 chemical commodities produced in the cracking process, would allow greening up the 20000 products produced by them).

o Novel steel making technologies with potential to make the industry carbon neutral (e.g. hydrogen steel making, electrified technologies).

o Investments in sustainable infrastructures for utilising RES (grids, storage, etc.).

o Investment in technologies to provide a secure and sustainable of strategic raw materials. Notably, sustainable sources of carbon such as CO2, waste plastics, and sustainable sources of hydrogen (electrolysis and hydrogen from waste plastics).

Main novelties raised during the discussions: • More prominence to climate change impacts on our society, including the health care system and the recognised threat to human health.

- A global outreach for European partnerships and initiatives is important. They do not necessarily have to be global but the different global initiatives in relevant domains should liaise with each other in a structured way to learn from each other.

- A smart resource usage assessment framework should be developed, involving governments, industry and society).

- Industries have a global impact. European industries when trading outside Europe are able to impose higher environmental standards (e.g. European Chemical industries made China to change law on investment exclusive on carbon usage).

- Importance of defining better the criteria for sustainable investments, and develop instruments to channel investment towards sustainable technologies. Simply imposing targets does not enable necessarily enable synergies and this might be detrimental to the achievement of climate neutrality.

- Main challenge is to find pragmatic solutions to bridge the technologies of today with those of tomorrow (e.g renewable energies are still not there for the Energy Intensive Industries to switch from fossil fuel to clean energies for their production)

- Other challenge is the lack of common standards (e.g. legislation on collection and use of waste differ from country to country in Europe) to start a circular industrial production.

- **Making Robots work**

The Orientations document is overall well accepted by the community and there was no fundamental criticism.

Standardization is a hot topic and needs to be picked up early during the development of robotics technologies, not as an afterthought. It is desirable to foresee standardization activities in EU collaborative projects. Projects should feed proposals to standardization committees. Standards should describe how to install new technology and they should be readable for non-experts too.

An interesting idea is the creation of experimental areas, similarly to the Japanese 'tokku zones', where special rules concerning safety and liability apply.

We need to address robotization of new sectors other than automotive, which is getting saturated. Construction has high potential to help workers, as it is the sector with the highest share of job related injuries.

A problem with EU projects is what happens after the project. There should be ways to ensure the continuation of projects beyond their life.

In 10 years robotics will be much simpler to use, software driven, mobile, wearable and connected. However, we will have to face a loss in skilled workers as the population is ageing. In Finland there are currently about 5000 open vacancies for highly educated engineers. There should be emphasis on lifelong training of the workforce. Digital Innovation Hubs can play an important role there. An investment in engineering and robotics training, starting at primary school, is desirable.

While in the EU standardization is perceived to slow down the uptake of robotics in sectors beyond automotive, in China companies introduce robots at work in the construction sector at a great pace. In the EU, we must not be afraid to speed up this process. If the construction industry is not automatized in the future housing will become more expensive due to the lack of workers.

We should not overestimate the near future. We need to accept that research is allowed to fail if we want to aim high. We need to think big, while keeping it realistic.

General agreement on the targeted impacts as presented in the Orientations. Synergies with other EU programmes were not discussed during the session.

Robotics is a strongly interdisciplinary field where social and medical sciences should join engineering, physics and material science. Unions and other societal stakeholders should participate to projects, as this would reduce fear about robotization.

In Aachen a reference construction site is being built. It is a merge of the lab and real application environment where workers can learn how to work with robots. The panel would like to see more reference construction sites under the European umbrella. This would enable people to work with robots in a safe training environment. This concept is linked to the Japanese 'tokku zones' and might be expanded to other fields.

- **Upscaling agro-ecology through open innovation**

The session confirmed that:

- Living Laboratories are open innovation models with capacity to connect key stakeholders and are suitable instruments to increase adoption of agro-ecological practices;

- Agro-ecological management should be adapted to local conditions;

- The role of farmers and consumers in Living Laboratories is key and their involvement in there needs to be carefully considered;

- Technology and digitalisation can play an important role in supporting the adoption of agro-ecological practices, and research and innovation has a role to play in this. A paradigm shift is needed for technology development to focus on sustainable development rather than farm optimisation;

- Farmers need to be part of the development process to ensure that digital technologies meet their needs;

Which are the new elements and main novelties to be considered for the next version of the document? What needs to be changed?

Understanding of agro-ecology in the context of the strategic orientations document needs to be further clarified. The characteristics of the Living Lab approach to be supported under Horizon Europe need to be further clarified and examples should be showcased.

The importance for the transition to agro-ecology to capitalise on the existing knowledge produced in the organic farming sector.

The discussion highlighted as well the following elements:

- Important to identify initiatives that can attract consumers to participate in Living Laboratories;
- Trust is a crucial aspect of Living Laboratories;
- Providing farmers with risk management and financial tools is vital in order to ensure the mainstreaming of new concepts (like agro-ecology) in the EU agricultural sector;
- The concept of agro-ecology is very broad, several definitions exist, but the main focus should remain on diversity and sustainable agricultural practices;

- **Natural Resources in a changing climate – spot on agriculture and forestry**

  During the session enriching discussion took place on the nexus between climate – water – nutrients in primary production (agriculture and forestry) on the following challenges:

  - Agriculture adapting to more variable water regimes (droughts and floods); water quality and the water cycle;
  - Fostering forest ecosystem services in relation to natural resources management such as water;
  - Optimising nutrient management and closing loops (approaches for increased circularity).

  As more cross-cutting issue the need to work on the science-practice interface – participatory research, co-design, co-learning – to connect science and practice has been confirmed.

  Overall, the session confirmed the main lines of the Orientations, especially with regards to the following fields:

  "Fostering climate change mitigation, and achieving sustainable management and efficient use of natural resources";

  "Finding alternatives to scarce resources such as water and decrease the dependency on critical raw materials";

  "Better understanding of the nutrient flows and the role of biodiversity as well as a more effective integration of legume crops in farming systems will allow to optimise nutrient management";

  "Decreasing pollution of water, soil and air from primary production"

  "Fostering adaptation of primary production to climate change";

  "Increasing the resilience of plants and animals to biotic and abiotic stresses by bringing more diversity into farming and forestry systems and providing farmers with better-adapted crop varieties";

  "Biodiversity and ecosystem services underpin productivity and resilience of agriculture and forestry";

"Observation networks of European forests are expected to be created and data related to forests harmonized".

- **Beyond 2020: reversing biodiversity decline**

  The audience and speakers agreed with the main lines of the Orientations related to Biodiversity but most of them think that still could be improved , as for example: better bridges could be made between clusters, ensure the coherence across the whole Programme take into consideration the impact on biodiversity and sustainability.

  A significant part of the audience was not familiar enough with the Orientations. To emit an opinion. Others consider that it is not ambitious enough.

  Biodiversity is considered to be well addressed, and somewhat present in other clusters, but how does it get proper attention?. How to avoid silos? Links with policy (CAP, climate) should be reinforced. Important role of Research and Innovation in science-based policy making, in particular to make a better EU biodiversity strategy. Links to Green Deal to be reinforced.

  - Ensure that biodiversity concerns are streamlined across the Horizon Europe programme (like current gender or ethics requirements - and possibly linked to climate change, not only in cluster 6. This is the only way to really address the drivers of biodiversity loss and contribute to systemic change.
  - Regarding the Orientations, the participants stressed the following elements in view of the update of the document: Better understanding of all planetary boundaries and the potential irreversible consequences of overrunning them, as well as knowledge of the dependence of our social and economic systems on healthy ecosystems;
  - Addressing direct and indirect drivers of biodiversity and show how to modify human activities to remove the negative consequences;
  - Reinforcing capacity for operational long-term monitoring systems;
  - How to leave the narrow economic growth paradigm: innovation is not about technology but also about social and governance innovation;
  - We need smart policy mixes for transformative change and integrative governance. Orientations include initiatives by all actors in society-governmental, market and civil society actors. So multi-actor, multi-level, multi-sector action. We need policy mixes to be able to simultaneously address the indirect drivers of biodiversity loss including the underlying values. Only if we address these drivers simultaneously can we enable and accelerate the transformation towards sustainability. This raises a major question on the governance of these processes of change – the question of transformative governance;
  - Demonstration: Reversion of recent desserts and concentric reduction of large deserted areas, transforming tropical desserts (e.g. SAHARA in Africa) into new jungles in order to counterbalance deforestation such as the Amazon destruction, etc;
  - Introduce psychology research as enabler of transformative change.
  - Mainstreaming Biodiversity with other policies is still a challenge: i.e. the CAP is ruling over biodiversity objectives (e.g. perverse subsidies). Horizon Europe should change the CAP and it should be set up already at the Strategic Programming level. Need for co-design the CAP with research actors. Pay farmers to enhance biodiversity;
  - Financial institutions do not follow Commission's lead on biodiversity. How to attract the financing sector – innovative finances;

- Problem of the Spatial planning for biodiversity loss regulation by MS regulation (EU vs National level). Needed systemic approaches.
- Transformation should not only be sustainable but also equitable- both within the countries and among countries
- Link with environmental media-quality.
- Missing protecting and restoring ecosystems
- Indirect drivers missing
- More focus on marine Biodiversity: in particular, deepsea ecosystem protection, marine plankton biodiversity and functions.
- Focus missing on Microbial biodiversity
- More attention to landscapes, landscape ecology and rural communities
- The link between health and climate is missing. Also the link with culture and values.
- Pesticide-free agriculture.
- Holistic tools for land use planning.
- "Nature based solutions" ,"green infrastructures" big interventions to make a change, disasters risks reduction
- Human behavioural sciences
- Natural capital protocol

The partnership on biodiversity should:

- Protect and mainstream biodiversity in other sectors, obtain the support from all MS to uptake scientific report for policy-making;
- To have connection with Key business actors for leveraging impact (circular economy). Show to private sector it is not a burden but an opportunity and a solution;
- Leverage more budget than in current partnership;
- Create integration across actors and sectors that are not currently in the Research and Innovation bubble: main stakeholders (NGOs, businesses);
- Link local – national – EU and international levels.

- **Transforming of food systems**

The main lines of the Orientations document have been confirmed. With a view to the next version of the document, the following elements should be considered:

- More emphasis on the New Green Deal and the role of Research and Innovation in shaping the farm to fork food system approach.
- Recognition that the EU Food 2030 initiative has been pivotal in putting food systems on the political agenda.
- Research and Innovation is key to redesign food systems to maximize co-benefits (nutrition, food safety, climate, circularity, environment, social equity, etc.)
- The role of Research and Innovation in understanding the rural-urban interface where 70% of the food we consume is urban related. (Circularity, dietary shift, etc.)
- Better use and impact of the abundant existing knowledge and scientific evidence we have now (on dietary shift, soils etc.

- Better understanding of the effects of micro plastics on health and food safety, and biodiversity.
- Better use of accelerators throughout Horizon Europe at every scale to support food systems transformation and co-benefits.
- Improve cooperation and flexibility between all actors meeting common goals.
- Facilitate this through a Horizon Europe partnership on food systems engaging all actors.
- Partnerships could also act as incubators to bring diverse communities together to create cohesion and common understanding in view of future calls for proposals and the broader political implications.
- Policy and system science (and tools) need to be harnessed to support decision-making, behavioral change and policy options.
- Better engagement with youth and their involvement in finding solutions upstream and throughout the Research and Innovation process.
- Much more food systems education at all levels and awareness of solutions.

The audience when questioned felt that that the most feasible and fruitful opportunity in the current policy landscape to test out co-benefits would come through the Common Agricultural Policy, Living Labs and innovation accelerators, and simpler public procurement procedures. With Research and Innovation through Horizon Europe, supporting business innovation for health and sustainability, short supply chains, and school fruit and vegetable schemes also being of importance.

They felt that the most important factor in delivering urban food system transformation would come from establishing local government integrated urban food system policies. These policies should focus upon setting-up of local living labs to co-create and test food system innovations, establishing a European food systems strategy to overcome fragmentation and ensure policy coherence, and providing an evidence based outreach approach to foster behavioural change at global level. Implementation of national urban policies that provide a systemic framing and Public-Private Partnerships delivering innovative market-driven solutions were also to be considered.

The best way to get people to reduce intake of processed foods along with high GHG emissions foods would come from taxation so that they become too expensive (like caviar) and encouraging local farmers through direct subsidies. The introduction of agriculture and nutrition education in schools to encourage a shift away from high-tech towards sustainable vocations was also important. Communication of harmful effects, introduction of alternative fast food plant-based protein, banning of 'bad foods', and the forcing of non-healthy food industry out of business, were to be considered.

Research investment, which fosters alternative proteins and dietary shift in Europe, should come from legumes and other plants, and innovations in food processing. Algae and seaweed, gastronomic innovation, insects, marketing innovation, fungal mycoprotein and cultured (laboratory-based) meat were also deemed interesting.

The most critical bottlenecks to bring innovations/start-ups to scale was found to be in access to funds (investments and grants) while specific support programmes such as accelerators and training, support to real use-cases /clients, hands-on support and reach out to partners were also of interest.

Consumers could best reduce plastic consumption by use of own bags, drinking tap water, changing shopping habits and better use of containers. Shopping in specialized shops, buying in bulk, avoiding single use food and drink containers and the ban of wrapping paper, straws, and packaging materials. Consumer pressure on governments and business should be investigated. Also of value was fruits and

vegetables bought form from local markets and people cooking and eating more often at work, using more glass and steel containers. Plastic bottles should be taxed or workable and incentivised return schemes introduced. Overall a reduce, reuse, and recycle philosophy must become part of a child's education.

Regarding the targeted impacts prepared, the participants raised the following points:

Establishment of primary production, food and bio-based systems based on sustainability, inclusiveness, health and safety; food and nutrition security for all Sustainable, low emission, resilient, competitive and equitable primary production and food systems will become the norm. The potential of aquatic production systems and aquaculture to produce sustainably high quality food and biomass will be unlocked. Imbalances in our food value chains will be corrected, from agriculture and fishing, to the food and drink industry, transportation, distribution, and consumption. Safe use of bio-resources from land and sea will be ensured. Sustainable, safe and healthy diets will be available and accessible for all and a major shift to healthy diets from sustainable food production systems will be achieved.

The recommendations made in this session were very much reflections of the orientations paper at both a specific and work programme level. The recommendations of most relevance to the targets include reference to the new green deal, maximising co-benefits, the role of food education and youth engagement, accelerators and incubators, need for a food partnership, better stakeholder cooperation, the FOOD 2030 structure, micro plastics, and role for policy and system science.

More details on the new elements (including comments on possible additional impacts to target, on any additional cross cutting dimension calling for more emphasis)

The new elements introduced by the session are summarized below. We feel they could be included in the Orientation Paper under a new revision cycle.

A bigger Research and Innovation emphasis in the New Green Deal should be shown especially in shaping the farm to fork food system approach and in redesigning food systems to maximize co-benefits. The rural/urban interface warrants greater understanding and a better use and impact of the abundant existing knowledge and scientific evidence is needed. Better understanding of the effects of micro plastics on health and food safety, and biodiversity. The use of accelerators, incubators, living labs, and higher levels of cooperation and flexibility between all actors meeting common goals has to be developed through a Horizon Europe partnership on food systems engaging all actors and bringing diverse communities together to create cohesion and common understanding. This partnership should harness policies and system science (and tools) to support decision-making, behavioral change and policy options and provide a better engagement with youth and more food systems education at all levels and awareness of solutions.

- **Natural resources in a changing climate – spot on agriculture and forestry**

The session focused on the nexus between climate – water – nutrients in primary production (agriculture and forestry), as addressed by presentations the following areas:

1. Agriculture adapting to more variable water regimes (droughts and floods); water quality and the water cycle (Helena Gómez Macpherson)

The presentation addressed the potential of remote sensing to estimate the amount of water in crops, provided that the physiology behind the information (indexes) is better understood. Diversification and diversity were seen as an effective tool to

increase resilience of cropping systems and agriculture in general. This implies having in place a wide range of tools for water management in agricultural production, also as a means to reduce risks.

2. Fostering forest ecosystem services in relation to natural resources management such as water

The presentation highlighted the societal, economic and ecological importance of forests, such as the potential for sequestration of greenhouse gas emissions, the provision of habitat for biodiversity and the economic value of wood and non-wood products. A main challenge remains how to manage the competing demands on forests and the inherent inherent tradeoffs between different forest ecosystem services (example "biodiversity" versus "biomass"). What can research do to tackle the various challenges? Ideas include: a full assessment of the ecosystem services "value" of Europe's forests (provision and demand side); a comprehensive and transparent analysis of the synergies and trade-offs between forest ecosystem services; better understand the changes related to forestry. It was considered important to move from modelling to empirical research and to integrate the different actors (e.g. forest users, managers, conservationists) in discussions.

3. Optimising nutrient management and closing loops (approaches for increased circularity)

The presentation tackled the "nutrient paradox", i.e. the increased use of fossil based mineral nutrients in primary production while at the same time having nutrient abundance and surplus of animal manure. It showed the increasing importance of nutrient recovery and closing nutrient loops. Closing nutrient loops requires that we move beyond the farm level and work across sectors, e.g. connect the nutrient flows from farms and biobased industries or from rural and urban areas. Research should help to reduce the dependence on primary resources. Other issues discussed included novel animal feeds, precision fertilization and optimising efficiency in nutrient uptake by plants.

More detailed general feedback (including comments on the overall structure of the Orientations document and/ or on the contents)

<u>The following points were highlighted during discussions:</u>

- Need to look at the effects of the different technologies on the communities that work in agriculture and forestry. E.g. how will digitisation or artificial intelligence affect labour? There is also a significant role for technology to increase the links between consumers and producers;
- The role of agroforestry and other mixed systems to increase water quality;
- The climate dimension was mentioned very little in presentations. With an increase of water levels, salinization of agricultural areas, etc. how are we preparing for changes in agriculture and forestry?
- Is there a role for nutrient (re)cycling in the context of carbon sequestration?
- What are the major barriers to a broad uptake of technologies for nutrient (re)cycling? Technology is probably ahead of legislation;
- Do we know about the potential of moving from annual cropping systems to more perennial crops, thereby increasing the efficiency of land use? With advances in refinery technology we could use more perennial plants, but would there be benefits in nutrient cycling? Monocultures are the easiest economic option. Any change towards more complex farming systems requires that the farming sector is involved in identifying alternatives and funding solutions. Participatory research is very important, and farmers have to be involved. Key is that all stakeholders work together to understand what the demands are.

On a more general level, participants confirmed and reiterated the need to work on the science-practice interface, including participatory research, co-design and co-learning. This is fully in line with the multi-actor approach as applied in Societal Challenge 2 of Horizon 2020 and as promoted through the European Innovation Partnership EIP AGRI.

Both, presentations and discussions were relevant to the following issues described in the orientations document (under Cluster 6)

- **Security research: involving users in research to increase impact**

While not directly discussing the Orientations document as such, its key aspects were confirmed. The panellists represented key stakeholder groups: research, industry, government and users, and therefore the discussed subjects were approached from multiple angles. There was a common agreement on the benefits on the involvement of end-users in the research process mentioning all stages starting from idea, through proposal preparation, research execution and ending on operational tests. The desirability of framing civil security research under a capability development approach was confirmed.

Whilst not novelties, the next version of the document could consider developing the following aspects:

- The role of research in developing standardised solutions, thus reducing the fragmentation of EU civil security markets and thereby facilitating the uptake and deployment of successful results of security research.

- The need to engage with citizens, both as those for whom security is provided and as actors in providing security.

- The desirability of continuing (as under Horizon 2020) practitioner end-users to be participants in research consortia, alongside researchers and industry.

Some doubts arose around the benefits of the research programmes for the end-users themselves namely a limited impact of the projects on the daily work of blue light services. While research receives knowledge, industry know-how and patents, end-users are usually left with technology not mature enough to be implemented. One of the reactions pointed out that users should openly ask about the benefit of their involvement, and from the very beginning. By doing so, they will engage in research projects with better awareness and, potentially with an idea of what will be happening once research provides its output.

Forums such as the EU-level Community of Users (and, in some Member States, its equivalents at national level) were identified in being useful to bring together policy-makers, end-users, researchers and industry in order to increase mutual understanding of the needs for and the possibilities offered by research.

The challenge of ensuring uptake of the successful results of security research was addressed: some opinions indicated that Horizon 2020 by default is a research program, and although there are some mechanisms being tested like Pre Commercial Procurement, the market expectations should be managed accordingly. It appears clear that research will not deliver the final tool to the end-user and that activities (appropriately financed) are required after research so that it can have real impact in terms of tools and services made available to security practitioners. Such post-research activities need to be planned in advance so as to enable timely uptake of research output.

It was also noted that research in nature is, and should be, revolutionary while industry is taking small steps and focusing its efforts on these research outcomes that are believed to be market deployable in terms of acceptance, compatibility and

affordability. Moreover, the security market is complicated to manage due to its political sensitivity, institutionalised clients and fragmented landscape.

Fragmentation of the security market kicked off an exchange on standardising and certification issues at the EU level, which potentially could help consolidate the area. Discussants agreed that it is an issue of utmost importance; however, the progress in this field has been very limited for some last 10 years. Another remedy for fragmentation that surfaced was preparation of long-term Capability Development Plans. However, unlike the far-reaching visions of defence ministries, fast changing civil security threats of modern civilisation may render any long-term prognosis obsolete within only a couple of years, notably in the cybersecurity domain.

The differences between civil security research and defence research (in civil security research the buyers were fragmented and the time frames shorter as compared to defence) led to the conclusion that it would not be feasible simply to transpose the capability development architecture adopted in defence into the civil security sector. Accordingly, the approach in defence can be a source of inspiration for the civil security sector but then a specific tailoring exercise will be required to meet the differing specificities of civil security.

The targeted impacts were not as such addressed. Instead, the session looked at how to increase the impact of civil security research.

As far as standards are concerned, the point was made that the security sector has specificities that have led to the formal standardisation process not working well in this area.

- **For an innovative and globally competitive health-related industry**

  Scope of the session: Discuss the impacts Horizon Europe should strive for to ensure EU health industry is sustainable and globally competitive while helping citizens stay healthy

  Stakeholders mainly expressed comments around the below lines, which were anticipated (also confirming the main lines of the Orientation document): transparency, inclusiveness incl. patients and SMEs, healthcare continuum, research into health economics and cross-sectorial cooperation

  - More detailed general feedback including on targeted impacts

  1.• Call for impacts covering the entire healthcare continuum taking into account health economics.

  2.• Plea for inclusiveness: cooperation between industrial sectors, between industry and academics, inclusiveness of SMEs, and ensure a place for all actors in the partnership (patients, civil society, health care payers, regulators, etc.). Also inclusiveness in governance.

  3.• Put in place mechanisms to fund the research and innovation process from ideas generation to uptake in health care. Ensure coordination between programmes.

  - More details on new elements

  In relation to the Orientations documents consider also the below additional impacts to consider

  - Cross-sectorial collaboration of health related sectors.


D-GLRA