



Vetenskapsrådet

Datum
2017-03-13

Diarienummer
5.3-2016-5578
GD-2017-59

Handläggare
Pontus Holm

Till diariet

Beslut om VRs rekommendationer för H2020 och FP9

Beslut

Vetenskapsrådet beslutar att anta rekommendationer angående Horisont 2020 och nästa EU ramprogram, enligt bilaga.

Bakgrund

Uppdraget Halvtidsutvärdering H2020 samt inspel inför nästa ramprogram FP 9 har pågått från maj 2016 till mars 2017 och har redan genererat en fyra sidig sammanfattning av VRs ståndpunkter angående Horisont 2020 och nästa ramprogram som har beslutats av GD och skickats till b.la. Europeiska Kommissionen. Nu är även det stora, inkluderande, heltäckande dokumentet klart som innehåller VRs rekommendationer för Horisont 2020 och nästa ramprogram inom en lång rad ämnen. Detta dokument är tänkt att fungera som ett referensmaterial för alla VR-medarbetare som kommer i kontakt med EU-relaterade frågor.

Skäl för beslutet

VR är engagerat i EU-frågor på ett stort antal områden. Det här dokumentet med samlade rekommendationer behövs för att underlätta och samordna arbetet.

Beslut i ärendet har fattats av generaldirektören Sven Stafström i närvaro av rådsdirektören Ann Fust och den internationella samordnaren Pontus Holm, föredragande. I den slutliga handläggningen har enhetschefen för SoS, Jan Bolin, avdelningschefen FP Johan Lindell och enhetschefen FPR Elisabeth Sjöstedt deltagit.

VETENSKAPSRÅDET
SWEDISH RESEARCH COUNCIL

Postadress/Postal address
Box 1035
SE-101 38 Stockholm
Sweden

Besöksadress/Visiting address
Västra Järnväggsgatan 3

Tel: +46-(0)8-546 44 000
Fax: +46-(0)8-546 44 180

Org. nr/Vat No
202100-5208

vetenskapsradet@vr.se
www.vr.se

Sven Stafström
Generaldirektör

Pontus Holm
Internationell samordnare



Vetenskapsrådet

Horizon 2020 and next framework programme Views of the Swedish Research Council

2017-03-08



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LÄSINSTRUKTION

Vetenskapsrådet (VR) har tagit fram synpunkter på nästa ramprogram. Det här dokumentet redovisar Vetenskapsrådets ställningstaganden och rekommendationer och är sammanställt för att ge stöd till Vetenskapsrådets medarbetare i interaktioner som rör Horisont 2020, nästa ramprogram och det europeiska forskningsområdet, ERA, i stort. Det är tänkt att användas som en ”uppslagsbok”.

Dokumentet består av två delar. Den första delen är ett fyrsidigt dokument som sammanfattar VRs huvudsakliga ståndpunkter. Det har använts som inspel både till Europeiska kommissionens öppna konsultation om halvtidsutvärdering av Horisont 2020 och till Regeringskansliets arbete med nästa ramprogram.

I del två följer kapitel som redogör på en detaljerad nivå för VRs ståndpunkter och ger rekommendationer i ämnet. Dessa ståndpunkter och rekommendationer har förts fram och vidareutvecklats under en bred process som började i maj 2016 och slutfördes i februari 2017. Denna process involverade alla medarbetare på VR som arbetar med EU-relaterade frågor, alla huvudsekreterare, SÄRK, ledningsrådet samt även svenska forskare och universitetsanställda via en enkät som gav 243 svar.

PREAMBLE

The current framework programme, Horizon 2020, is a political instrument contributing to the implementation of the Europe 2020 Strategy to put Europe on the path to smart, sustainable and inclusive growth. It is the largest framework programme ever and constitutes the EU's most powerful instrument for implementing the European Research Area, ERA.

This paper states the views and recommendations of the Swedish Research Council (SRC) for the further development of Horizon 2020 and the design of the next framework programme. SRC have also been involved in formulating the view of Science Europe in the opinion paper “[The Framework Programme That Europe Needs](#)” as well as other policy briefs on FET-flagships, Research Infrastructure, Impact etc. All publications are available at the [Science Europe homepage](#).

SRC finds that it is no longer possible to consider the framework programmes in isolation. The concept of ERA, the ERA priorities and its implementation has gained enhanced importance and ERA activities outside the framework programme such as the tackling of societal challenges increasingly interact with framework programme initiatives. In light of this, the paper also addresses interactions between the framework programme and ERA at European and national levels.

I - THREE MAIN PRIORITIES FOR HORIZON 2020 AND NEXT FRAMEWORK PROGRAMME

Excellence and fundamental research¹ will safeguard Europe's long term competitiveness

Excellence as the main guiding principle

The principle of excellence as the primary selection criteria must be actively safeguarded throughout the framework programme. A crucial factor to achieve this is a robust and transparent peer review process based on solid ethical principles. Consensus review meetings must be held and the applicants should be provided with substantial feedback.

ERC should continue to be a driver of excellence in the next framework programme with retained independence and a maintained substantial share of the budget.

Fundamental research is crucial in all areas of the framework programme

To prepare for an uncertain future, Europe must make sure that it supports fundamental research that generates new ground-breaking knowledge, including support to world class research infrastructures, global cooperation and optimal conditions for researchers as stated in the Lund Declaration 2015². Fundamental research must to a larger extent than now be an integral component of the whole framework programme. Creation and utilization of new knowledge is necessary at all stages of the innovation cycle and contributes to tackling societal challenges and strengthening Europe's industrial leadership.

Disruptive technologies typically emerge in an unpredictable manner and are dependent on fundamental research. This calls for a thematically unlimited funding system like FET Open. This format should be developed beyond the current ICT focus to become the primary support instrument for collaborative bottom up research.

A more coherent and focused take on societal challenges

Fulfilling the priorities of the Lund Declaration 2015

Addressing societal challenges at European level through collaborative efforts has a clear European and global added value. The Lund declaration 2015 outlines four priority areas to speed up solutions to tackle societal challenges: alignment, frontier research, global cooperation and impact. The next framework programme should build on these principles and, in a more coherent way incorporate and relate to other ERA initiatives.

¹ Fundamental research means empirical and theoretical work driven by curiosity to acquire new knowledge in specific areas, without any direct practical application or use as main objective.

² The [Lund Declaration 2015](#) was presented at the [Lund Revisited conference](#) on the 4th of December 2015.

The framework programme should continue to support joint programming activities such as the Joint Programming Initiatives (JPI) and must consider these when structuring the efforts of tackling societal challenges. The European commission has an important role as facilitator to align national and European efforts. In this context, providing flexible instruments to support the needs of these initiatives is crucial.

Global cooperation is an important means to strengthen European research. Europe needs to connect with partners around the world, in advanced, emerging and developing countries to address societal challenges in partnership. The drop in global cooperation compared to Framework Programme 7 must be addressed and efforts should be made to increase participation of third countries and to encourage such countries to set aside matching funds.

The interpretation of the impact of research and innovation needs to be broad in scope and take into account a wide range of influences on society. This includes the application of research results in order to attain social, economic, environmental and cultural effects. Impact beyond academia refers to the dissemination, further refinement, commercialization, patenting, licensing or other practical use of research results.

The framework programme should continue the efforts to develop tools and methods for demonstrating the impact of research and innovation on society. Methodological diversity is recommended for the proper assessment of the impact of research on society. Evaluation techniques and the availability of specific indicator sets should not drive assessments.

Interdisciplinary solutions

Society needs interdisciplinary solutions to the complex challenges that face us and the framework programme has an important role to continue supporting the integration of different research disciplines. The integration of social sciences and humanities needs further improvement in Horizon 2020 and thus represents an unexploited potential. For example, many of today's societal challenges are increasingly cultural in nature requiring the involvement of humanities research to achieve sustainable solutions. This calls for the current and next framework programme to strengthen the support for social sciences and humanities research, recognizing the great variation between disciplines like for instance law, educational science, economy, anthropology and the arts.

Register based research is often cross-disciplinary in nature and multinational register data should be utilized to a larger extent. Multinational register data are a unique resource. Such data have great potential to produce knowledge in a cost-effective manner contributing to answering research questions addressing grand societal challenges and increasing European competitiveness. The framework programme should capitalize on this opportunity.

Stronger together through smarter cooperation

Added value through cooperation and coordination

The European research and innovation programme needs to identify and focus on areas with a clear European added value to an even greater extent than now. One important role of the framework programme in this respect is to act as a facilitator to amplify the efforts of member

states, thus allowing for improved alignment between national and European programmes. The complete R&D ecosystem of the ERA must be taken into account and the roles of the member states and the European commission clarified.

Access to high quality research infrastructures is essential to increase research quality and to secure European research competitiveness. The funding for research infrastructures needs to increase in order to support the design and preparatory phases of new research infrastructures as well as to consolidate, operate and upgrade existing research infrastructures. Specifically, the need for reliable e-infrastructure and the demand for storage, calculation, and archiving of research data is growing. EU should strive to find common solutions within this area. ESFRI should continue to prioritize needs of research infrastructures at the European level including evaluation of current research infrastructures giving ESFRI an even more central role in renewing and securing the quality of European research infrastructures.

The Marie Curie Sklodowska Actions mobility programme of Horizon 2020 has proved to be a productive and popular instrument with clear European added value. The next framework programme should include a mobility programme that spans across the framework programme components, including research infrastructures and industry-academia collaborative partnerships.

There is a growing interest for public engagement, open science and open innovation at European level. The next framework programme should prioritise developing methods for co-creation, end-user involvement and dissemination of the findings of research according to Responsible Research and Innovation (RRI).

The framework programme also needs to be designed to include less research intensive member states and regions whilst maintaining excellence, thus safeguarding ERA coherence. To this end various measures need to be put in place, such as reformulating the remuneration regulations for grantees in order to counteract brain-drain from the less research intensive member states and regions.

Simplification of overall structure and instruments

The three-pillar structure of Horizon 2020, with its focus on excellence, societal challenges and industrial leadership respectively, brought about a much-needed clarification of the goals of the different priorities. A similar approach should be adopted for the next framework programme. The framework programme structure should be further optimised to enhance coherence and open up for synergies between the different missions.

The framework programme should contain a limited set of flexible instruments with defined aims and clear inter-relations. This set of instruments should include long-term support suited to the long term nature of initiatives like research infrastructure operational costs, longitudinal studies and joint programming initiatives. Funding instruments such as Research and Innovation Actions (RIA) should remain reasonably stable to facilitate active participation from the research community and to build upon results achieved in earlier collaborations.

It is essential that grants rather than loans remain the main funding principle. Close to market activities such as EFSI should be funded through other means than the Research and Innovation Programme.

More transparency for trust and partnership

Trust and partnership between stakeholders are essential factors for the success of the framework programme and the realisation of ERA. This requires further simplification and increased transparency regarding grant-related processes and governance. Here the programme committees play a central part, as they are the primary tools for the alignment of national and EU priorities and provide a link to national stakeholders. The programme committees must therefore be maintained and their role strengthened in the next framework programme. The process for drafting work programmes must be predictable, uniform and transparent, allowing time for development of views and the identification of synergies between the programme committees.

II – VIEWS AND RECOMMENDATIONS FOR HORIZON 2020 AND THE NEXT FRAMEWORK PROGRAMME

1. GENERAL FEATURES AND INSTRUMENTS

1.1 Excellence and fundamental research

Europe needs to move into the future well equipped to address a variety of challenges. The framework programme can only contribute to this through consistently fostering ground-breaking knowledge in a variety of ways and through making sure that excellence always is the main criteria.

Looking at Horizon 2020 there is a need for increased funding for fundamental, (zero to low Technology Readiness Level, TRL), high-risk research within all three pillars. Fundamental research is needed to create new knowledge throughout the innovation cycle thus allowing new ideas to be introduced as well as the refinement of existing ones. In addition, if the funding is overly focused on producing short-term applications, there is a risk of losing the necessary competence for future breakthrough research in the long term. There should therefore be a balanced support for all levels of TRL, with particular attention to ensure that there is no funding gap between fundamental and applied research, thus allowing for both excellent fundamental research and excellent applied research to thrive. Care should be taken when using the TRL concept, as many fields of research do not fit into a linear scale.

VR's recommendations

- Fund exclusively excellent research and innovation based on transparency and solid ethical considerations.
- Make sure that fundamental research that generates new ground-breaking knowledge to a larger extent than today is an integral part of the whole framework programme.

1.2 Size and stability of the budget

The size and stability of the framework programme budget is crucial to its success and impact. In order to exploit Europe's full potential, as demonstrated by the large number of very good applications that currently cannot be funded, the budget of next framework programme needs to be larger than Horizon 2020 (possible effects of Brexit not adjusted for here).

VR's recommendations

- Protect a sizeable budget of the next framework programme, preferably larger than that of Horizon 2020 (see also "Science Europe Position Statement - The Framework Programme that Europe Needs" 2016).
- Maintain or increase support for the European Research Council, ERC, and for actions promoting mobility such as Marie Skłodowska Curie Actions.

- Increase funding for social sciences and humanities and for research infrastructures.

1.3 Widening excellence and closing the knowledge divide

Coherence is a cornerstone of the European project. Brain drain from low-performing countries and regions in Europe to more high performing ones is an issue that has become increasingly important. This needs to be taken into account not only in the concerned countries and regions but also when designing the framework programmes and considering the best use of the structural funds. Measures taken in the Science with and for Society-programme (Spreading Excellence and Widening Participation) in Horizon 2020 are examples of what can be done in the framework programme context.

With the current structural fund rules, there is a risk that the funds are used locally/nationally to solve problems that are better tackled through collaboration at European level. To use these funds to upgrade national/local research infrastructure that do not have the capacity/functionality to support world-class research should be avoided and the funds instead directed to facilitate the use of European research infrastructures.

So-called smart specialisation is currently a prerequisite in order to receive funding from the European Regional Development Fund (ERDF). It involves *inter alia* a focus on identifying niche areas of competitive strength in a certain country.

VR's recommendations

- Explore other sources than framework programme funding, such as the structural funds for capacity building at European level.
- Enable low performing member states and regions to maintain a broad enough basis of scientific fields to uphold readiness for future challenges and technological developments by using the structural funds.
- Design structural fund rules and regulations so that they facilitate participation in framework programme activities.
- Allow structural funds to be used for increased access to joint European and regional research infrastructures and to facilitate for low performing countries to invest in instruments, databases and training.
- Consider enhancing the capacity of national research infrastructures of European interest by using structural funds to support European access to these.
- Strengthen framework programme measures aimed at “widening participation” whilst maintaining excellence.
- Stimulate researcher-initiated exchanges involving researchers in low performing member states by using open calls without the smart specialization requirement, for example through Marie Skłodowska Curie actions.
- Introduce the “seal of excellence” in all parts of the framework programme, thus contributing to setting standards and facilitating smart alignment between national and European efforts.

- Allow framework programme salaries to be at competitive levels in low performing member states.

1.4 Programme Committees

Member states are represented in (configurations of) programme committees in Horizon 2020, both in the overarching strategic configuration and in configurations for the different parts of the framework programme. Member state representation is important for the alignment of national priorities with EU priorities, for the involvement of national stakeholders and, not least, to maintain trust.

Programme committees currently do not have uniform processes to design new work programmes. For example, not all programme committees have meetings with the European commission's internal so called advisory groups. These groups are instrumental in producing the first drafts of the work programmes. In Europe in a changing world (Societal Challenge 6), the programme committee has been consulted at an early stage of the process, whereas this has not been the case in the programme committee for Health (Societal Challenge 1). In addition it has become increasingly difficult to get an overview of the process for developing the work programmes in Horizon 2020 due to concepts that blur the picture such as focus areas, strategic areas, cross-cutting issues, Moedas' "three O:s" etc. This has made it challenging for member states to engage in the process and influence the outcome. It also makes it difficult to identify synergies and overlap between programme committees. A better overview of the process would decrease the risk to start too many similar initiatives, e.g. similar ERA-net topics, at the same time.

VR's recommendations

- Maintain and strengthen the programme committees in the next framework programme.
- Develop a clear, stable, uniform and transparent process for drafting work programmes in the programme committees, which allows time for discussions and development of views, similar to the process used in the 7th framework programme.
- Give programme committees access to comprehensive data on applications and funded projects without delay, as well as improved possibilities to analyse projects that have been funded, e.g. through research area classification systems and text mining tools.

1.5 Societal impact

Impact of research beyond academia, or societal impact, should be interpreted in a broad sense. The application of research results can over time achieve social, economic, environmental or cultural effects in society.

Societal impact has become an important issue in the discussion of the next framework programme for a variety of reasons. One is highlighted in one of the three O's launched by the

Commissioner Moedas'; Open innovation. Moedas finds that Europe too rarely succeeds in getting research results to market. Technologies developed in Europe are most of the time commercialised elsewhere. Europe need open innovation to capitalise on the results of European research and innovation. This means creating the right ecosystems, increasing investment, and bringing more companies and regions into the knowledge economy, thus creating impact beyond academia. The way forward according to Moedas is about involving far more actors in the innovation process, from researchers, to entrepreneurs, to users, to governments and civil society.

Furthermore, to show impact and value of the investments made in research and innovation is also of increasing importance as many different needs compete for a share of the EU-budget. As an example, currently voices are raised to increase the EU budget for defence. The Lund declaration 2015 also stipulate that European development, prosperity and competitiveness to an increasing extent is dependent on the ability to secure and demonstrate impact on society from investments in research and innovation. This ability is going to be a key factor for the design of the next framework programme.

There is a need to develop the tools to measure societal impact in order to include societal innovations such as new working methods and life style changes. Case studies offer the opportunity to capture the complexity of the relationship between research results and the wider effects of research over the short and the long term. The Swedish Research Council in various contexts has suggested that peer review of case studies should be used for the evaluation of societal impact as a complement to other national and international evaluation models (see e.g. <https://publikationer.vr.se/en/product/research-quality-evaluation-in-sweden-fokus-2/>).

- Reinforce efforts to develop tools and methods that can demonstrate the societal value and use that research and innovation have in society.
- Use methodological diversity for the proper assessment of the impact of research on society. Evaluation techniques and the availability of specific indicator sets should not drive assessments.

1.6 Funding instruments

The flora of framework programme funding instruments has become very complex and the purpose of the respective instruments is not always clear. Not least, the creation of various forms of partnership programmes has contributed to this complexity. Depending on instrument, these can fund calls, networking, alignment activities or a combination of the above. The extent to which the funding offered by these partnership programmes is open to all interested applicants varies. Funding instruments should be reasonably stable over time as well as flexible enough to cater for a variety of needs.

The role of loans as financial instruments in the framework programme is currently debated. While such instruments may serve a role in supporting close-to-market and exploitation activities, grants are necessary to ensure adequate support for fundamental research.

Fundamental research generating new knowledge is closely interrelated to disruptive innovation and fuels the economy both at present and in the future. The bulk of this type of research is funded and performed in the public sector with limited access to financial instruments and where these instruments normally are not fit for purpose. It is therefore essential that grants remain the main funding instrument in the framework programmes. See also the [position statement](#) of Science Europe Member Organisations³.

VR's recommendations

- Produce an overview and analysis of current funding instruments as a basis for the design of instruments in the next framework programme.
- Limit the number of instruments in the next framework programme and make sure that they have clearly defined aims and inter-relations as well as clear European added value.
- Keep funding instruments such as Innovation Actions (IA) and Research and Innovation Actions (RIA) stable to facilitate active participation from the research community and to build upon results achieved in earlier collaborations.
- Make sure that funding instruments, geared at funding agencies, are stable over time, thus facilitating for these agencies to adapt their processes and incorporate participation into their strategies.
- Design instruments that allow for long-term support to suit the long-term nature of certain initiatives such as research infrastructure operational costs, longitudinal studies and joint programming initiatives.
- Do not expand loan based financing to the detriment of grant based funding.

1.6.1 Public Public Partnerships, P2Ps

So-called Public Public Partnerships, P2Ps, are partnerships between public authorities/not for profit organisations aiming at coordination and collaboration. In the context of ERA and the framework programmes the P2P-instruments promote cross-border coordination and collaboration and are expected to provide European benefit by aligning efforts in member states and increasing synergies. They include ERA-nets and initiatives under Article 185 as well as the new European Joint Programme Cofund (EJP). Joint Programming-initiatives, which are networks not directly linked to the framework programmes are also P2Ps.

ERA-nets started in the 6th framework programme with the aim to encourage cross-border collaboration between research funding organisations (RFOs) through support to mapping, exercises, sharing of best practice, developing joint research agendas etc with the ultimate aim to foster joint calls. This was the first time that RFOs could apply for funding from a framework programme. The ERA-net-calls in the 6th framework programme were bottom-up with no thematic limitations. In the 7th framework programme, the ERA-nets were limited to certain thematic areas. There were two parallel instruments; ERA-net for coordination, mapping etc. and ERA-net plus for a series of joint calls. In Horizon 2020, the two instruments were merged into one, ERA-net Cofund, with a single cofunded joint call and limited support for management costs, mapping, sharing best practice etc. ERA-net Cofund calls are thematically limited and can be designed for example to support a particular Joint Programming Initiative.

³ <http://www.scienceurope.org/downloads/>

A so-called true common pot is the most effective tool for cross-border research funding. However, the use of a true common pot in cross-border collaboration is normally problematic due e.g. to national legislation prohibiting spending money on non-national projects, “juste retour” considerations etc. The “virtual common pot” which often is used to circumvent these problems, does not function well either. So for example, can there be a mismatch between collaboration projects recommended for funding and contributions from national funders in that some funders may fund all of “their” parts of the collaboration projects whereas others only fund some. HERA and NORFACE, which have long experience of joint calls have found ways to handle this and could be used as good examples.

VR’s recommendations

- Create a flexible and long-term P2P-instrument, designed to support Joint Programming Initiatives and other initiatives tackling societal challenges. The instrument should build on features in the current CSA and ERA-net instruments, allowing for e.g. sharing information, developing common standards, methods, processes, strategic research agendas etc.
- Make sure that there are a reasonable number of P2Ps ongoing at the same time in order to allow (organisations in) member states to participate as efficiently as possible.
- Develop topics for P2Ps from (organisations in) member states through a transparent bottom-up process.
- Consider systems with an increased level of member state commitment, such as “generous virtual common pot”, where each member state guarantees to fund a certain number of researchers or all researchers of top-ranked consortia.
- Produce guidelines to avoid mismatch between the number of applicants and the available funds from participating organisations.
- Do not limit P2Ps such as ERA-nets to a single cofounded call. The work involved in preparing a call for an ERA-net is substantial. Allowing more than one cofounded call per ERA-net, as in the 7th framework programme, makes the effort more worthwhile, mobilises a larger financial contribution and gives the opportunity to cover a broader part of the research field.
- Identify ways to streamline, simplify, and facilitate the call process in P2Ps, based on experience e.g. from existing ERA-nets.

1.7 Success rates and the peer review process

Horizon 2020 is a highly attractive programme. According to the second Horizon 2020 monitoring report the success rate for eligible proposals by 31 December 2015 was only 11.8 %, as compared to 19 % in framework programme seven. Oversubscription was particularly evident in some areas such as Future and Emerging Technologies (FET) with only 3.6 % success rate.

A robust and transparent peer review process in all parts of the framework programme is crucial as a measure to safeguard excellence and maintain confidence in the programme.

VR's recommendations

- Address the low success rate in some parts of Horizon 2020 immediately, using available measures and taking into account that there is no one *ex ante* process that fits all topics. Measures include e.g. two stage calls (with at least 30 percent success rate in stage two and the number of applications invited to stage two calculated in relation to available budget); clearer call texts and criteria, broader topics (possibly published more than once).
- Organise consensus meetings and produce consensus reports for each evaluated proposal. Use video conferences that complement the individual evaluation reports produced by reviewers when there is a heavy application pressure.
- Sufficient and complete feedback is necessary, in both stage 1 and stage 2. Final scores and comments should express consensus and provide information on strengths and weaknesses of the proposal for the benefit of the applicants.
- Introduce independent observers to evaluate the review process.
- Secure transparency in the whole review process.

2. STRUCTURE AND PROGRAMMES

The Excellent Science pillar in Horizon 2020 consists of four programmes which were brought together to enable them to function in a more coherent way: The European Research Council (ERC); Future and Emerging Technologies (FET); Marie Skłodowska-Curie Actions and Research infrastructure (including e-infrastructures).

2.1 The European Research Council

Bold long-term excellent fundamental research must be safeguarded and allowed to develop freely without adjusting to external requirements. It is the foundation for truly disruptive research-based innovation, which in turn is needed to tackle societal challenges and to increase industrial competitiveness in a sustainable and innovative way. In this context the European Research Council (ERC) focusing on “frontier research” is a resounding success. It is a driver of excellence through Europe-wide competition thus delivering European added value. Furthermore, it offers the possibility of benchmarking national research against that of the very best European (and international) researchers and it has had a structuring effect on the European research landscape. A recent pilot study undertaken by ERC states that about $\frac{3}{4}$ of completed projects have resulted in scientific breakthrough or major advance. However, for all its success, ERC in its current form also contains flaws that should be addressed in the next framework programme.

VR's recommendations

- Keep ERC as a central part of the next framework programme with maintained independence and a maintained or increased budget.
- Continue to fund excellent curiosity-driven fundamental research across all scientific fields.
- Continue to give sizeable ERC-grants to the very best researchers thus offering possibilities that are frequently not available at national level. The ERC Scientific Council should determine the optimal grant sizes.
- Increase efforts to attract more excellent researchers from outside Europe to ERC in order to vitalise European research further.
- Simplify the procedure for reporting the outcome of ERCs project.
- Keep the gender equality dimension in focus, both concerning grantees and the composition of review panels.
- Make sure that open access to high quality data and statistics including gender information is readily available.
- Review regulations and formats to facilitate the participation of researchers in low-performing member states without compromising the level of excellence. An example of a necessary change is the removal of regulations hindering salaries to be at competitive levels in low-performing member states.

2.2 Future and Emerging Technologies, FET

Fundamental research is best supported through bottom-up calls, whereas more applied research can be supported through a more focused, programmatic approach. FET, which is geared at future and emerging technologies, should not try to define future technologies but provide support for high risk innovative projects of any field that could provide stepping-stones towards what the future may hold (very focused calls will per definition address already identified technologies). The evaluation of proposals in the FET programme should not only be on scientific excellence but also on the potential for applications.

FET's support for bottom up collaborative technology projects give European added value. However, the programme needs to be revised in order to make it more efficient. FET Open is a very attractive instruments but it needs to be reformed to tackle the low success rates as currently only 3.6% of the applications are funded (Horizon 2020 monitoring report 2015). The relation between FET Proactive and the Societal Challenges and Industrial Leadership pillars needs to be clarified. FET Flagships involve massive amounts of funding both from the framework programme and from participating member states. It is therefore particularly important that this scheme is evaluated to make sure that any future flagships are well chosen and work in an optimal way. Not all research goals are suited for the FET Flagship instrument and it is essential that the selection procedure truly involve member states to secure their strong commitment, not least since they are expected to cover 50% of the cost.

VR's recommendations

- Support bottom up collaborative technology projects in the next framework programme.
- Limit FET to radically new technology and emerging technology in exploratory research topics with high risk.
- Focus on Future and Emerging Technologies in a broad sense and not only ICT related research areas.
- Allocate an increased share of the FET budget to FET Open. This will enable the development of additional truly novel technologies and counteract the acutely low success rates.
- Clarify the relation between FET Proactive and the Societal Challenges and Industrial Leadership pillars in H2020 to ensure that they are interlinked.
- Evaluate the utilisation of the FET Flagship instrument, before initiating new FET Flagships. It is important with transparency and involving stakeholders. Adequate time must be set aside for a thorough analysis of possible topics, alternative instruments and previous experiences.
- Secure a review process consisting of evaluations by individual peer reviewers followed by a consensus meeting. Advanced and robust technical support could potentially complement on site consensus meetings in order to handle the large number of evaluators. The review process needs to be evaluated by independent observers.
- Develop a more transparent process for definition and selection of topics.

2.3 Marie Skłodowska Curie Actions, MSCA

The support for mobility of pre- and postdoctoral students offered by MSCA in Horizon 2020 is a clear success and the programme is highly popular within the research community. The next framework programme should build on this success, prioritising the support for mobility and expanding it to other framework programme parts. The peer review process must be robust and include consensus meetings. Ways need to be found to handle the large amount of proposals.

VR's recommendations

- Expand the mobility programme in the next framework programme to cover most or all of the other framework programme components, including research infrastructures and industry-academia collaborative partnerships.
- Improve the peer review process by letting independent experts evaluate the process. Consensus meetings must be organised and consensus reports produced for each evaluated proposal. Taking into account the large number of proposals advanced and robust technical support will be necessary. This includes e.g. video conferences to secure the possibility of organising consensus meeting and produce

consensus reports (CR) for each evaluated proposal as a complement to the individual evaluation report (IER) produced by external reviewers.

- Implement a scientifically based purchasing power parity factor to replace the correction coefficient calculated by the European commission.
- Monitor researcher mobility continuously to understand better effects on career paths, knowledge transfer and excellence.

2.4 Research infrastructures

The need for advanced research infrastructure is increasing within all academic fields. For Europe to strengthen its position as a leading research area, European researchers need access to the best scientific instruments. This is true within physics, astronomy, medical research, social sciences as well as within the humanities.

Currently framework programme funding is allowed for the design and preparatory phases in the development of new research infrastructures. However, funding is also highly needed to consolidate and operate research infrastructures under establishment, as well as upgrading existing research infrastructures to meet new research challenges and new requirements from researchers and other users. Although sufficient funding is central during all phases, joint European funding has an especially important role to play when it comes to meeting operation costs.

Research is becoming more and more dependent on an efficient and reliable e-infrastructure and the demand for storage, calculation, and archiving of research data is growing rapidly. In order to secure an environment facilitating excellent research the EU should strive to find common solutions within this area in order to avoid sub-optimization of available resources. An important aspect of an efficient e-infrastructure is to develop guidelines and standards for storage and archiving of research data. That is, of all the data generated from an experiment or data collection, identify what data should be stored and made available to the research community and, in a longer perspective, what data should be archived.

VR's recommendations

- Increase the funding for research infrastructures supporting excellent research.
- Set aside funding to consolidate and operate RIs.
- Explore the potential of co-funding research infrastructures jointly by industry and public services in order to further meet increasing demands, possibly through a test round which will then be evaluated before a subsequent call.
- Avoid unnecessary duplication by introducing incentives to promote joint use. Increased cross-border use of research infrastructures is needed and should be developed further, e.g. through the MSCA programme.
- Base academic researcher's access to European research infrastructures on evaluation of scientific excellence in order to secure European research competitiveness and as a driver to increase research quality.

- Develop guidelines and standards for storage and archiving of research data. These guidelines cannot be universal; they need to be developed to support the diverse needs of excellent research within different research areas.
- ESFRI should continue to prioritize needs of research infrastructures at the European level, that is, continue the update of the ESFRI roadmap.
- Let ESFRI evaluate implemented ESFRI projects and ESFRI landmarks. ESFRI should also give recommendations about further funding including putting an end to European joint funding. By doing so ESFRI can play an even more central role in renewing and securing the quality of European research infrastructure.
- Strongly consider actively supporting research utilising high-end synchrotron- and neutron source facilities.

2.5 Industrial Leadership

The Industrial leadership pillar aims to speed up development of the technologies and innovations that will underpin tomorrow's businesses and help innovative European SMEs to grow into world-leading companies. It focuses on Leadership in enabling and industrial technologies (LEIT) and Access to risk finance.

The development of new products is rarely a linear process from the original finding based on fundamental research followed by product and business case development to reach the market. Instead, fundamental research is central throughout the process and continuously feeds into the knowledge base for further developing the concept and reacting to new scientific advances. Fundamental research generating new ground-breaking knowledge plays a foundational role and is essential for creating a sustainable innovation climate. Innovations at the forefront of technology and science appear in a rapid process, which cannot be followed in detail by funders of research and innovation. Since funders may not have the knowledge to pick the future winners it is important to keep open pathways for funding of new innovations and ground-breaking ideas, taking advantage of competitive initiatives in the European Research and Innovation Area. These ideas are often based on scientific break-throughs in fundamental sciences and later transferred to the private sector for commercialisation.

VR's recommendations

- Support fundamental research generating new ground-breaking knowledge to a larger extent than now in the Industrial Leadership pillar.

2.6 Societal challenges and Joint Programming Initiatives

Addressing societal challenges at European level through collaborative efforts has a clear European and global added value. The Lund declaration 2015 outlines four priority areas to speed up solutions to tackling societal challenges: alignment, frontier research, global cooperation and impact. The aim is to bring together resources and knowledge across different disciplines to launch a concerted effort to tackle the challenge-at-hand. This covers

activities ranging from fundamental research to application, all with a clear aim to create impact.

Horizon 2020 has identified the following seven main societal challenges:

1. Health, demographic change and well-being;
2. Food security, sustainable agriculture and forestry, marine and maritime and inland water research, and the bioeconomy;
3. Secure, clean and efficient energy;
4. Smart, green and integrated transport;
5. Climate action, environment, resource efficiency and raw materials;
6. Europe in a changing world - inclusive, innovative and reflective societies;
7. Secure societies - protecting freedom and security of Europe and its citizens.

In addition to the above mentioned seven societal challenges of Horizon 2020, member and associate states run so called Joint Programming Initiatives (JPIs). These are member state driven networks for tackling a specified societal challenge. The 10 current JPIs together cover a broad range of societal challenges but it is important to note that they were developed one by one and not with the overarching aim to cover all contemporary top prioritized challenges. All JPIs have received some degree of support from Horizon 2020, often in the shape of CSAs (coordination support action) or ERA-Net Cofunds.

The following JPIs have been launched to date:

- Alzheimer and other Neurodegenerative Diseases (JPND)
- Agriculture, Food Security and Climate Change (FACCE)
- A Healthy Diet for a Healthy Life (HDHL)
- Cultural Heritage and Global Change: A New Challenge for Europe
- Urban Europe - Global Urban Challenges, Joint European Solutions
- Connecting Climate Knowledge for Europe (JPI Climate)
- More Years, Better Lives - The Potential and Challenges of Demographic Change (MYBL)
- Antimicrobial Resistance- The Microbial Challenge - An Emerging Threat to Human Health (JPIAMR)
- Water Challenges for a Changing World (JPI Water)
- Healthy and Productive Seas and Oceans (JPI Oceans)

In addition to the above, there is a proposal on the table for initiating an 11th JPI on migration, migrants, and integration but it is not at all clear at this point if there will in fact be additional JPIs.

The societal challenges as defined in Horizon 2020 are very broad compared to the JPIs, which typically are more focused and mission-oriented in scope. JPIs are comprehensive multinational collaborations that aim to augment the research and research impact within a defined societal challenge, constituting a mechanism for strengthening the connection between fundamental research and innovation. The JPI format represents an opportunity for member states to address quite specific challenges for which there is a clear European or even international added value. All JPIs have developed strategic research (and innovation) agendas with an array of specific targets, thus enabling any required degree of specification.

The fact that JPIs can utilise P2P funding instruments from Horizon 2020 as central components of their operations creates a connection between them and the seven Horizon 2020 Societal Challenges. Maybe the clearest such connection exists between the first societal challenge “Health, demographic change and well-being” and the two JPIs JPND and JPIAMR. The Health Challenge has funded both CSA’s and ERA-Net’s for these two JPIs, thus pursuing its own aim by supporting JPI activities.

VR’s recommendations

- Maintain a strong focus on broad societal challenges.
- Build the programme on the Lund Declaration 2015 principles and in a more coherent way incorporate and relate to other ERA initiatives and stakeholders.
- Secure a transparent process for how challenges are defined and instruments are selected and how member states are involved.
- Coordinate the various challenges in the framework programme in order to promote synergies between them.
- Continue to support joint programming activities such as the Joint Programming Initiatives (JPI) and consider these when structuring the efforts to tackle societal challenges.
- Strengthen demand-driven SSH research in order to contribute to a solid evidence base and the development of novel approaches for supporting the formulation of evidence-based policies.
- Utilize foresight studies and the Strategic Research and Innovation Agendas (SRIAs) developed by JPIs, ERA-Nets and specific topic European consortia to identify prioritised challenges, call topics etc.
- Design funding instruments for the task of tackling societal challenges. This should include long term support for both fundamental and applied research, as well as interactions with end-users.
- Cater for contingency and flexibility to tackle unexpected challenges.
- Continue to support the integration of different research disciplines in order to come up with solutions to the complex challenges facing us.
- Capitalize on multinational register data as a unique and a cost-effective resource with great potential to produce knowledge contributing to answering research questions addressing grand societal challenges and increasing European competitiveness.

2.7 Science with and for Society, SwafS

Science with and for Society has been part of European science policy since 2001, first as ‘Science and Society’ (FP6), then as ‘Science in Society’ (FP7) and since 2014 in Horizon 2020 as ‘Science with and for Society’(SwafS). This attention to science and society has been coupled to an increasing shift of European science policy towards addressing societal challenges, thus strengthening the bonds between science and society and Responsible Research and Innovation (RRI). The specific objective of "Science with and for society" is to

build effective cooperation between science and society, foster the recruitment of new talent for science, and pair scientific excellence with social awareness and responsibility.

The Horizon 2020 Annual Monitoring Report 2015 shows that the EU budget allocated to successful projects in SwafS actions represents 0.6% of the Horizon 2020 budget allocated to calls.

The highly limited SwafS budget is insufficient to cover a broad range of issues, which partly coincide with cross-cutting issues: science education, gender equality, integration, engagement and involvement of society in R&I, Open Access and Open Science, governance of Responsible Research and Innovation (RRI), knowledge on science communication. All these issues are most important and need to be continuously addressed in other parts of next framework programme. SwafS on the other hand should consolidate its effort to two main issues: methods for integration of different stakeholders and interdisciplinary actions in challenge based research and innovation, including end-users, and methods for measuring knowledge exchange and societal impact.

There is a growing interest for public engagement, open science and open innovation (the two latter forming part of Moedas' "three Os") at the European level. The next framework programme should prioritise developing methods for co-creation and end-user involvement according to the RRI principles in projects financed to tackle societal challenges. Efforts should also be made to finance the development of tools to measure societal impact.

VR's recommendations

- Give the successor of SwafS a narrower scope and focus on the following two issues:
a) support methods for integration of different stakeholders and interdisciplinary actions in challenge based research and innovation which includes end-users, and b) support actions for developing methods for measuring knowledge exchange and societal impact.

2.8 Fusion

The research and educational programme Euratom covers nuclear energy, including fission and fusion. In this text, only fusion is dealt with. The fusion programme differs profoundly from earlier framework programmes, being more similar to other parts of Horizon 2020, although keeping some unique characteristics. It is more focused than it was in framework programme 7, both generally and at work package level. Fundamental research has less support than previously. A unique feature is EURO fusion, a consortium formed by all EU member states. EURO fusion is governed by a consortium agreement and its coordinator (Institut für Plasmaphysik, Garching, Tyskland) manages the contacts with the European commission. Broadly speaking, the fusion programme has two foci: ITER, which is planned to be commissioned in 2025, and DEMO which will be constructed after ITER. The purpose with ITER is to test the viability of fusion as large-scale energy resource, whereas DEMO should deliver power to the grid and be the last step prior to a commercial reactor. An interim evaluation of the whole Euratom programme will be completed in 2017.

The new structure of the fusion programme and its organisation of activities have not yet been consolidated, particularly within the EURO fusion consortium, but it seems to be developing in the right direction. The set up with work packages and related boards (which is new for the fusion programme) stimulates participation.

VR's recommendations

- DEMO is too dominant in the present phase of the programme. The construction of DEMO will be based on the experiences of ITER, but there still are uncertainties regarding the design of ITER. Accordingly, it seems more profitable to put more focus on ITER and thoroughly investigate different ITER scenarios in order to obtain a better generic understanding of these.
- Address some of the internal procedures within the EURO fusion consortium that still are unnecessarily complicated, e.g. the reimbursement levels.

3. ISSUES TO BE MAINSTREAMED THROUGHOUT THE FRAMEWORK PROGRAMME

3.1 Ethics and research integrity

All proposals above the threshold and considered for funding in Horizon 2020 undergo an ethics review carried out by independent ethics experts and/or qualified staff working in a panel. The review starts with an ethics screening, and if appropriate a further analysis called the ethics assessment is conducted. The ethics review can lead to ethics requirements that become contractual obligations.

High research integrity and unconditional observance of ethical standards and good research practices is crucial for all actors in the R&I system. Society's trust is a prerequisite for research to contribute to the European development and welfare. These conditions must be based on a common understanding and on agreement on the principles that should apply and need to be regulated in a system for handling misconduct in research and innovation.

VR's recommendations

- Continue the focus on research ethics in H2020 and give applicants further education on how ethics rules and guidelines should be handled practically in projects.
- Support knowledge sharing between member states on ethics and research integrity using for example a Mutual Learning Exercise in the last part of H2020.

3.2 Gender equality and the gender dimension in research

Gender equality is a cross-cutting issue that concerns all parts of Horizon 2020. Three main objectives underpin the strategy on gender equality in H2020:

- Fostering equal opportunities and gender balance in research teams, in order to close the gaps concerning the participation of women;
- Ensuring gender balance in decision-making, in order to reach the targets of 40% of the under-represented sex in evaluation panels and expert groups and 50% in advisory groups;
- Integrating the gender dimension in research content, taking into account relevant biological characteristics as well as social and cultural features of both women and men in research (sex and gender analysis).

The Horizon 2020 monitoring report of 2015 concluded that most of the Horizon 2020 work programmes have made some progress (from 2014 to 2015) in terms of having a more systemic approach to the integration of the gender dimension in research and innovation content. However, it will be important to continue and improve this approach over the coming years of Horizon 2020, with a view to improving the quality of research and its relevance to the whole society.

The 2015 monitoring report also states that gender balance in decision-making bodies has improved and for Horizon 2020 Advisory Groups it has been fully achieved. Gender balance for experts evaluators is about to be achieved, despite the lower presence of women among registered experts.

VR's recommendations

- Continue to fund networking actions to support the development of gender equality efforts in research beyond the planned Gender ERA-net within the SwafS programme.
- Include funding for the integration of the gender dimension in R&I content, i.e. Objective 3 in the Horizon 2020 Gender Strategy.
- Connect the gender perspective to the major challenges, e.g. Migration and gender equality; Health/care/social services and gender equality, and/or Education and gender equality.

3.3 International cooperation

Cooperation with countries outside the European Union is an important means to strengthen European research. Europe needs to attract the world's best researchers and innovators as well as private sector investment and European initiatives can play an important role in this respect.

Europe also needs to connect with partners around the world, in advanced, emerging and developing countries to address societal challenges in partnership. The Joint Programming Initiatives represent a successful mechanism for this. Several JPIs now have members from the Americas and Asia. India has applied for membership of JPIAMR. International partners can be door openers to broader cooperation, not least with developing countries. Such cooperation can support the European Union's external and development policy objectives through building bridges with emerging and developing countries thus contributing to their capacity building. International cooperation should be in line with the United Nation's sustainable development goals.

The share of third country participation has fallen from 4.9% under FP7 to 2.4% in Horizon 2020 for collaborative grants signed before 1 September 2016.⁴ The H2020 financial contribution to third countries (non EU-28 and non-associated countries) was 0.7%. This needs to be addressed.

VR's recommendations

- Address the drop in international cooperation through renewed efforts to encourage third countries to set aside matching funds, thus also ensuring full commitment of these countries.
- Create dedicated calls in partnership with organisations in emerging and developing countries when appropriate.
- Encourage the use of framework programme project funding to support the inclusion of partners in third countries.
- Learn from ongoing collaborations, like the European & Developing Countries Clinical Trials Partnership (EDCTP), when further developing modes of international cooperation.
- Use other means than framework programme funding to support capacity building in developing countries, such as better utilising and linking to existing development programmes.

3.4 Open Science

Open Science was one of the concepts launched by commissioner Moedas in 2015 (one of Moeda's "three Os"). A fundamental part of open science is open access to research results, including scientific publications, research data and other sorts of research output. A transition towards open access to research results is likely to change the landscape for all actors in the research system, as well as for publicists.

3.4.1 Open access to publications

Open access to scientific publications is required in Horizon 2020. A wide dissemination of an expanded range of scientific information benefits not only science itself, but also society as a whole, including the business community. It also gives a better return for the parties that fund research.

The 14th of September 2016 the EC presented its legislative proposal to update the EU framework on copyright, which include the much-needed mandatory exception for text and data mining. As is stressed in the Council conclusions, adopted on 27/05/2016, incentive mechanisms need to be put in place to reward researchers for sharing the results of their research. The conclusions state that assessing scientific quality should be based on the work

Horizon 2020 monitoring report 2015

⁴ 7th FP7 annual monitoring report 2013

itself, while current focus is on indicators based on the impact of journals. Journals with a high journal impact factor are often not open access, but subscription based. As a result, the reward system is not compatible with the open access target.

VR's recommendations

- Propel the developments regarding copyright by introducing licensing systems (Creative Commons/CC) as a precondition in the framework programme.
- Explore the use of so-called alternative metrics in the framework programme to improve the assessment of aspects such as the impact of research results on society.
- State how openness will be rewarded in framework programme career development.

3.4.2 Open research data and the importance of data management

The rapidly increasing amount of research data from different sources is an important driver of new knowledge and collaborations. For Europe to take maximum advantage of this new era, efforts are needed to secure adequate technical infrastructures and human knowledge for analysing, curating, long-term preservation and dissemination of research data. A major challenge for the next framework programme will be to address the rapidly increasing volumes of research data from all scientific disciplines. Some aspects of this challenge are generic and arise in fundamental as well as in applied science. Other challenges are specific for some fields, e.g. handling of personal data.

Open access to data generated through publicly funded research is an important step in the transition towards open science. Open access to research data has huge potential to be used as a foundation for new research in academia as well as in SMEs, industry and the public sector. However, there are several difficulties (technical, legal and cultural) that need to be overcome before open data can be fully realised. There are also substantial costs associated to open data and this needs to be addressed through dedicated funding in Horizon 2020. It is important that research projects and data-generating research infrastructures plan for proper data management already from the start and include costs for this in their budgets (if it is not funded from elsewhere).

The European Open Science Cloud (EOSC) proposed by the Commission in a communication in April 2016 may address the challenges described above, i.e. dealing with the data deluge and making data open. Sweden supports the consolidation and federation of e-infrastructures proposed in the communication, as well as the effort to drive development of standards. Reducing the current fragmentation among e-infrastructures and digital services in Europe benefits research by making the research process easier and by removing barriers for cross-border collaborations. To this end, it is important to make sure that EOSC is global and not only European. The Swedish Research Council foresees that Sweden's participation in EOSC will be through participation by national research infrastructures, i.e. any funding goes to national research infrastructures, which in turn participate in EOSC.

VR's recommendations

- Fund development and operation of tools and infrastructures for all aspects of data management (i.e. analysis, curation, preservation and dissemination) in the next framework programme.
- Fund costs for using tools and infrastructure for all aspects of data management (i.e. analysis, curation, preservation and dissemination) within a research project.
- Make the inclusion of information on open data handling and related costs mandatory in proposals in the next framework programme.
- Costs for projects and research infrastructures, where generated data is to be made openly available, should be included in the initial budget and be eligible costs in the framework programme.
- Facilitate collaboration between scientists with domain knowledge (i.e. specific scientific fields such as biology and astronomy) and researchers in mathematics and computer science in order to develop better tools and methods for advanced data analysis and development of digital tools This is a key task for the next framework programme which can give EU added value.
- The main purpose for EOSC should be to support research with adequate e-infrastructures and digital services of high quality in a cost-effective way.

3.5 Social sciences and the humanities, SSH

Social sciences and the Humanities (SSH) is a tremendously broad concept that includes diverse disciplines like for instance law, educational science, economy, anthropology and the arts. Horizon 2020 has integrated SSH as a cross-cutting issue across the framework programme and SSH is also a key component of Societal Challenge 6. In contrast to the approach in the 7th framework programme where SSH had its own dedicated programme and budget line, Horizon 2020 aims at fully integrating SSH in a systematic and strategic way in each of its priorities.

According to the second monitoring report on the integration of social sciences and humanities in Horizon 2020⁵ the SSH-flagged topics in 2015 remain stable compared to 2014. The report also concludes there is room for improvement. There are obvious concerns regarding the integration of SSH in some Societal Challenges and in the Leadership in enabling and industrial technologies (LEIT) part of the programme. Some disciplines are well represented but others are not. This is particularly the case for the humanities and the arts. Furthermore, the SSH partners and coordinators in the 2015 projects are concentrated in a few countries (almost 50% of the SSH partners and nearly 75% of SSH coordinators are established in only five EU member states). To address these issues and to meet the concerns of the SSH and STEM communities, efforts are being made to improve the SSH integration in the work programmes for 2018-2020. Suggested improvements are among others to improve the quality of topics, enhance evaluation procedures and step up communication efforts.

⁵ Integration of social sciences and humanities in horizon 2020: participants, budget and disciplines 2nd Monitoring report on SSH-flagged projects funded in 2015 under the Societal Challenges and Industrial Leadership priorities, Directorate-General for Research and Innovation

As noted above the integration of social sciences and humanities could be improved and still represents an unexploited potential. Many of today's societal challenges are increasingly cultural in nature requiring the involvement of humanities research to achieve sustainable solutions. The ultimate goal should be to make SSH research perspectives an integral part of the development process for new work programmes within the framework programme.

VR's recommendations

- Increase support for SSH-research. A strong science base within the field of SSH is crucial for addressing societal issues and for commercialisation of products and services in a sustainable way.
- Acknowledge the need for contributions from the many different disciplines within the SSH field to generate new knowledge, support evidence-based policymaking, develop key competences and produce interdisciplinary solutions to both societal and technological issues.
- Include SSH experts in the drafting of work programmes and in advisory groups. SSH involvement should remain throughout the process including the final evaluation phase.
- Broaden significantly the range of SSH disciplines to contribute to topic texts of future work programmes. Some disciplines are widely represented whereas others are all but invisible, particularly the humanities and the arts.
- Encourage researchers to involve SSH from the onset of a project's problem formulation phase and on occasion have SSH partners taking lead in this process.
- Include SSH experts in the evaluation panels for topics with SSH dimensions. This is key for successfully integrating SSH.⁶

3.6 Interdisciplinarity

Interdisciplinary research is not an end in itself, but plays a crucial role in the development of future knowledge and completely new fields of science. Society needs interdisciplinary solutions to the complex challenges that face us and the framework programme has an important role to continue supporting the integration of different research disciplines.

Register based research is often cross-disciplinary in nature and multinational resources of databases and biobanks etc. should be utilised to a larger extent. Such data have great potential to produce knowledge in a cost-effective manner and to contribute to answering complex, interdisciplinary research questions. The framework programme should capitalize on this opportunity.

Social sciences and the Humanities (SSH) play a central role in developing interdisciplinarity. The perspectives of economists, geographers, sociologists, demographers, political scientists,

⁶ EC (2015). Integration of Social Sciences and Humanities in Horizon 2020: Participants, budget and disciplines. Monitoring report on SSH-flagged projects funded in 2014 under the Societal Challenges and Industrial Leadership. Next report due in November 2016.

anthropologists, historians and literary scholars – just to mention a few – are crucial for the analysis of institutions in society and for how individuals interact with their surroundings.

VR's recommendations

- Support register based research that connects various disciplines.
- Continue to integrate stakeholders, public sector, industry and end-users with different research disciplines, not least social sciences and humanities research.