

First reflections on the EU's next research framework programme

1. The EU's future research framework programme: A clear focus on research

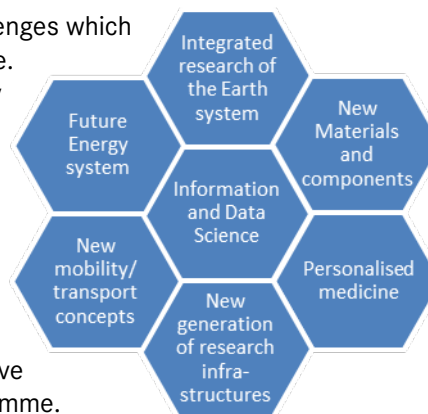
In looking towards the future of research in Europe the Helmholtz Association emphasizes the outstanding importance of the EU programmes. Research is a brilliant and tangible example for true and effective European collaboration. Further, research is a key element to boost EU competitiveness and is vital for finding solutions for grand societal challenges. Investing in research is of high strategic relevance for the future. The Helmholtz Association strongly urges to come back to a clear focus on funding research activities and to support highly gifted scientists in order to enable research to be the true frontrunner for innovation.

The Helmholtz Association expects the next EU research framework programme to tackle most urgent societal needs which will clearly benefit from the European research arena. It should unlock the full potential of the new challenges and opportunities concerning the management of data which leads to innovative knowledge and information management.

2. The EU's future research framework programme: Key research areas

The EU has to cope with a huge number of political but also scientific challenges which necessitate a sustainable development of an enduring research landscape. Enormous common requirements as societal wealth and circular economy including environmental protection are at the forefront of research issues. The EU needs to finance the best research approaches and excellent researchers need the best partners to provide systematic solutions. Therefore scientific excellence has to remain the most important criterion in the next research programme.

The Helmholtz Association has identified seven key research areas considered of highest strategic relevance for the coming years. These areas can also, for their high impact and relevance for a resilient future, serve as basis of the research agenda for the next EU research framework programme.



a) Information and Data Science

In the digital age “Information and Data Science” has acquired a central role and is enabling all research areas. On the one hand it is essential for the provision of world-class instruments and infrastructures for high-performance computing and for the management and analysis of big data (e.g. with machine and deep learning) for science, engineering and production in Europe. On the other hand “Information and Data Science” is important to explore the fundamentals of new technologies (e.g. quantum computation) and strategies for a future green ICT. Here, the focus must lie on the development of highly energy-efficient concepts and processes for the storage and processing of information.

b) New Materials and Components

For future technologies it is essential to design, control and manufacture materials on different time and length scales in order to realise systems with new and appealing functionalities. By means of application-orientated basic research in the fields of soft matter and life science it is possible to develop knowledge-based solutions for disease therapy. In material science major challenges include the realization of components of low weight, high mechanical performance, and the implementation of multifunctional properties. Furthermore, the full potential of materials with structural dimensions of only a few nanometres has still to be discovered. All these new components in turn play an essential role for all research fields.

c) Future Energy System

The aim is to develop solutions to secure an economically, ecologically and socially sustainable and reliable supply of energy including safe disposal and treatment of wastes, residues and emissions. One important goal is to replace fossil fuels and nuclear fission with sustainable climate-neutral energy sources. The main focus of a European research agenda should be on fields supporting this energy transition in a system oriented approach. This includes renewable energies, energy efficiency, storage, grid technologies, fusion as long-term option as well as the consideration of related economic and social aspects.

d) Integrated Research of the Earth System

The global goal is to understand the system Earth to ensure that our planet remains ecologically stable and the climate equilibrium is not destabilised. Considering the complexity of the Earth System, integrated models building on comprehensive observational data sets and encompassing all components of the Earth System are the key to tackle Earth System challenges. A new systemic approach from data collection to information extraction and creation of knowledge and outcomes is necessary. This knowledge can be used for scientific evidence-based policy recommendations to enable the society and economy to cope with the complex challenges brought about by changes in the Earth System.

e) Personalised Medicine

“Biomedical health research” is one of the key elements of EU research. It contributes to reducing in particular the burden of common diseases for the benefit of patients and society. “Health research” especially in the context of personalised medicine unravels the complex molecular causes of diseases and, based on this, develops novel targeted strategies for their prevention, early diagnosis and therapy. All research is pursued in the mind set of translational research from “bench to bedside” and “bedside to bench”. Handling and analysing complex data sets plays an increasing role for personalized medicine research. Through its focus on the unique, individual characteristics underlying disease, personalised medicine can lead to more effective therapies, and thus has a remarkable impact on society through value creation, knowledge transfer and more efficient health care systems.

f) New Mobility/ Transport Concepts

The key focus of European research has to be on the optimisation of the transport system as a whole, to make best use of the different transport modes for an integrated, efficient, robust, sustainable and competitive transport system. Therefore, particularly intermodal connections between automotive, rail and aviation have to be addressed and technology development amongst and within modes promoted. Another crucial issue is to reduce the environmental impact of transport by fostering innovative decarbonisation, taking into account the different preconditions of the different transport modes as e.g. different development cycles and safety requirements.

g) New Generation of Research Infrastructures

Research Infrastructures (RI) are of paramount importance for a competitive research and innovation landscape in Europe. They also serve as platforms for a vivid exchange between talented European scientists. Close collaboration of research infrastructures on technological challenges is key to remaining at the cutting-edge on a global scale. A more coordinated approach between national funders will speed-up the process of setting-up new RI. Making existing RI accessible across the EU leverages the research and innovation potential of the newer member states and avoids duplication when conceiving new RI. The growing number and diversity of pan-European RIs together with the need of more coordinated approaches to operate world-class RIs in Europe interfere with the very limited Horizon 2020 RI budget.

3. The EU's future research framework programme: Research made in the EU

The European Union comprises an excellent research potential and a longstanding research tradition that interlinks thousands of European researchers. Its diverse research landscapes advance at varying speeds but are united in the European Research Area. Better **bridging the gap** between regions is one of the major political challenges for the coming years, and effective partnerships between research institutions can be one key. One of the strengths of European research framework programmes is that they are the tangible EU-wide commitment to foster a European Research Area which is open for all Member States to participate, and stronger synergies between the framework programmes and Structural funds should support this openness.

The EU is the home of many of the most prominent researchers in various scientific disciplines. Key research areas with a European added value should be pushed forward to better connect the national efforts in these research fields. The EU could increase its performance significantly by strengthening the **long-term cooperation** and research programme development between main European research stakeholders.

Research is the engine of new developments and knowledge in the EU. Therefore, research made in the EU needs a strong commitment for ensuring the future wealth of the EU and its long-term sustainability.

4. The EU's future research framework programme: Recommendations for 2021- 2027

In order to find solutions for global challenges, Europe needs to bring together the best research and innovation stakeholders, capacities and knowledge across Europe. To exploit the full EU research capacity, the Helmholtz Association highlights the following recommendations for the future EU research programme:

a) Financial Aspects

The Helmholtz Association appreciates Horizon 2020 as reliable instrument to foster the European Research Area and to ensure Europe's competitiveness for the years to come. The EU research framework programme has to remain an attracting funding opportunity for activities allowing a clear European added value. In view of the global competition Europe is facing and the massive funding increase in R&D notably in Asia, however, it would be dangerous to remain at the same level while other economies are stepping up.

- **The Helmholtz Association recommends providing at least €100 billion for EU's future research framework programme. This budget should be dedicated to civilian research.**
- **A programme for defence research should not be part of the next EU research framework programme.**

The Helmholtz Association is seriously concerned about the tendency to finance research via loans. Many relevant players are not addressed by these instruments since public research organisations in many Member States are not allowed to take out loans, and only the end of the innovation chain is addressed.

- **The next research framework programme should primarily remain focused on co-funding, not on loans.**

b) Funding Aspects

The enormous **oversubscription** in the first calls of Horizon 2020 shows the need for research funding in the EU. The very low success rates, however, threaten to discourage the targeted top scientists from submitting. A decrease from a success rate of 1:5 in FP7 to 1:8 in Horizon 2020 is a risk to the quality of the programme and a waste of resources, since many excellent proposals could not be funded. Such an extent of oversubscription needs to be prevented for the future.

- **Stronger focus for calls and topics, the efficient use of two stage-calls or the reintroduction of pre-proposal checks could diminish oversubscription.**

The European added value is greatest where synergies within the EU offer new possibilities. This is most tangible where big challenges require the joint forces of competences found in Europe: In Horizon 2020 pillar II (Leadership in Enabling and Industrial Technologies) and III (Societal Challenges), **collaborative research projects** bring together the best scientists as well as the most innovative enterprises in Europe, and integrate skills and competencies across disciplines. This is unique and a real benefit for the European Union. In order to find solutions for global challenges Europe need to bring together the best research and innovation stakeholders and capacities and knowledge across Europe. As this cannot be funded via national programmes the framework program is the best instrument to foster European collaboration amongst all types of stakeholders (industry, SMEs, research organisations, academia).

- **Thus collaborative research should continue to be the core of the next framework programme.**

The structure of Horizon 2020 is adequate and well-known. The ever-increasing number of organisations responsible for implementing Horizon 2020 (JTI, P2P etc.) is a problem growing over time and adding to the complexity of the **funding landscape**. Researchers need stability concerning the research conditions such as funding instruments. The mid-term review of JTIs should be used to review their number, keeping only the most efficient ones. Joint Programming Initiatives, ERANETs and ERANET COFUND actions should be evaluated in the same manner.

- **The number of instruments should be streamlined or actively reduced.**
- **The structure of Horizon 2020 should be maintained.**

Collaborative research in the next framework programme would be even more efficient if it covered the **whole innovation chain** instead of focusing very strongly on applied research. The next framework programme has to recognize that a special relevance lies in ground-breaking new ideas and their applications for research results which emphasize the significance of the first part of the innovation chain.

- **Europe needs the game changers which arise from completely new approaches, mostly in Technology Readiness Levels 1 - 6.**

c) Innovation and Impact

There is a need to broaden the concepts of innovation and impact beyond market-orientation when discussing the future of research in the EU. Ground-breaking innovation will quite often take more than 10 years to bring tangible results, and its potential impact is on sales figures, but also on everyday life, e.g. more intelligent traffic management or better flood warnings. Long-time perspectives as well as innovation in societal and research aspects have to be taken into consideration when drafting the new research framework programme. A stronger focus beyond industry and economy, notably on the United Nations Sustainable Development Goals, will increase the impact of FP9 on scientific innovation and on the challenges our society is facing. Europe needs to be more active in securing a good standard of living for its citizens.

- **It is necessary to clearly define the next research programme in a long-term global context in due consideration of the sustainable development goals as reflection basis.**

5. The EU's future research framework programme - main recommendations:

- Reliable budget dedicated to civilian research of at least €100 billion – investments in research are key for solving societal challenges and for ensuring Europe's competitiveness and wealth
- Focus on collaborative research – the EU research programme should concentrate more on novel ideas and game-changing research and less on fine-tuning technologies close to the market
- No big changes in structure, rules and instruments – stability is the key for maximum EU competitiveness by concentrating on excellence and not on administrative aspects
- No extensions of loans – they have limited scope and co-funding works better for research projects
- Innovation is more than market rollout and impact can mean a better flood-warning system – there is a need of more sophisticated, broader definitions to assure "FP9" can fulfil its whole potential impact

The Helmholtz Association is looking forward to an active involvement of the European research stakeholders in developing the EU's next research framework programme.

These first reflections will be complemented in the coming months by more detailed Helmholtz publications concerning the EU research landscape at www.helmholtz.de/eu-positions.

The Helmholtz Association has communicated key messages on Horizon 2020 in the „Position Paper on the interim evaluation of Horizon 2020“ ([link](#)).

Brief portrait of the Helmholtz Association

The Helmholtz Association contributes to solving major challenges facing society, science and the economy with top scientific achievements in six research fields: Energy; Earth and Environment; Health; Key Technologies; Matter; and Aeronautics, Space and Transport. With some 38,000 employees in 18 research centres and an annual budget of more than €4 billion, the Helmholtz Association is Germany's largest scientific organisation. Its work follows in the tradition of the great natural scientist Hermann von Helmholtz (1821-1894).

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