

Guidelines for the Realignment of the European Research Area 2020

A contribution by the Helmholtz Association

The Helmholtz Association sees an important opportunity for strengthening the performance of research and innovation in Europe through the discussion on the review of the European Research Area (ERA). It is vital to strengthen the role of research and innovation as key parts of Europe's economic model for the highly competitive times that will follow the Covid-19 pandemic, but also to prepare Europe for new challenges that lie ahead.

The current crisis has shown both the strengths and weaknesses of the ERA under a burning glass. Therefore, the EU should use the lessons learned from research activities related to Covid-19 to draw conclusions going forward. Europe needs to reassure its citizens that it will start preparing for new challenges by expanding research capacities, building ecosystems for key enabling technologies and lessening the administrative burden for researchers.

It is equally important to position research and knowledge as key parts of European identity. Helmholtz is prepared to contribute to this task not only with its competence in research infrastructures, but also with its comprehensive expertise in Grand Challenge topics such as Climate, Cancer/Health, Energy Systems, Mobility, AI Applications, High Performance Computing (HPC), as well as Quantum Technologies incl. Quantum Computing, as represented in the current priorities of the EU, notably the Green Deal and a Europe fit for the digital age.

Helmholtz agrees that a renewed ERA can only succeed on a systemic level if the EU Member States truly commit to strengthen its future viability – the implementation of the Lisbon Treaty's 3% target (GDP share to be invested in research and innovation) in every Member State is an important prerequisite for building and strengthening efficient national research systems. In this respect, Helmholtz supports the view of the European Research and Innovation Area Committee (ERAC), which in its report has identified the need for a leveraged investment in research. Research and innovation must again become a key item on the agenda of Heads of State and Government.

Structural elements of the ERA

The framework conditions of the ERA must be strengthened in order to enable the European Union to tackle various global challenges and to play an important role in forming the major scientific breakthroughs of tomorrow and beyond.

To achieve this, two approaches need to be combined more efficiently than they are today:

- The **EU Framework Programmes for Research and Innovation** – at its core – needs to facilitate European *collaboration* in research again. As far as fundamental research is concerned, there has been much emphasis in recent years on funding frontier science primarily through the ERC, while reducing the role of frontier research in collaborative settings. This weakens the framework programmes in one of their essential roles: creating synergies in research on all levels of the value chain, from fundamental to applied research. To strengthen the ERA, the focus needs to revert also on joint, long-term research endeavours on Grand Global Challenges starting from low Technology Readiness Levels (TRL), and moving systematically to higher TRL up to 6, ideally in collaboration with different suitable partners as an initiative moves from low to higher TRL. The Framework Programmes also should focus more on improving cooperation on research infrastructures (RI).
- The **conditions for research cooperation between the Member States** beyond the EU programmes need to become more effective and flexible.

ERAC Priority 1 (“Framework conditions for the production, circulation and use of knowledge, including research career issues”)

From Helmholtz’ point of view priority 1 is particularly relevant:

a) Helmholtz sees a strong potential for an improved cooperation in the field of research infrastructures, which must be an essential part of the first "potential intervention area". World-leading excellent research is not possible without high-performance computers, research aircraft and vessels, weather stations, wind tunnels or particle accelerators. The European benefit deriving from better coordination in this area is clear: It would allow Europe to provide a more competitive landscape of excellent facilities to its scientists and innovators, which will also attract talents from across the globe. Research infrastructures and standards for interoperability of research data also form the basis for open science, which in turn is needed to create maximum return for public investment.

A powerful ERA requires

- support for more transnational access to national and regional infrastructures in Europe (e.g. supporting EU access to the polar vessels operated by some Member States rather than obliging each Member State to build their own icebreaker). There are many RI in Europe which are not set up at European level and therefore are not covered by the European Strategy Forum on Research Infrastructures’ (ESFRI) roadmap, but which are of high European relevance.
- improved networking between national RI, e.g. in order to strengthen interoperability or enable better autonomous measurements through joint technology development.
- efficiently coordinated technology development roadmaps for specific research areas led by RI.
- a more efficient, joint coordination regarding the selection and construction of new pan-European RI as well as appropriate joint funding and governance mechanisms for them to be implemented within ESFRI. The fact that many ESFRI projects take considerably longer than ten years to become operational clearly shows the need for action.
- the establishment of a true European ecosystem for applied research in the field of HPC and Data Science on topics such as novel diagnostic tools, decision supporting models, predictive modelling and simulation as well as research data sharing platforms (see also paragraph b)
- the possibility to adapt to change when and where necessary through the reduction of unnecessary administrative burden for all programmes at EU level, including personnel related matters.
- free circulation of scientists, knowledge and technologies.

Proposed fields of action:

- Strengthen the cooperation of national RI funders and RI operators in joint technology development (see Annex under 1. “Better access to better research infrastructures in Europe”).
- Detail the mandate of ESFRI to be able to act faster and with more impact widening its scope also to research infrastructures for applied research.
- Strengthen the cooperation of national RI operators in strategically relevant thematic areas with the aim of developing coordinated thematic roadmaps for large national RI (such as the ESFRI report on neutron sources or the related activities under AstroNet) and support both flexible and targeted programmes. These would also allow for rapid action in times where research plays a key role, as shown during the Covid-19 pandemic. In this context, national and regional RI can play a decisive role if they are well coordinated.

- Continue the support for activities developing interoperability standards needed for open science, such as the Research Data Alliance.
- Harmonise open access policies of Member States and encourage such harmonization by European research funding and performing organizations.

b) Helmholtz also sees the need to advance and implement fully functioning **e-Infrastructures in the European Research Area** at various levels

- In just three decades, High Performance Computing (HPC) has fundamentally changed the way scientists do research, drive innovation in industry and grow as a society. Today we are on the verge of a new era in terms of computing and data processing capabilities: the Exascale era. Exascale offers its users a gigantic computational power that will make it possible to analyse large volumes of data, which has not been possible before. At the same time, Artificial Intelligence (AI) is undergoing rapid development and now requires similar data and computing capabilities. In addition, there are forthcoming technologies (such as quantum computing and neuromorphic computing systems) that would offer completely new paradigms in computing and allow to explore other very complex research challenges that cannot be modelled using state-of-the-art e-infrastructures. We strongly propose to position quantum technologies at the forefront of the European research agenda.
- Therefore, new solutions are necessary for the exchange, analysis and handling of large heterogeneous data sets at European level. To address this challenge, tailor-made “cloud” web services should be implemented for specific research communities. For all this, Europe and its Member States should strongly invest and promote the deployment of technology based on the most flexible hardware composability, taking advantage of the expertise developed at European level in initiatives like FENIX, which is a federated European research cloud in operations right now. An ideal cloud infrastructure should go far beyond the tools currently implemented in the EOSC portal; it should have services of transversal character across user platforms and permit to represent any kind of software services on top of the infrastructure. It should also allow for a distributed but maximally collaborative use of heterogeneous computing and data resources, ensure state-of-the-art cyber security, and permit anonymization of data (e.g. medical data, insurance data, etc.).
- The European Open Science Cloud (EOSC) initiative develops an important Europe-wide infrastructure to support data-driven research. An EOSC can be a success if its elaboration is guided by science. This means that the technical benefit is in the foreground and users are adequately represented in all decision-making structures of an EOSC. At the same time, existing national structures and current developments like the “Nationale Forschungsdateninfrastruktur” (the German Research Data Infrastructure, NFDI) or Services like re3data - the global Registry of Research Data Repositories - need to be integrated in the EU activities.
- In addition, data self-determination, data privacy and ownership, data encryption, and data security are of high systemic relevance for both research and industry in Europe and should be further promoted and supported as key issues. Researchers; industry and the society as a whole depend on digital solutions that use a large amount of confidential and / or private data. At the same time, this also highlights a potential weakness as long as cloud services as mentioned above are not operational in Europe.
- Green IT provides sustainable solutions to the digital infrastructure, both to manufacturing of hardware and to sustainable data centres, based on low-energy cooling concepts.

c) Helmholtz also sees further great potential in the area of improved **cooperation between national research programmes and activities** at various levels

- Large, ambitious initiatives such as the former flagship projects are particularly suited to develop ambitious world-leading initiatives, which contribute to the attractiveness and visibility of the renewed ERA and, through a concerted action in selected thematic fields, to achieve results that would not be feasible at national level. Such instruments must be expanded and strengthened (see Annex under 3. "Joint large-scale strategic research endeavours in a renewed ERA").
- In addition, the ERA-Net scheme should be kept and yet needs to be significantly improved to provide flexible funding frameworks that allow for a variable geometry and to react quickly to new priorities or crises. The basic concept allows for closer European cooperation in nationally funded projects and strengthens not only the projects and their results themselves, but also the renewed ERA. However, the administrative obstacles for effective cooperation are still substantial and should be reduced considerably (see Annex under 4. "Strengthen ERA-Net-like structures to allow for flexible and ad-hoc research topics among Member States").
- Another important pillar of cooperation can be found at the level of research performing organisations: Long-term strategic and thematically focused partnerships like PEER, EERA, ECRA, EREA and ESRE enrich the landscape with their concerted bottom-up collaboration on specific topics and could serve as platforms immediately that could be further build upon. Strengthening such approaches through new schemes that unlike the ERA-NET Cofund Typ 3 are based on lean administrative principles should be explored. Increased cooperation of research institutions that receive institutional funding at the national level has considerable potential to create synergies and increase exchange, thus improving the results. Pilot projects should be further developed here, as explained in the Annex (under 2. "Coordination of institutional research programmes").

d) Europe as a **magnet for international talent**

- Europe's performance capability in research and innovation depends heavily on attracting, developing, and retaining world-leading talents. Facilitating exchanges of researchers, mutual recognition of national qualifications and equal opportunities are key. At the same time, there is a growing international competition, especially driven by the USA and China. Therefore, appealing initiatives are urgently needed in Europe: The ERC grants and MSCA are useful instruments, as is the proper funding of RI, but a much larger effort is required. This could include financial and career related incentives for European scientists returning to the EU after a stay e.g. in the USA or Canada, including dual career opportunities. Large flagship projects with international visibility and other initiatives such as "research schools", "junior scientist programmes" and specific programmes for underrepresented scientists, such as women, are necessary as an extension of support for talent management.

ERAC Priority 2 ("R&I driven joint action with other policy areas")

The priority defined as "R&I driven joint action with other policy areas" should take up the main focus selected by the Member States under the "Synergies of Horizon Europe with other EU programmes". It should especially support the intervention area "Promoting cooperation of MS on specific topics", e.g. through more flexibility regarding the ERDF funds for the coordination and update of national and regional RI. Another example would be a more intensive cross talk regarding the innovation priorities of the Smart Specialisation Strategies from different Member States and Regions under the Common Agricultural Policy through a renewed ERA.

ERAC Priority 3 ("Relevance and visibility of R&I for Society")

Helmholtz also sees new opportunities in the area of priority 3 for research to contribute more vocally to the social dialogue with its expertise. Horizon Europe should set up pilot activities in order to **design the implementation of the SDGs far beyond the research community** and to plan jointly with policy makers, businesses and society (see Annex under 5. "Fostering research-based knowledge-driven co-design of policy development - in support of the SDGs"). Both "research & innovation actions" and "coordination actions" will be suitable tools to achieve this under Horizon Europe. These actions should also connect relevant societal players, industry and research on a broad basis, in order to develop cross-sector solutions and increase the acceptance by European citizens.

ERAC Priority 4 ("Broad Inclusiveness")

From Helmholtz' perspective, priority 4 is essential for the successful implementation of a renewed ERA.

Here, comprehensive measures are required to provide incentives for Member States with fewer research capacities to allocate sufficient national research funding and to improve efficient framework conditions for researchers.

In addition, "partnering programmes" as well as widening programmes and actions should be intensified. Instruments such as the "Helmholtz European Partnering", which structurally promote and strengthen peer-to-peer cooperation, should be expanded more widely throughout Europe. Partnering programmes could also contribute to building the above-mentioned ecosystems for key enabling technologies.

Research infrastructures can also play a pivotal role in this respect: On the one hand, researchers from countries with fewer RI would benefit from access schemes to high-performance research infrastructures throughout Europe as they could perform excellent research on such RI without having to relocate permanently. On the other hand, dedicated projects can create new links between organizations operating RI and organizations in "widening" countries by exchanging experience on the construction of new RI in those "widening" countries (e.g. DESY cooperation in the preparation phase and early construction of SOLARIS, PL). In addition, we recommend launching a specific twinning opportunity to provide trans-national access to RI to a team of scientists consisting both of partners from widening countries and a partner with specialised experience in the use of the specific instruments of that RI. This would efficiently enhance the collaboration within the European Research Area.

The Helmholtz Centres have elaborated specific activities in more detail. These suggestions for implementation actions for a renewed ERA can be found in the following annex.

Brief portrait of the Helmholtz Association

Helmholtz contributes to solving grand challenges facing society, science, and the economy through interdisciplinary research at the highest international level in six major fields: Energy, Earth and Environment, Health, Key Technologies, Matter, and Aeronautics, Space, and Transport. With more than 40,000 employees at 19 Research Centers and an annual budget of around 4.8 billion euros, Helmholtz is the largest scientific organization in Germany. Its work is rooted in the tradition of the great natural scientist Hermann von Helmholtz (1821–1894).

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Annex

To the Guidelines for the Realignment of the European Research Area 2020

1. Better access to better research infrastructures in Europe

Facilitating interoperability, use an evolution of technology in national and EU R&I systems by building on demand-driven research infrastructures

Background Information and Description of Challenge:

One vital framework condition for the Production, Circulation and Use of Knowledge is the access of European researchers to the tools without which knowledge production is impossible in many areas of science: research infrastructures (RI). Those laser facilities, telescopes, research airplanes and vessels, high-performance computers, imaging facilities etc. require massive investment. They are also essential to attract the best brains in science to Europe. This is why Europe will only stay at the forefront of science if synergies at European level are used more effectively.

For setting up the next generation of very large RI this is a process discussed at European level in the ESFRI forum. The vast majority of RI in Europe, however, are national or regional RI, and the potential for synergies at this level is to a high extent underexploited.

The concept below explores ways in which these synergies can be exploited at the level of the Member States.

National Research Infrastructures (RI) from very different science areas are starting to organise themselves at European level in a coordinated way with variable geometry that goes beyond the framework of ESFRI. The main reason behind this is the focus of ESFRI on pan-European RIs and the paradigm shift limiting Trans-national Access to RI offered through the Framework Programmes under Horizon Europe, if the plans of the European Commission are implemented as stated in the Specific Programme.

The main concept is explained in this first page, and is valid for a large variety of networks of RI with different missions. It applies to initiatives dedicated to the identification of Aviation Research Infrastructure needs and gaps in view of the European Aviation strategy, as the RINGO-CSA, but also to research vessels, the neutron sources in LENS and many others. It is further described here using the examples of two very different networks of RIs: EMPHASIS, active in the plant phenotyping area and LEAPS (League of European Accelerator-based Photon Sources). Both aim at providing services for different research areas beyond their own domain and plan to advance the knowledge and technology of their respective areas of research in a coordinated process among interested Member States. Germany leads in both of the presented examples.

Assessment and Outlook:

Both EMPHASIS and LEAPS have high visibility at national ministries of key Member States in their specific area of research. They are close to the implementation of a new level of organisation tightly involving the Member States. EMPHASIS and LEAPS could be showcased for spreading their best practices to further areas of research

and to set the foundation of a Lighthouse for the renewed ERA that will complement and go beyond ESFRI regarding coordination of national RI. The Lighthouse will improve the recognition and support of national RI in the new ERA by policy makers, ERA stakeholders and the wider society by demonstrating in a tangible and concrete way the added value of transnational access in the new ERA paradigm and its associated objectives and priorities in practice.

Implementation form, Lead Organisation and Supporters:

Both initiatives (EMPHASIS and LEAPS) are aiming at organising interested Member States in a self-sustainable structure based on ERA-Net or co-funded European Partnership-like coordination, which allows for a variable geometry depending on the needs of different Member States. National funders would set up a national fund that will cover the expenses of projects dealing with excellence-driven research and coordinated technology development and include access to research infrastructures. Each country can set the focus on a specific part depending on their needs, so this instrument will allow for a variable geometry composition depending on area of research or activities to perform. Additionally, and depending on the evolution of trans-national access under Horizon Europe, a complementary fund may cover also the travelling costs for researchers performing measurements at the RI located in a different Member State, depending on the country needs and regardless of the scientific area. An advantageous position could be granted for RIs or researchers located in widening countries, where part of the operational costs needed for performing the concrete experiments could be covered from the framework programme.

If wished, such structures allow for a potential internationalisation and can include members outside of Europe in a variable geometry and play a key role in science diplomacy.

Roadmap for Implementation:**EMPHASIS:**

- 2020 - 2021: Preparation: Running a participatory, transparent and open process to conceptualise an ERA-Net-like structure with research projects supporting trans-national access to plant phenotyping installations;
- 2021 - 2022: Implementing the ERA-Net-like structure;
- 2023 - 2024: Operation of the ERA-Net-like structure in line with EMPHASIS operation.

LEAPS:

- 2021: Kick-off the project LEAPS-INNOV to implement first projects following the technology roadmap including industry engagement;
- 2022: Explore ways to provide trans-national access to light sources;
- 2024: Implement the European Partnership-like structure.

Intervention Areas Supported:

Primarily: (1) Framework Conditions for the Production, Circulation and Use of Knowledge, including Research Career Issues (2) R&I driven joint action with other policy areas. In addition: (3) Relevance and visibility of R&I for society (4) Broad Inclusiveness.

Further Information, References:

- Homepage EMPHASIS: <https://emphasis.plant-phenotyping.eu>
- Homepage LEAPS: <https://leaps-initiative.eu/>

2. Coordination of institutional research programs

Background Information and Description of Challenge:

A major part of research funding is invested by research organisations and industry. While ERA-NETs and JPIs endeavour to align research programs of funding organisations, and technology platforms and partnerships like IMI – Innovative Medicines Initiative contribute to a coordination of private with public investment in research, there is **no successful tool to coordinate research programs of large national research organisations on European level** – such as the Helmholtz programs.

Still, there are many examples of very promising long-term collaboration between European research stakeholders which could be further exploited to strengthen the European Research Area, such as the European Energy Research Alliance EERA, the Association of European Research Establishments in Aeronautics EREA, the European Climate Research Alliance ECRA, as well as PEER, the Partnership for European Environmental Research. Notably the PEER members have repeatedly observed the lack of a tool to strengthen their activities. The PEER members are national research centres and run their own internationally evaluated research programs. Europe could largely benefit from a better coordination and co-design of these programs. So far, there is no such tool available and legal and time constraints do not enable more efforts than a cooperation agreement, voluntary exchange of information and mutual use of facilities.

Assessment and Outlook:

The Draft ERAC Opinion on the Future of the ERA states the following obstacle: “The complex interplay within the European multi-level and multi-actor ecosystems for knowledge production, circulation and use constitutes a major obstacle to a fully functioning ERA.” The only solution envisaged by the report comprises a tremendous effort: “In order to take full advantage of possible synergies and complementarities between EU and national ecosystems for knowledge production, circulation and use, the complex legal and administrative policy frameworks should be made compatible and interoperable at all levels.”

Such a huge effort should be addressed in realistic steps, and a tool offered in Horizon Europe that supports voluntary coordination of institutional programs will form a realistic and promising step.

Implementation form (also Lead Organisation and Supporters):

Development and test of a mechanism for the coordination of institutional research programs requires a joint effort of a selected number of research organisations. The Helmholtz Centre for Environmental research – UFZ and other members of PEER would be willing to undertake such an effort.

Timeline for Implementation:

Considering the duration of the institutional programs, a coordination activity of five to seven years could be appropriate.

Intervention Areas Concerned:

The described activity will contribute to priority “Framework Conditions for the Production, Circulation and Use of Knowledge” and its potential intervention area “Exploring ways to increase the interoperability of national and EU R&I systems to reduce the fragmentation of rules and procedures for R&I funding”, but it will even go beyond and enable a more targeted and effective knowledge creation, thus also serving priority “R&I driven joint action with other policy areas”.

3. Joint large-scale strategic research endeavors in a renewed ERA

Background Information and Description of Challenge:

Many of today's challenges require coordinated research efforts at a much larger scale than individual projects. The Member States need a tool to allow for significant, coordinated and balanced investment programs with a long-time perspective to close the gap that the discontinuation of the FET-Flagship program has left in the European research funding landscape. Long-term large-scale research initiatives with a coherent governance structure are essential to overcome major research and innovation challenges Europe is facing. The partnerships are one potential tool to use, but a broader process involving further stakeholders for selecting and implementing them would be much needed.

As an example, the LifeTime initiative deals with the challenges that the healthcare area at the Member States is facing and complements the proposed European Partnerships in this area.

The coordination scheme through FET-Flagship-like initiatives, including LifeTime will integrate efforts within the public and private sector, create synergies and offer sustainable transformative solutions. It will release ERA's full potential to the benefit of the economies of the Member States and their citizens' health. In the case of LifeTime, the initiative aims at revolutionizing healthcare by mapping, understanding, and targeting human cells during disease. Life-Time will develop and integrate several breakthrough technologies (single-cell multi-omics, advanced imaging, machine learning/AI, personalized disease models). LifeTime could act as a trailblazer for similar initiatives in further areas of research and innovation where the renewed ERA must play a leading role.

Assessment and Outlook for LifeTime:

1. Builds on an existing substantial and coordinated structure at EU level, as well as it offers a bundling of Member States' investments towards understanding and treating human disease exploring molecular, cellular and systems approaches;
2. Unifies a framework fostering collaboration between academia and industry across multiple disciplines;
3. Implements joint projects between public and private sectors spanning the entire biomedical innovation cycle from discovery research, technology development, and implementation into hospitals and the healthcare industry;
4. Elicits new flexible modes of stimulating innovation by facilitating cross-sectoral collaborations among industries accommodating the different development timelines and business models;
5. Allows for comprehensive early technology adoption programs by enabling rapid implementation at the EU level;
6. Supports a network of centres of excellence that link multidisciplinary scientists with hospitals;
7. Provides digital environments to process large datasets and uses advanced analytics/AI and machine learning with scalable health applications;
8. Offers training, education of clinicians and medical staff developing the skills to embrace new technologies;
9. Promotes early disease interception with all stakeholders involved in therapy development and provision;
10. Contributes to public education to facilitate societal participation in the digital revolution in science-based medicine.

Implementation form, Lead Organisation and Supporters:

The Max Delbrück Center for Molecular Medicine in the Helmholtz Association (MDC) in Germany is leading LifeTime together with the Marie Curie Institute in France. In addition, LifeTime comprises a new pan-European consortium of >90 leading research institutions supported by over 70 companies.

Intervention Areas Concerned:

1. Exploring ways to increase the interoperability of national and EU R&I systems to reduce the fragmentation of rules and procedures for R&I funding, such as promoting ERA seals of quality, enhancing trust and recognition between funding agencies across Europe;
2. Further developing Open Science and Open Innovation policy approaches at European and national levels in order to truly foster the circulation of knowledge;
3. Mobilising support at the highest level for knowledge-based policy design and implementation;
4. Promoting cooperation of MS on specific topics (e.g., through R&I infrastructures or European partnerships);
5. Promoting a dialogue and concerted actions with sectoral policies beyond the strict remits of R&I policy, to avoid fragmentation with regulation policies or impact assessments;
6. Embedding R&I and promoting capacities for absorption of new knowledge and technologies in other sectoral policies, including towards the SDGs and within missions;
7. Ensuring closer collaboration between MS and the EU Commission on International Cooperation;
8. Co-designing, implementing and assessing R&I policies with stakeholders and society, namely by finding more effective ways of involving citizens to set and implement R&I policy priorities;
9. Fostering connectivity and pan-European R&I collaborative links;

Further Information, References: <https://lifetime-fetflagship.eu>

4. Strengthen ERA-Net-like structures to allow for flexible and ad-hoc research topics among Member States.

Background Information and Description of Challenge:

With the upcoming European Partnerships under Horizon Europe, the implementation of small ERA-Net structures will be outside of scope in the new Framework Programme, especially for those areas of research in which only a few Member States have a specific interest implemented through a national roadmap. The case of cofunds without the participation of the European Commission are also outside the scope of the European Partnerships. This produces a gap in many fields, as exemplified by the example portrayed here in the area of “Digital Material Science for Catalysis”, which could complement national initiatives, including the German initiative “MaterialDigital”.

Assessment and Outlook):

ERA-Nets effectively connect different Member States while taking into account their national roadmaps under the umbrella of EU-relevant topics. ERA-Net topics have been typically selected ad-hoc during the preparation of the Workprogrammes of Horizon 2020 after consultation at national level. The current selection process under the European Partnerships for Horizon Europe does not provide the needed flexibility for a quick agreement on topics among Member States. The renewed ERA could take here the lead to fill this gap. The example of an ERA-Net structure for “Digital Material Science for Catalysis” could complement national initiatives into educating experts in data science. A field which is highly useful for the future: Energy saving catalysis with custom-made materials while the process includes methodologies of artificial intelligence, synthesis and dedicated characterization. All EU Member States will have to deal with a growing demand for data scientists.

Implementation form, Lead Organisation and Supporters:

Implementation by means of a regular co-funded ERA-Net under the lead of ERA with links to the ERA programme under Horizon Europe. Especial budget provisions could be granted for Widening countries during the preparation and implementation, in order to ease their participation. Those Widening countries having a national strategy or national initiatives in the concrete area could be prioritised and their activities funded through the Widening programme of Horizon Europe for the resulting ERA-Net to have a maximum impact.

Timeline for Implementation:

Preparation of the ERA-NET-Concept until 2022. Implementation with calls 2023 – 2027.

Intervention Areas Concerned:

- ERA priority 2 “R&I driven joint action with other policy areas”
- intervention area “Promoting cooperation of MS on specific topics (e.g., through R&I infrastructures or complementing European Partnerships)”

Further Information, References:

- Germany has started its national funding scheme “MaterialDigital” (<https://www.bmbf.de/foerderungen/bekanntmachung-2627.html>).
- German “Hightech-Strategie 2025”, topic “Wirtschaft und Arbeit 4.0” (relevant to „ressourcenschonende, digitale Materialforschung“ (<https://www.hightech-strategie.de/de/wirtschaft-und-arbeit-4-0-1724.php>))

5. Fostering research-based knowledge-driven co-design of policy development (in support of the SDGs)

Background Information and Description of Challenge:

European legislation in the environmental field is, in international comparison, a success story with high, cutting-edge standards for human well-being. (One prominent example is the Water Framework Directive.) However, recognition of these regulatory achievements by the European citizen is widely lacking – on the contrary, regulations made in Brussels are broadly considered as unnecessary “overregulation”.

Furthermore, successful policy implementation in different areas is still often hindered by competing sectoral policies.

The Draft ERAC Opinion on the Future of the ERA summarizes this background situation well: “The Research-based knowledge does not fully exploit its potential to provide the smart directionality needed to achieve transformative changes required to meet Europe’s wider policy objectives and the SDGs.” and recommends a new ERA narrative/paradigm for sectoral policy implementation: “proactively support other sectoral policies, in order to facilitate their evidence-based development and monitoring, help assessing their expected impact and contribute to their implementation through testing and experimentation.” (The report fails to mention that the interrelation of other sectoral policies also has to be considered.)

Assessment and Outlook:

In order to better “exploit the potential for co-design, co-creation and co-implementation of R&I with other policy areas” as requested by the ERAC opinion paper, pilot activities to foster implementation of the SDGs shall be supported by Horizon Europe. These activities have to cover interrelations between specific SDGs as well as risks related to the implementation of the SDGs. **The knowledge creation process shall be based on networks of actors from research, sectoral policies, economy and society.** By this approach, applicable cross-sector solutions will be developed and implemented and acceptability and acceptance of policy implementation by the European citizen will be raised.

Implementation form, Lead Organisation and Supporters:

The activity requires research & innovation actions as well as coordination actions involving a broad set of actors.

Timeline for Implementation:

Activities require actions with a duration between two and five years.

Intervention Areas Concerned:

The activity will directly contribute to the priority “R&I driven joint action with other policy areas”, especially to the intervention areas “Promoting a dialogue and concerted actions with sectoral policies beyond the strict remit of R&I policy, to avoid fragmentation with regulation policies or impact assessments” and “Embedding R&I and promoting capacities for absorption of new knowledge and technologies in other sectoral policies, including towards the SDGs and within missions”.

The activity supports three elements for the new ERA: “From evidence-based policy-making to research-based knowledge-driven policy change”, “From individual knowledge dimensions to an integrated and dynamic knowledge circle”, and “From involvement of stakeholders in research-based knowledge policy design and implementation to broader societal engagement and responsiveness”.