THE PAST, PRESENT AND FUTURE OF THE EUROPEAN RESEARCH & INNOVATION FRAMEWORK PROGRAMS 2014-2027

Response of the Fraunhofer-Gesellschaft regarding the public consultation by the European Commission

February 23, 2023

1 Introduction

The Fraunhofer-Gesellschaft welcomes the evaluation of the Research & Innovation Framework Program and its future, and supports the strategic, ambitious goals of the European Commission. In this position paper, Fraunhofer reflects on the experience of being, to date, one of the three Horizon Europe beneficiaries with the most projects and net EU contributions, as already in Horizon 2020.

For Fraunhofer, the main benefits and reasons for taking part in the Framework Programs are clear: to participate has an exceptional effect on European and international cooperation, thereby achieving excellence and visibility. It supports interdisciplinary and cross-sectorial cooperation and can bridge gaps in national or regional funding.

For the remaining time of Horizon Europe and facing the upcoming Strategic Plan, Fraunhofer provides feedback and recommendations on the following main topics: Budget, Implementing Horizon Europe, Strategic Planning, Missions, Partnerships, the European Innovation Council, Complementarities and Synergies. The Annex provides selected thematic feedback for future initiatives where Fraunhofer is ready to work together with the EU Commission to support future programming.

In addition to this position paper, Fraunhofer has strongly contributed to and recommends the European Association of Research and Technology Organization's (EARTO) answer to this consultation.

2
The Past, Present and Future of the European Research & Innovation Framework Programs 2014-2027

Budget

With 95,5 billion euros between 2021-2027, the Horizon Europe budget under the current Multiannual Financial Framework (MFF) is designed to provide a substantial, long-term, and stable funding regime for high-end R&I activities tackling societal challenges.

However, this budget is under constant threat due to regular re-negotiations of the yearly EU R&I budget under the MFF (between the European Council and European Parliament), yearly re-allocations within the EU R&I budget itself, as well as new top-down EU policy initiatives created without new funding from outside the Framework Program (e.g., European Bauhaus initiative, Bill Gates Breakthrough Energy initiative). Though the program should be flexible to adapt research topics to new challenges, it is important that the budget should not be taken away from the important collaborative research activities between industry and RTOs. **Fraunhofer strongly advocates getting "fresh money" from outside the Framework Program to fund new activities**.

Implementing Horizon Europe

Fraunhofer welcomes the efforts of the EU Commission to simplify the Framework Program. However, **not all "simplification" introduced by the EU Commission in recent years has led to actual simplification in terms of implementation and administrative procedures**. From an applicant's perspective, these measures often have the opposite effect and lead to an increased effort in proposal preparation and implementation. In combination with the oversubscription of the program and the resulting low success rates, this leads to a high amount of redundant costs for the applicants.

For the further design of the current and future Framework Program, it is therefore important to continue working on simplification. **Including the perspective of applicants is crucial in developing new simplification measures and modifying existing ones.**

Size of projects

Since Horizon 2020, more projects with significantly larger project volumes have been introduced. A trend towards larger projects can also be observed in Horizon Europe. This leads to an increasing number of project partners and higher coordination efforts during the application and implementation phase. Fraunhofer recommends **finding a better balance between smaller and larger collaborative projects**. Additionally, the **whole TRL range should be covered appropriately**. For example, smaller projects with low TRLs, larger validation projects and demonstrations with medium TRLs, and deployment projects to be channeled via large instruments such as partnerships, TEFs, possibly IPCEIs, etc.

Costs for project coordination

The coordination of projects is becoming increasingly unattractive even for organizations with longstanding EU project experience like Fraunhofer. Increased coordination efforts invoked by larger project volumes in combination with reduced funding rates and increasing overhead costs due to inflation make it difficult to finance these activities, particularly **since coordination does not translate into any additional scientific knowledge gain**. Therefore, **full-cost funding should be re-introduced and specifically applied to coordination activities**.

Increasing number of requirements by EU Commission

In the past years, more and more requirements (e.g., Ethics, Data Management Plan, Do No (Significant) Harm Principle, Open Science) have been added to the Framework Programs, which increase the effort in the preparation of project proposals. However, rarely any of those are ever reconsidered or deleted.

While these requirements all have their justification, they contribute to an even higher complexity for applicants. Fraunhofer therefore recommends **refraining from introducing new requirements that unnecessarily add to the complexity of the application process**.

Lump sums

Lump sum projects started in Horizon 2020 as pilots to help simplify the Framework Program and are being increasingly expanded in Horizon Europe. An increased effort can be observed during the project preparation and implementation, especially when reporting to the EU Commission the proof of results to collect lump sums. To date, there is not enough data to assess whether the simplification by lump sums affects the whole life cycle of projects – from application to audit. In line with EARTO, **Fraunhofer strongly recommends that a thorough assessment of the full lifecycle of lump sum projects, particularly larger and more complex ones, must first be undertaken before an extension of lump-sum funded projects in the work programs under the Strategic Plan 2025-2027**.
In this context, please refer to the EARTO position paper on Lump Sums.

Annotated Model Grant Agreement

To provide certainty to all applicants, **the final version of the Annotated Model Grant Agreement should be made available without any further delay**.

Administrative hurdles in cross-border mobility for researchers

Although **cross-border mobility of researchers is an important element of the European Research Area, in practice it is hampered by high bureaucratic requirements**. These administrative hurdles have their origin in the European Posting of Workers Directive and other European legislation in the field of social security, for example, A1 forms for business trips (EU Regulation 883/04 and 987/09), social security obligations, EU notification requirements and Equal Pay principle (directives 2014/67/EU and 2018/957/EU).

Fraunhofer, in close collaboration with EARTO, has addressed these administrative hurdles at the European level and made proposals for a concrete improvement of the situation (see also EARTO position on current hurdles to mobility of researchers). **Fraunhofer calls for these administrative hurdles to be removed to ensure cross-border mobility of researchers and contribute to strengthening the European Research Area**.

Strategic Planning

The Strategic Plan 2021-2024 is a planning tool newly introduced in the Framework Program. It consists of four key strategic orientations, 15 impact areas, and 32 cluster-specific expected impacts, each translated into a destination in the work program covering multiple topics.

The structure and integration of these elements is very complex and often difficult for scientists to understand. There is neither an overview of the overall structure in the more than 100-page long Strategic Plan, nor is the plan referenced as a strategic document in the Calls for Proposals. Therefore, **the plan remains largely "invisible" to scientists and a broader understanding of the multi-dimensional and multi-objective structure is rather rudimentary**.

In addition to the **structural complexity** mentioned above, the **cross-cutting themes** added in the past years (Gender, Ethics & Integrity, Open Science, etc.) also lead to content-related challenges that applicants find difficult to fulfil comprehensively. For Fraunhofer scientists these cross-cutting themes play a minor role, meanwhile the **focus lies on technical topics such as KETs and international cooperation**.

Overall, a **more comprehensible presentation of the overall structure combined with more transparent and clearer communication would be very much appreciated**.

Missions

Fraunhofer encouraged the creation of EU missions to increase the visibility for the impacts generated by European R&I investments and amplify citizen acceptance. Especially in times of growing public and political scrutiny of the value of R&I activities and intensified pressure on research budgets, a mission-oriented approach has the potential to support the alignment of R&I policy with other sectoral policies to tackle societal challenges. Yet, this transformative process is challenged by the need to calibrate long-term horizons and short-term political debates in a rapidly changing geopolitical environment. Thus far, Fraunhofer has identified **several shortcomings regarding the missions**:

1. Despite the varying degrees of innovation of the missions, it is still essential that the whole **budget - taken out of the Horizon Europe budget - is invested in research and innovation activities and not mere procurement of technologies**.
2. The **implementation of the missions is delayed**, the **degree of duplications with other instruments under Horizon Europe is high** (e.g., partnerships).
3. The **current governance structure** is relatively transparent, but highly complex, and **not fit for purpose for a mission-oriented approach** that requires a strategic and quick intervention logic to steer the projects in the right direction to deliver on their strategic objectives.
4. The **mission approach would imply creating longer projects** that go beyond technological development towards leadership in certain fields, where political decisions are matched with technological strengths. Such an **evolution as well as a clear distinction to the design of Pillar II and its cluster work programs are not evident**, except for increasing and partly unrealistic demands on consortia regarding stakeholder and citizen engagement as well as on the expected impact.
5. Little to no alignment with national initiatives is obvious, **better coordination of thematic areas, objectives and projects is needed**.

The current state of the mission casts doubt on their success as ambitious projects with true European added value. Fraunhofer very much welcomes the upcoming evaluation of the missions and expects appropriate consequences to be drawn from it. **The evaluation should examine if budget contributions from Pillar II were spent on research in the same thematic areas when shifted to the missions. In case new missions are discussed, an ex-ante analysis to evaluate if they are feasible and strategically relevant should be elaborated**.

Partnerships

Fraunhofer welcomes the streamlining of partnerships and the endeavors to simplify their structure as this approach strengthens the impact of European R&I. Co-programmed and institutionalized partnerships are a clear benefit of Horizon Europe as they are highly relevant to engage industry and RTOs and thus, link research and industrial applications. However, they still suffer from **fragmentation, heterogeneity and non-transparency regarding governance structures, conditions of participation and the involvement of RTOs**. For a further improvement of the partnerships the following recommendations should be taken into consideration:

1. **Accelerate their implementation**, increase the efforts to **create synergies between different partnerships, missions, the work program, and other initiatives, and reduce overlaps**.
2. The Single Basic Act and the application of varying funding and financing rules are critical. The **administrative and financial issues of membership in the private associations need to be further simplified for RTOs and industry** to generate commitment and to create a clear and consistent regulatory framework.
3. RTOs are treated very differently depending on the partnership and their positions are oftentimes not considered in-depth. **Decision-making processes and bodies need to integrate and focus more on R&I and give RTOs a more substantial role as providers of expertise and technology solutions**.
4. Partnerships need to **pay more attention to covering the whole value chain of R&I, thereby aligning short-term ambitions and long-term impact, and integrating low and higher TRLs**, whilst anticipating and remaining flexible for upcoming challenges. Only then will it be clear if partnerships can be more effective compared to regular collaborative research projects and can leverage additional public and private investment in R&I and societal benefits.
5. **More openness and clearer communication with the member organizations** involved as well as the broader stakeholder community leads to a more consistent understanding of the partnerships. This should also be helpful to tackle their fragmentation.

<u>EIT Knowledge and Innovation Communities (KICs)</u>
Despite the ambition of the European Institute of Innovation & Technology (EIT) to empower innovators and entrepreneurs to develop world-class solutions for societal challenges and creating sustainable growth, participation in the EIT KICs becomes increasingly difficult for RTOs and industry partners. The governance structures, regulatory framework and administrative procedures are perceived as highly complex and non-transparent, whereas financial sustainability seems to be almost impossible to achieve under the administrative burden of KICs. The added value of participation is questionable for KIC partners if they have little possibility to actively shape KIC activities. **Fraunhofer recommends improved framework conditions for faster clarification of legal and administrative implementation, e.g., adjusted budget for management tasks**.

European Innovation Council

The European Innovation Council (EIC) presented a unique opportunity to build a compelling innovation support structure and technology-push mechanism for Europe. Unfortunately, so far, **the EIC has fallen short of the expectations raised** in its inception since it mainly merged old program lines (such as FET and the SME instrument) into a new administrative structure.

Fraunhofer recalls the debate about the different approaches to strengthen Europe's innovation performance and to overcome Europe's relative weakness in the transition from research to market. The most critical phase in the innovation process is the maturation of technology (TRLs 4-7) where Fraunhofer sees the biggest potential to **make a difference by using the scope and scale of Horizon Europe together with a dedicated instrument for the maturation of technology** as part of a coherent approach to foster innovation.

Looking at the EIC today, the large number of proposals for **EIC Pathfinder** funding confirms that there is significant interest in this program. At the same time **the very low success rate (<10%) raises questions whether adequate funding and selection processes** are in place. **Oversubscription is a significant problem**, as it leads to frustration and results in redundant costs for proposal writing and evaluation. Moreover, Fraunhofer researchers underscore that the **effort and lead time ahead of a project are too high**.

Further, **EIC Transition** (TRL 4-5/6) is conceptually too restrictive and by far too small in terms of funding given the huge potential in this field. Transition funding is limited to Pathfinder, FET, and ERC PoC results. This unnecessarily sets limits to making full use of the instrument's potential by leaving out successful projects from other parts of the Framework Program. Therefore, **we propose to open the Transition instrument for successful projects under Pillar II and increase the budget for more applications accordingly**.

Complementarities and synergies

On this topic, the EU Commission's survey focused on opportunities to strengthen complementarities between Clusters in Pillar II and maximize synergies between Horizon Europe and other EU funding programs.

Complementarities

As already mentioned, strategic planning process remains far removed from most researchers' day to day work. Levels of familiarity with the Strategic Plan are low. Clear, targeted, and concise guidance on how to best fit their efforts into the storied logic of the Strategic Plan is direly needed.

Against this background, it is **equally difficult for researchers to address complementarities between Clusters. Clusters are thematically broad by design** meaning that establishing links solely at that level is not feasible (see, for example, Cluster 6 with a markedly wide portfolio spanning domains from food, bioeconomy, and agriculture to the environment). **A much more practical solution could focus on establishing closer links between cross-cluster Destinations and Topics**. Given that researchers tend to use keywords to match their research ideas with topics across the program on the Funding & Tenders Portal, additional efforts are needed to make cross-cluster complementarities between Destinations and Topics **more visible**. As is the case with synergies (see below), a balance needs to be struck between fostering complementarities and adding additional layers of complexity.

open

Fraunhofer sees unexploited potential for complementarities across all Clusters. However, fostering these should be based on **clear priorities**, as a first step, and **aligned with fields of strategic importance** such as: the twin green and digital transition of the manufacturing and process industries; civil, defense, and space promoting open strategic autonomy; digital and emerging technologies; data and computing technologies; the advancement of Artificial Intelligence technologies.

As a second step, **one should focus on specific research areas**. For example, **raw and advanced materials** will provide significant added value if complementarities are enhanced across Clusters, accelerating the development, industrialization, and deployment of strategic technologies in Europe. Specifically, **stronger collaboration in the advanced materials domain that allows for the participation of key stakeholders from research, industry, and Member States** with a sound medium and long-term perspective needs to be implemented, anticipating future challenges (see AMI2030 initiative).

Another area with much underexploited potential is the **biological transformation of technology and industry. To deliver on the twin green and digital transition, there needs to be a closer alignment between both strands.** To this end, a closer integration of nature, technology, and information as well as the establishment of bio-intelligent production systems can kick-start a comprehensive transformation process. Leveraging complementarities across Destinations, Topics, and scientific disciplines will only reinforce closer ties between the green and the digital "arm" of the transition.

Synergies

Leveraging synergies between Horizon Europe and other EU programs offers a pathway towards stronger European innovation. The European Regional Development Fund, the Digital Europe Program, EU4Health, the European Defense Fund, and EU Space Program are a good fit and a promising starting point. More specifically, **applicants need targeted guidance and best practice to bridge the gap between programs and overcome participation barriers. Further, a closer alignment in terms of programming and funding schedules is key to fostering synergies**.

Europe needs a streamlined pathway from research to close to market deployment supported by different programs and instruments. To make sure successful project results from the Framework Program are followed-up upon by the project partners, **clear and transparent guidance on the various programs**, their complementarities, and funding synergies would be helpful. **Alignment should also be established between the various EU and national or regional programs** to avoid double funding and benefit from the full potential of effective R&I implementation.

3
Annex: Selected RD&I priorities proposed for the Strategic Plan 2025-2027

The Annex provides selected thematic feedback for future initiatives where Fraunhofer is ready to work together with the EU Commission to support future programming.

Health

- Decoding the immune system: Dysregulation of the immune system, which causes a variety of diseases of different organ systems, such as rheumatism or inflammatory bowel diseases, should be defined as a common disease due to the large number of people affected. The development of therapeutic strategies with the concept of symptom-based rather than organ-based care offers the opportunity to develop cost-intelligent therapeutic procedures.
- Translational platform for animal testing replacement methods: There are already very promising approaches to successfully bypassing animal testing. However, we often still lack development and validation steps to ultimately certify these methods and transfer them into practical application. Animal testing in research could be effectively reduced with the help of a translational platform for alternative methods and a research program for the further development, validation, and harmonization of alternative methods and procedures.
- Customized medical technology solutions: Medical devices with artificial intelligence offer great opportunities for individualized patient care. The promotion of cutting-edge integrated medical technology research in the areas of additive manufacturing, robotic surgery, intelligent sensor technology, cell technology, and innovative medical imaging will enable the creation of technology-driven and individualized healthcare solutions for patients.
- Automated production processes: Digital process platforms can contribute to the technological sovereignty of the EU in the future. Automated processes and digitally supported production technologies can for example achieve the production of innovative and personalized therapeutics. The development of new process and production technologies offers great potential for the cost-effective production of new active ingredients.
- Data ecosystems for individual therapies: In order to be able to use data for the care of patients, the establishment of data ecosystems as well as the development of an overarching development management are required. The creation of transparent and sovereign possibilities for the use of patient data/care data offers the opportunity to develop cost-efficient solutions, e.g., for therapy support, and to further develop continuous improvements in medical service processes.

Security

- Resilient Infrastructure: privacy-compliant smart monitoring, predicting impacts of future extreme weather events, energy resilience in the face of advancing climate change, fail-safe, robust energy-efficient communications for system-relevant infrastructure services, human-in-the-loop-based intrusion detection for power systems, combined risks and cascading effects in critical supply chains, incl. logistics networks, secure data spaces for infrastructure protection, quantum computing, space infrastructure protection, automated testing

- Digital: resilience, security incident assessment and prevention for cyber-physical systems, quantifying risks arising from AI application in critical technologies, explainable AI, secure and trustworthy identities, methods to protect against the misuse of AI
- Autonomous systems: use and misuse of autonomous systems in U-Space and beyond for civil and infrastructure protection
- Situational awareness: improving situational understanding at all levels of decision-making, incl. data-driven resilience management
- Navigation: safe navigation without navigation satellite systems
- Cross-cutting issues: civil-military cooperation, optimized use of limited resources in the event of a crisis or in crisis preparedness, increased resilience against, e.g., CBRN-E hazards and threats for citizens and first responders, use of citizen science

Industrial production, natural resources, security

- AI and Machine Learning in the context of industrial production, where it can help secure and foster Europe's competitive position by accelerating the path to maturity for production processes and thus reduce time-to-market for new products. This includes a stronger focus on sustainability in the field of manufacturing and a higher lifetime efficiency thus minimizing lifetime structural costs and maintenance services.
- Equally important, image and video analysis and exploitation as well as optronics as cross-cutting technological themes in several Pillar II Clusters deserve significant funding to keep Europe at least at par with Asia and North America, also helping with the effort to secure Europe's genuine technology basis and avoiding the risk of becoming dependent on those regions' players.

Smart mobility, farming, and energy

Design and implement a Dynamic Systems of Systems based on:

- Reliable data management: DynaSoS are data-intensive systems, where different organizations may need to share information and where value is created using data from various sources. "Data management" is an overarching term that covers multiple data-related aspects, such as data architecture, data acquisition, data quality management, data curation, data storing, data integration, and data governance. To support data management at development time and during the operation of DynaSoS, a much higher level of automation is required alongside with guaranteed levels of application-specific qualities such as trustworthiness.
- Automated software engineering: DynaSoS comprise systems that are continuously evolved by different organizations. Uncoordinated evolution of technical and non-technical systems yield unpredictable states. Handling the evolutions of systems before unwanted phenomena occur increases the demand for automated software engineering. Several trend reports highlight this demand. Automated software engineering challenges comprise e.g., elicitation of functional and non- functional requirements from run-time data as well as related real-time updates (over the air), context- and user-specific service orchestration, and quality assurance within an open feedback loop.

- Context-aware behavior: DynaSoS behave situation-specific, which requires context awareness and understanding. Context awareness is the main challenge for autonomous systems. DynaSoS must understand the current situation so that they can anticipate phenomena that emerge from the behavior of its systems as well as changes in their environment. Challenges arise from the unknown unknows that cannot be modelled upfront but must be treated in real-time. Managing uncertainties could help to mitigate risks related to DynaSoS' operation as well as digital twins of components that could be run in a simulation environment to predict and train their behavior.
- Continuous Engineering of safe and highly trustworthy DynaSoS: DynaSoS provide essential services; failures are highly critical. Assuring that failures will not occur is challenging, because the behavior emerges from complex interactions of dynamic and evolving systems. Many novel quality assurance and, in particular, safety approaches can contribute to deal with this issue, but are not sufficient even if they would be harmonized and integrated. Understanding which risks might occur, what has to be done during the engineering, what needs to be done during operation, how to close the feedback loop. A further challenge will be the certification of such systems, in particular, if methods from artificial intelligence are employed to provide systems functions.
- Value-based engineering of DynaSoS: A DynaSoS shall provide services in line with the current values of society. This requires that regulatory constraints, societal and economic requirements are fulfilled. However, they are often only prescribed in high-level targets or principles. Value-based engineering needs refers to the challenge to come to translate principles into practice. Applications of DynaSoS for sustainability (UN SDGs) or social good that are sustainable (e.g, energy efficient) are the next step for an inclusive and healthy, democratic society. Engineering such socio-technical DynaSoS is as complex, e.g., because of the many conflicting qualities that must be ensured.
- Complexity, emergent phenomena, and resilience: A DynaSoS is a complex system that can generate emergent phenomena. Resilience refers to the property that required emergent phenomena are provided in spite of disturbances and that disturbances will not lead to unwanted emergent phenomena or a collapse of the DynaSoS. Complexity science provides many theories and tools that need to be enhanced and integrated into software engineering for DynaSoS.

4
About the Fraunhofer-Gesellschaft

The Fraunhofer-Gesellschaft based in Germany is the world's leading applied research organization. Prioritizing key future-relevant technologies and commercializing its findings in business and industry, it plays a major role in the innovation process. A trailblazer and trendsetter in innovative developments and research excellence, it is helping shape our society and our future. Founded in 1949, Fraunhofer currently operates 76 institutes and research units throughout Germany. Over 30,000 employees, predominantly scientists and engineers, work with an annual research budget of 2.9 billion euros. Fraunhofer generates 2.5 billion euros of this from contract research.

Contact

Verena Fennemann
Head of Fraunhofer EU Office
94, Rue Royale
1000 Brussels, Belgium

verena.fennemann@zv.fraunhofer.de
Phone +32 2 50642-45

Homepage Fraunhofer-Gesellschaft

Sources:

EARTO Answer to the EC Consultation on the past, present and future of the European Research & Innovation Framework Programmes 2014-2027, EARTO-Answer-to-EC-Consultations-on-Future-of-RI-FPs-Final.pdf

EARTO Feedback on EARTO Members' Experiences with Lump-Sums Projects within Horizon Europe, EARTO-Position-Paper-on-Lump-Sums-10-February-2023-Final.pdf.

EARTO Position Paper on Current Hurdles to Mobility of Researchers, https://www.earto.eu/earto-position-paper-on-current-hurdles-to-mobility-of-researchers/