

EMBL position paper: Horizon Europe interim evaluation

The European Molecular Biology Laboratory (EMBL) is one of the world's leading research institutions, and Europe's flagship laboratory for the life sciences, funded by 28 Member States, and hosted at six European sites.

With almost 200 grants funded by Horizon 2020, and over 45 by Horizon Europe, EMBL has extensive experience in running EU-funded projects. In addition, EMBL and the European Commission (EC) exchange information and cooperate on a number of issues of mutual interest. This cooperation is formalised through a Memorandum of Understanding.

We welcome the EC's work on the ex-post evaluation of Horizon 2020, the mid-term evaluation of Horizon Europe and the 2025 - 2027 Strategic Plan. We also take this opportunity to share EMBL's viewpoint, based on our experience and expertise in the fields covered by the consultation.

Identification of funding priorities

Pillar I - Excellent Science

Research Infrastructures

While, EMBL acknowledges the attention given to Research Infrastructures (RIs) by the EC through Horizon Europe, we would like to raise again their key role in the European scientific landscape. RIs bring together scientific expertise that drives discoveries and creation of knowledge. RIs also give birth to innovation as they need to develop advanced instruments and a variety of cutting-edge technologies. These developments, often done in close collaboration with industry, lead to both incremental and breakthrough innovations. Sustainable funding towards RIs would unlock numerous benefits for European society and industry. It would also offer avenues for continued training for the future generations of scientists. Two recent pieces of independent research have supported these claims: the Technopolis report¹ has looked at the benefits that EMBL experimental services have created for the research community and EMBL member states, highlighting that EMBL delivers substantial value to Europe by enabling researchers to conduct novel and demanding experiments that could not be easily be achieved at the national level. The Beagrie report² assessed the value of EMBL-EBI's data resources, estimating that EMBL-EBI data resources underpin research impacts worth £1.3 billion annually.

Long-term support and funding to RIs is in line with the aspirations of the EU Member States, as demonstrated by the Portuguese, Czech, and now Swedish presidency of the Council of the EU. The importance of RIs was also confirmed by recent Council Conclusions on Research Infrastructures in December 2022. Member States have also shown support to RIs through the ERA Policy Agenda. The 'Strengthen Research Infrastructures' ERA action could also focus on international and national RIs, in addition to ESFRIs and ERCIs, as they are crucial actors making ERA a reality.

EMBL welcomes the future review of the Charter for access to European Research Infrastructures, as part of future ERA actions on RIs. In order to foster truly collaborative projects that will allow

¹ <https://www.embl.org/documents/wp-content/uploads/2021/11/technopolis-group-experimental-services-impact-report.pdf>

² <https://www.embl.org/documents/wp-content/uploads/2021/10/EMBL-EBI-impact-report-summary-2021.pdf>

European scientists to tackle future health and environmental crises, wide and flexible access to infrastructures for curiosity-driven projects should be encouraged, in parallel with enabling calls that focus on specific fields or thematic priorities. In addition, EMBL would welcome a simplification and/or consolidation of the application process for access to ensure that the calls remain attractive and well-utilised by researchers from all corners of Europe. To summarise, EMBL would be in favour of a careful balance between access calls for proposals addressing specific topics (top-down) and calls for proposals without a pre-defined topic (bottom-up).

Overall, funding for RIs should also support the full lifecycle of infrastructures. RIs would benefit greatly from funding for maintenance to keep offering the same level of services to academic and industrial users across Europe. This is particularly relevant for Data Infrastructures which archive, curate, maintain and update vast datasets. With the increasingly important role of computation in biology, exemplified by AI applications in imaging and structural biology or data storage requirements in genomics or microscopy, the need for supporting computational infrastructures is greater than ever. Large-scale Data Infrastructures could profit from funding programmes that allow the expansion of data storage and compute resources to stay innovative and competitive in the global landscape, and to be able to attract new talent to Europe, while offering the same quality of service free of charge.

Horizon Europe support for covid-related activities was welcomed and necessary, and highlighted fundamental science as a critical component of the solutions that allowed the subsequent rapid development of vaccines and therapeutics. It is also our best line of defence to face future environmental and health related challenges – both known and unknown. EMBL advocates for the sustained funding for fundamental science and of the RIs that support and enable it.

EMBL would like to highlight future priorities related to EOSC under Horizon Europe and beyond. One of the most impactful and successful groups of EOSC projects have been the five ESFRI cluster projects ESCAPE, ENVRI-FAIR, SSHOC, PaNOSC, and EOSC-Life. These projects have been key in linking ESFRIs and other world-class Research Infrastructures with EOSC. EMBL's experience from these projects shows that such funding is most often focused on delivering immediate results. This could lead to the tendency of creating new (or duplicated) services and resources rather than focusing on operating and sustaining existing ones, despite their proven value to research communities. The situation creates uncertainties regarding the continuation of services, which in turn makes the user communities reluctant to take up and rely on these new EOSC services. While appreciating the current initiative on more cross-cluster collaboration, EMBL suggests that support for continuous work within each of the cluster communities is still required in order to build upon the progress made so far, and to further develop them post-Horizon Europe.

Related to this, there are multiple benefits stemming from enabling domain specific collaboration across research organisations, disciplines and initiatives. As an example, EMBL has supported the Global Alliance for Genomics & Health (GA4GH)³ to enhance responsible sharing of human genetic data through the development of interoperable global standards for human data access, through the Federated European Genome-phenome Archive (Federated EGA)⁴. This effort has had a direct impact on the Covid-19 Data Platform, as it uses established data infrastructures at EMBL-EBI. By

³ <https://www.ga4gh.org/>

⁴ <https://ega-archive.org/>

connecting the platform to the Federated EGA, EMBL has facilitated the securely-controlled access and sharing of sensitive patient and research subject data sets relating to COVID-19.

Finally, we would like to highlight the ATTRACT Programme⁵ as a great bridge between RIs and Innovation funding. Thanks to EU funding, the consortium has helped build an open innovation culture across Europe's RIs, encouraging breakthrough technology developments and supporting their progression to commercial products for the benefit of European industry and society. EMBL believes that future funding directed toward an open innovation culture built around European RIs would encourage more entrepreneurship for the benefit of Europe.

Researchers' careers

Training is one of EMBL's five core missions, with a commitment to excellence in training at all stages of careers in the life sciences.

To improve the impact of support provided under 'Researchers' careers', EMBL would like to highlight that pre- and postdoctoral projects often require longer time for completion than the timespan currently supported by EU funding. This is particularly true for projects with an interdisciplinary focus. Based on a recently published career destination study⁶ of former EMBL fellows the average time for obtaining an independent group leader position is 6.8 years from the defence date. The current funding time frames, in combination with high competition for permanent positions, decrease the attractiveness of academic careers for many young researchers, particularly women.

Furthermore on researchers' careers, EMBL is increasingly witnessing a need for highly skilled personnel in the field of operating and managing RIs. The ARISE programme⁷ was an important step in the right direction. Through ARISE, EMBL hires research-oriented engineers to advance technology and methods in life sciences, and to learn how to lead research infrastructures and services. EMBL would welcome a Europe-wide discussion on how programs such as ARISE could evolve beyond their project-based nature and contribute towards the development of a full-fledged career path for researchers. This is aligned with the December 2022 Council Conclusions on Research Infrastructures where EU Member States emphasised "the vital role of highly skilled personnel in constructing and operating RIs, and serving users and meeting their needs".

Pillar II - Global Challenges and European Industrial Competitiveness

EMBL's current scientific programme 'Molecules to Ecosystems', launched in 2022, introduced five Transversal Themes (Planetary Biology, Human Ecosystems, Infection Biology, Microbial Ecosystems, and Theory). These themes aim to deepen the interdisciplinary science at EMBL, and to enable the application of molecular biology approaches to global challenges, including antimicrobial resistance, loss of biodiversity, and pollution. As demonstrated by the COVID-19 pandemic, molecular life sciences are essential in developing knowledge and innovations towards the sustainability of human action on the natural world. Within this context, we would like to highlight some of the future research priorities that Horizon Europe could support.

⁵ <https://attract-eu.com/>

⁶ Lu et al.; bioRxiv 2022.03.01.481975; doi: <https://doi.org/10.1101/2022.03.01.481975>

⁷ <https://www.embl.org/about/info/arise/programme-overview/>

EMBL researchers aim to harness the functions of different microbial ecosystems for various biotechnological applications such as food/agriculture or health; however, there is a lack of model organisms for these ecosystems. This challenges our ability to modulate the composition and output of these microbial ecosystems, and to consider future applications. In the same way that past EU funding looked into setting standards to analyse microbiome data, it is now imperative to fund efforts to come up with and fully characterise key experimental model organisms and communities that represent different microbial ecosystems. This would have a transformative impact on the basic understanding of these systems, interventions, and use of their functional capacities for various applications (biotech, medical, food or agricultural).

Making sure Europe is ready to face future health crises will require substantial funding for fundamental research on the current pathogens with pandemic potential (not only SARS coronaviruses but also influenza), including emerging viruses. In fact, it is fundamental research on structures of spike proteins from previously known coronaviruses that laid the ground for development of the SARS-CoV-2 vaccines. Our understanding of how pathogens replicate in human bodies and cells is still very limited. Researchers need funding for systematic mapping that focuses on how pathogens look, replicate, and evade the immune system so when one acquires pandemic properties, we are ready.

Similar attention needs to be given to the ongoing 'silent' pandemic of antimicrobial resistance (AMR). Bacteria resistant to many, if not all, available antibiotics are found in alarming numbers throughout the world. As a result, once easily treatable bacterial infections become life-threatening again. This poses an imminent threat to public health. The current estimates are that 1.2 million people died in the world in 2019 because of antibacterial-resistant infections⁸. While funding for AMR projects has been available under Horizon Europe, and a new AMR Partnership will be set up in the coming years, it is critical to support work on this crisis now: fundamental research is urgently needed to find solutions to the problem; provide new strategies to understand, prevent and/or revert AMR; rapidly diagnose and predict AMR development; and solve current scientific bottlenecks in antibiotic discovery. Ensuring efficient European coordination would require the support of platforms to share and reuse genomic data, and the creation and maintenance of methods which extract biological and epidemiological insights from this data. Publicly shared and harmonised data will be needed to understand the spread of pathogens and AMR, and to develop rapid diagnostics to improve individual patient treatment and treatment policy. Connecting national AMR action plans together would also require the development of mathematical models (and computational and statistical tools to develop such models), which synthesise genomic and epidemiological data sources and climate change data, and link them with knowledge on basic pathogen biology.

Regarding the EU Missions, we recognise that their focus, as communicated since the launch of Horizon Europe, is “to bring concrete solutions to some of our greatest challenges”. Now that the Missions Boards have provided concrete Mission plans, EMBL welcomes the fact that all Missions have recognised the need for a strong fundamental research component. As highlighted in the Cancer Mission’s implementation plan, fundamental research represents the foundation of any future discoveries and actions. We hope that this imperative would be reflected appropriately in future Missions Work Programmes.

⁸ Antimicrobial Resistance Collaborators; Lancet 2022 Feb 12;399(10325):629-655

Spreading Excellence and Widening Participation

One of EMBL's key missions is to uplift the capabilities of its member states to deliver excellent science with regional, national and Europe-wide impact. In this context, EMBL is a strong supporter of the objectives underpinning the widening actions. Based on our participation in multiple Twinning and Teaming grants, these collaborative modules have positive and often transformative impact on the capability of Widening countries to connect across borders, interact with new partners, attract and retain international talent.

Therefore, EMBL would strongly advocate for the continued support for Widening actions in the EU framework programmes. Some of the lessons learnt could be used to further improve the objectives and impact of the Widening actions. In particular, EMBL would welcome bringing more expertise from Widening countries onto the review boards; adjusting some of the sustainability criteria and expectations so that they fit better the scientific ecosystem of the Widening regions; and opening opportunities for bridging the gap between the end of the grant and the full autonomy of the newly created centres of excellence. To ensure the long-term viability of the investment made nationally, a follow-up competitive call for successful Teaming projects could be envisaged.

Conclusion

The European Research Framework Programmes (FPs) are an essential enabler of excellent science across borders and scientific disciplines. They are an important and often unique tool to support research and infrastructures of pan-European scope. EMBL argues for the continued support and strengthening of the FPs to allow them to reach their full ambition and impact potential. Importantly, while it is clear that FPs are expected to serve an ever more complex R&I ecosystem, they should remain compatible with the nature of the scientific endeavour, thus enabling discovery-driven approaches and shared access to European RIs.