

## **CSC's view on key strategic priorities to advance the European research infrastructure ecosystem – contribution to Horizon Europe strategic plan 2025-27**

### Summary

- The European RI ecosystem is a key component of the critical infrastructure which is essential for the functioning of society and the economy. This must be reflected in the next Horizon Europe strategic plan
- Europe must make strategic choices to ensure that the ownership of its most valuable data is kept in Europe, underpinned by publicly funded research data infrastructures
- The principles of FAIR data, open science and interoperability at all levels must remain at the heart of Horizon Europe in the years to come
- A key priority for the digital research infrastructure landscape is to allow for data processing and advanced computing capacities to develop in close convergence. EOSC and EuroHPC JU must work together to ensure that the capacity to process small and large volumes of data is accessible to EOSC users and that the Web of FAIR data and related services established by EOSC is fully interoperable with the EuroHPC JU systems to equip European researchers and innovators with high quality services and data that can support their research.
- The advancement of HPC, AI and quantum go hand in hand – these technologies complement each other and should be developed in cooperation. Funding instruments like Horizon Europe and Digital Europe programme play an important role in supporting this converged development
- Systematic competence development is not a separate track, but an integral part of advancing the development and impact of RIs and building next generation capabilities
- Horizon Europe must be a vehicle for strengthening the global research infrastructure ecosystem by addressing interoperability requirements and aligning resources and common priorities on a global scale
- Horizon Europe can be instrumental in encouraging RIs to make their own carbon footprint as small as possible by making comprehensive climate criteria and full climate impact assessment an integral part of the programme
- Long-term sustainability and continuity of the European RI landscape require stable and predictable funding models that meet the needs of RIs throughout their life cycles, including preparation, implementation, construction, operation and major upgrades

### **Research Infrastructures are part of the critical infrastructure of a well-functioning society and economy**

The current Horizon Europe strategic plan (2021-2024) recognises that research infrastructures (RIs) contribute to advancing excellent science, addressing societal challenges, ensuring evidence-based policymaking and helping industry strengthening its knowledge base and technical know-how. A viable RI ecosystem in Europe is, however, becoming even more strategically important, and the recent Council Conclusions on Research Infrastructures<sup>i</sup>, highlight that the European RI ecosystem is not just a contributing part, but in fact a key component of the critical infrastructure which is essential for the



functioning of society and the economy, in addition to for instance healthcare, security or energy infrastructures. As shown during the Covid-19 pandemic, RIs are absolutely essential for the capacity to deal with acute crisis scenarios, which demonstrates the increasing interdependence between RIs, research and evidence-based policy-making. This development may also indicate that RI policy-making will gradually be converging with other sectorial policy-making in the areas such as energy, environment, agriculture or health. Horizon Europe must reflect this development by integrating the priorities for the European RI ecosystem into the Strategic Plan for 2025-27.

### **European data infrastructures and data policies must match the needs of data-intensive research and innovation**

In the current era of data-intensive research, increasing amounts of data from many different sources are used to advance scientific breakthroughs and industrial innovation. This highlights the importance of continuing the efforts to develop data infrastructures and data policies that support the findability, accessibility, interoperability and re-usability of data for research purposes. The principles of FAIR data and open science must remain at the heart of Horizon Europe in the years to come.

Another cornerstone of data-intensive research and innovation is interoperability, which is key for enabling collaboration and shared use of research infrastructures among research communities from both industry and academia. Interoperability must be addressed at all levels - legal, organisational, semantic, technical, and developed through community-driven processes of creating shared standards and processes, with EU-level guidance and coordination by e.g. the European Data Innovation Board and the Interoperable Europe Board, to be established by the Data Governance Act<sup>ii</sup> and the Interoperable Europe Act<sup>iii</sup>, respectively.

Europe must make strategic choices to ensure that the ownership of its most valuable data is kept in Europe, underpinned by publicly funded research data infrastructures. This allows for secure data management and re-use in Europe, thereby improving cyber resilience, reducing dependence on global commercial cloud services and increasing trust among the data owners and users. The common European data spaces must be created taking into account the needs of the research community and the ambitions of the European Open Science Cloud (EOSC).

### **Supercomputing boosts benefits of data and development of emerging technologies**

Horizon Europe is an important instrument to help leveraging the investments already made in the development of world-class supercomputing and data infrastructures in Europe. A key priority for the digital research infrastructure landscape is to allow for data processing and advanced computing capacities to develop in close convergence. This implies that the European Open Science Cloud (EOSC)<sup>iv</sup> and the European High-Performance Computing Joint Undertaking (EuroHPC JU)<sup>v</sup> must work together to ensure that the capacity to process small and large volumes of data is accessible to EOSC users and that the Web of FAIR data and related services established by EOSC is fully interoperable with the EuroHPC JU systems to equip European researchers and innovators with high quality services and data that can support their research. This can support widening HPC access to new research communities and enable more opportunities for interdisciplinary research. Horizon Europe must additionally continue to be part of challenge-driven flagship initiatives such as Destination Earth<sup>vi</sup>, where both complex modeling and extreme-scale data is applied.



In addition to traditional supercomputing, attention must also be paid to emerging technologies, such as AI and quantum. The advancement of HPC, AI and quantum go hand in hand – these technologies complement each other and should be developed in cooperation. Funding instruments like Horizon Europe and Digital Europe programme play an important role in supporting this converged development. The aim must be to create a comprehensive and sustainable ecosystem of interoperable, federated digital research infrastructures, where HPC, cloud, quantum, AI, data management and network connectivity work in convergence. This will be key, not only for Europe's research capabilities and technological competitiveness, but for sustainable growth and resilience.

### **Systematic competence development is critical for advancing the RI ecosystem and building next generation capabilities**

Humans are at the core of the European research infrastructure ecosystem, which must be reflected when setting the strategic priorities for Europe's RI landscape in the coming years. Systematic competence development is not a separate track, but an integral part of advancing the development and impact of RIs and building next generation capabilities. Data-intensive research and the growing use of digital RIs require not only new skills, but also the pace of learning has to accelerate in order to keep up with the fast development of digital technologies like HPC, AI and quantum. It is, however, important to recognise that competence development is less about individuals acquiring necessary skills but more about creating conditions for cross-disciplinary intersections where joint communities are learning together. Horizon Europe must liaise closely with other relevant funding instruments like Digital Europe Programme to ensure that this approach to competence development and skills related to the use of RIs is aligned and prioritised across programmes.

### **Horizon Europe can be a vehicle for leveraging the global RI ecosystem**

Forming strong global partnerships with like-minded actors will not only contribute to tackling global challenges and drive innovation, it is essential for Europe's open strategic autonomy. Horizon Europe must be the vehicle for strengthening the global research infrastructure ecosystem by addressing interoperability requirements, aligning resources and common priorities on a global scale, in line with the recommendations of the Brno Declaration on Fostering a Global Ecosystem of Research Infrastructures<sup>vii</sup>. This will not be realized only through separate research projects targeting international RI development, it requires that international collaboration becomes an even more integrated part of Horizon Europe. The current policy that allows countries like New Zealand, Japan, Canada and South Korea to make association agreements with Horizon Europe is an important step in the right direction.

### **Horizon Europe must take action to help decreasing the climate footprint of RIs**

Horizon Europe must take clear responsibility of the climate footprint of research itself. While in particular digital RIs are important to advance climate research and green innovation, they often have a very high energy consumption. Horizon Europe can be instrumental in encouraging RIs to make their own carbon footprint as small as possible by making comprehensive climate criteria and full climate impact assessment an integral part of the programme. When evaluating the footprint, it is critical that all factors and indicators are taken into account: the whole life cycle of any large RI construction, purpose of use, total cost of ownership, energy efficiency, possibility of waste heat utilisation, and supply of renewable energy sources. These factors have a huge and direct impact on the environmental burden, energy security and cost for whole Europe.



## Long-term sustainability of European RIs can be ensured through stable and predictable funding models

A world-class European research infrastructure landscape is a strategic asset and a fundamental pillar of research and innovation ecosystems, which requires long-term political and financial commitment from both Member States and the EU. Horizon Europe plays an important role in the creation of stable and predictable funding models that meet the needs of RIs throughout their life cycles, including preparation, implementation, construction, operation and major upgrades.

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<sup>i</sup> <https://data.consilium.europa.eu/doc/document/ST-15429-2022-INIT/en/pdf>

<sup>ii</sup> <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A32022R0868>

<sup>iii</sup> [https://commission.europa.eu/publications/interoperable-europe-act-proposal\\_en](https://commission.europa.eu/publications/interoperable-europe-act-proposal_en)

<sup>iv</sup> <https://eosc-portal.eu/>

<sup>v</sup> [https://eurohpc-ju.europa.eu/index\\_en](https://eurohpc-ju.europa.eu/index_en)

<sup>vi</sup> <https://digital-strategy.ec.europa.eu/en/policies/destination-earth>

<sup>vii</sup> <https://www.icri2022.cz/post/brno-declaration-on-fostering-a-global-ecosystem-of-research-infrastructures>

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### About CSC

CSC – IT Center for Science Ltd. is a Finnish center of expertise in information technology owned by the Finnish state and higher education institutions. CSC provides high-quality ICT infrastructure and expert services for research, higher education institutions, culture organisations, public administration and enterprises, to help them thrive and benefit society at large. Together with ten European countries, CSC hosts at its datacenter in Kajaani, Finland, one of the pan-European pre-exascale supercomputers, LUMI, acquired through the EuroHPC Joint Undertaking. CSC's research infrastructures are utilised for research related to strategic policy areas of the European Union, such as climate and environment, as well as personalised medicine and health.



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