

Unlocking the potential of Research Infrastructure Ecosystems to tackle societal challenges

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Key messages

- **Although Research Infrastructures (RIs) play a critical role in all fields of science, most RIs still serve a restricted expert user community.** Many RIs have unexploited potential to expand their user communities and broaden their scope of activities, including through international partnerships.
- **Collaborative arrangements among RIs can exploit complementarities and foster new interdisciplinary partnerships,** supporting excellent science and innovation.
- **RI ecosystems, i.e. dynamic and evolving partnerships between RIs which are developed around a set of shared strategic objectives, represent unique opportunities to accelerate the pace of scientific discovery and address complex societal challenges.**
- **Policymakers and funders play a critical role in ensuring the conditions for sustainable and successful RI collaborations.** The successful development of an RI ecosystem is not solely dependent on the operational organisation of the partnership but also on the supporting incentives and policies put in place by funders and governments. Integrating RI ecosystems into strategic planning exercises and developing specific funding mechanisms that promote and recognise the value of collaboration between RIs are important for maximising the return on investment in RIs both individually and collectively.

What's the issue?

RIs represent considerable investments but are rarely being exploited to their full potential. RIs play a key role in enabling and developing research in all scientific domains and represent an increasingly large share of research investment (OECD, 2025^[1]) - estimated at about 10% of public research spending in a country like France¹. Potential users of RIs are increasingly diverse and numerous, particularly as the data produced by RIs becomes progressively more complex and varied. However, most existing RIs are domain-specific and serve a restricted expert user community (OECD/Science Europe, 2020^[1]). Many RIs have unexploited potential to expand their user communities and the range of research that they support. In line with increasing investment in RIs, the expectations from funders and policymakers are expanding. There is a strong emphasis on delivering socio-economic impact, which goes beyond the production of new knowledge (OECD, 2019^[2]). There is therefore an opportunity to enhance the use and efficiency of RIs, and their scientific and socio-economic impact, by better exploiting the synergies among them.

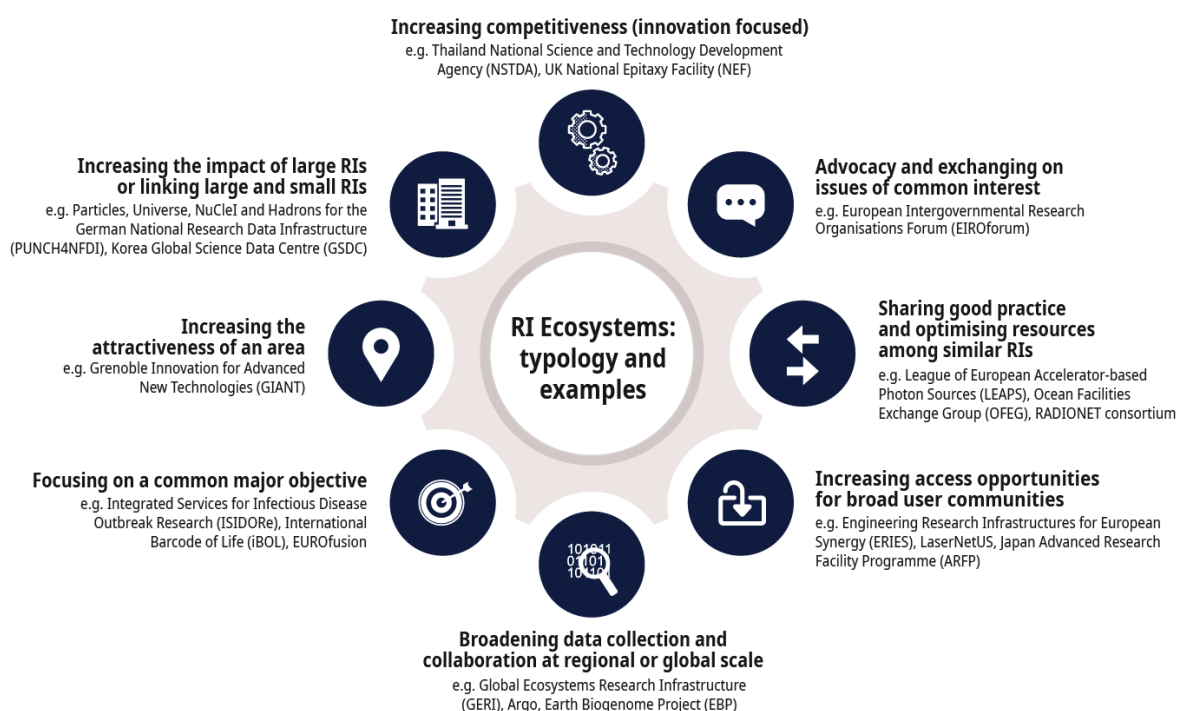
Existing collaborations between RIs are still largely restricted to working together in closely related scientific fields. For example, IceCube, the neutrino observatory built in Antarctica, has formed collaborations on topics of common interest with other neutrino telescopes deployed in the Mediterranean and in Lake Baikal through cooperative agreements (<https://www.km3net.org/gnn-global-neutrino-network-formed>). There are similarly strong international collaborations among nuclear fusion facilities, between synchrotrons, or research vessels. A recent survey among RI managers and decision-makers underlined the interest in developing closer collaborations between RIs to enhance their scope and impact. However, this also highlighted a number of practical challenges to establishing and maintaining productive partnerships, including the governance and coordinated operation of RIs that have very different operating models (OECD, 2023^[3]). Funding and resource issues were also identified as significant barriers to cooperation, particularly across borders. Hence it is not surprising that the majority of RI collaborations have been developed between similar RIs or within specific fields. The development of more heterogeneous ecosystems that include RIs from different domains remains relatively rare and incentives to establish such partnerships are lacking.

International collaboration between RIs remains limited. While there is an increasing trend in the development of RI collaborative networks or consortia at national or regional level (including within Europe), few have an intercontinental dimension, which highlights real challenges for RIs to collaborate across different jurisdictions. Most RI collaborations are currently situated or originate from Europe and North America, despite the obvious potential value that partnerships with RIs from other regions could have for addressing global challenges.

RI ecosystems can have diverse goals and require specific instruments and policies for their development. RI ecosystems are dynamic and evolving collaborations between RIs that are developed around common goals and provide joint services and/or activities at the level of the collaboration. These ecosystems can have a broad diversity of strategic goals. Specific scientific aims are often mixed with more generic objectives, such as increasing the visibility of their user community and strengthening their interaction with funders/policymakers, as illustrated in Figure 1. This diversity of objectives is also mirrored by a diversity of member composition, and there is no one-size-fits-all model for their governance, financing and development.

¹ In France, full annual cost for RIs was estimated at 1.5 billion euros in 2016 out of total public research spending of about 17 billion euros.

Figure 1. Typology of RI ecosystems based on their main strategic objectives and representative examples



Note: Strategic objectives are not mutually exclusive

Source: Author's design based on (OECD, 2025^[4])

Why is supporting the development of RI ecosystems important?

Scientific and societal challenges are increasingly complex in nature. Contemporary research is characterized by increasing cooperation not only at an intradisciplinary level, but also across and beyond disciplines, as many scientific and societal problems are too complex to be effectively addressed by a single field of study. These problems require the competencies and tools from multiple disciplines—natural sciences, engineering and social sciences—to study the causes and effects and develop solutions. For instance, environmental change not only affects global weather patterns but also has profound implications for agriculture, water resources, and public health. These challenges cannot be addressed in isolation, they require coordinated efforts across disciplines and RIs are uniquely positioned to catalyse such efforts.

RI ecosystems have demonstrated their capacity to address societal challenges. During the COVID-19 crisis, RIs mobilised quickly and adapted their activities to respond to the challenges raised by the pandemic. Thus, not only were biomedical RIs fully refocused on COVID-19 issues, but many RIs from other domains also reoriented their activities to support scientists involved in COVID-19 research (OECD, 2023^[5]). For example, physics RIs proposed their experimental equipment and expertise to help identify drug targets or adapted their high-performance computing resources for epidemiological modeling and data mining. The pandemic also fostered new coordination mechanisms and partnerships between RIs: for example, in Europe, a common Alliance of Medical Research Infrastructures was established to facilitate broad user access to facilities, data and resources.

RI ecosystems are also developing to respond to other major challenges and to the need for socio-economic transformations. These can be aligned with and supported by mission-oriented policies (e.g. designed to support the transition to a circular economy through the development of innovative,

sustainable materials). They also play an important role in informing and monitoring critical international agreements via global programmes related global earth observation or environmental change. Interconnected multidisciplinary RI ecosystems constitutes a critical strategic asset for addressing complex socio-economic challenges but they require specific policy support if they are to effectively perform this role (OECD, 2025^[1]).

What can policymakers do?

- Strategic RI exercises and road-mapping by institutions and governments should incorporate an ecosystem view into their objectives and therefore incentivise RI collaboration and exploitation of synergies, particularly at the international level where collaboration between RIs remains challenging.
- Existing international fora, such as the International Conference on Research Infrastructures (ICRI) should take account of the critical role of RI ecosystems in the research landscape and provide opportunities for RI ecosystem managers, funders and policy makers to share experience and good cooperative practices,
- Governments and research agencies should explore various models of cooperation that can allow RI ecosystems to respond to policy needs, and in a way that is both flexible and dynamic. There is considerable opportunity for mutual learning across countries and scientific domains in this respect.
- Research funders and governments should implement sustainable funding models for RIs that both stimulate the creation of new RI ecosystems and incentivise RIs to join existing ecosystems, with enhanced efforts to enable the participation of RIs from emerging economies.

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