ESFRI European Strategy Forum on Research Infrastructures

ESFRI Report

Access to Research Infrastructures and Charter on Access to RIs

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EXECUTIVE SUMMARY

There are still challenges to **broader and effective access** to research infrastructures (RIs) as needed by users to tackle scientific and societal challenges and to underpin the new European Research Area (ERA)

The objectives of the **ESFRI Drafting Group on Access** are to identify these challenges, propose ways to address them and propose orientations for the revision of the European Charter of Access to Research Infrastructures (the 'Charter'). This work is part of Action 8 of the ERA Policy Agenda 2022-2024: 'Strengthen sustainability, accessibility and resilience of research infrastructures in the ERA'.

To this end, the ESFRI Drafting Group on Access implemented in May-June 2023 two parallel **surveys**: one detailed survey targeting research infrastructures (individual ones or networks with joint access scheme) and one targeting RI stakeholders.

Response rates were very high in the domain of Physical Sciences and Engineering (PSE). Trends, if any, for single-site RIs reflect the PSE domain while distributed RIs provide a more balanced representation of all domains including PSE. This must be considered when discussing the outcome of the surveys.

The RI respondents express a large diversity of types of access (physical, remote, virtual), nature of service offered (access to equipment, to data, to collection etc.), including within an RI, often depending on the domain and the nature of the RI (single site or distributed). Described categories of users, access policies are more homogenous although there are also trends including per domain.

Although physical access remains predominant among the respondents, there are clear trends from RIs with such access to **increase and improve remote access (or hybrid access)** as well as wide virtual access. There is also a marked willingness to open up to **new research communities and industry users**.

Among the barriers to broader access, several legal, institutional, and financial aspects were raised as well as technical aspects. The trends related to **multidisciplinary** efforts, **innovation**, and **green and digital** transitions were also discussed. In addition, respondents provided feedback on EU support for **transnational and virtual access**.

The outcome of the survey is presented in detail in this report. Preliminary recommendations to address access challenges and revise the Charter are tentatively listed and are summarised hereafter.

Legal, institutional, financial, and other dimensions

- Develop targeted **legal guidance** focusing on intellectual property right (IPR), data protection, and liability. Explore the establishment of a **central platform** or coordinating entity to disseminate guidance and raise awareness on opportunities provided by RIs.
- Strengthen **visibility and recognition** of distributed RIs (notably distributed ERICs) in national and European research systems.
- Help identify **diversified funding streams** for access, advocating for long-term support.
- **EU support**: ensure continuity and appropriate budget and a better balance between curiosity and challenge-driven access.

Technology development

- Prioritise cutting-edge **technology developments** to address user needs and their integration in RIs, emphasising interoperable **remote and virtual access** platforms.
- Promote **interoperability**, **standardisation** and **harmonisation** within and across RIs including in support of **FAIR principles** and **multidisciplinary** needs.
- **The environmental footprint** of access must be assessed and mitigated.
- Support RIs in managing the challenge of "big data" and open science, of **digitisation**, in developing hybrid access mode and related upskilling of RI staff and training of users.
- Technology developments should go along with an **assessment of the resources needed**.
- **Innovation**: promote technological transfers, co-development initiatives, and broader collaborations with industry and SMEs.

Main orientations for the revision of the Charter

- The Charter should elaborate further on **open science**, **data** and FAIR principles, on **digital** aspects and be in line with the latest relevant EU recommendations on these matters.
- Add '**priority-driven access**' mode.
- Add '**crisis access**' mode.
- Add reference to access for **education/training.**
- Consider the latest relevant EU recommendations on **reciprocity and sovereignty.**
- **Acknowledgement of RIs**, although already a principle in the current Charter, could be further elaborated notably in the context of wide virtual access.

While many respondents appreciated the general nature of the Charter, some respondents called for much more detailed guidelines, examples and links to templates. It is the opinion of the ESFRI Drafting Group and of the experts who supported this work that the Charter should remain a concise point of reference, outlining fundamental access principles and acting as a benchmark for RIs. The Charter should not become overly prescriptive with the risk of frequent revision. The Charter could however be supported through the dedicated Portal with the guidance documents.

These findings and recommendations were presented and discussed at the second meetup of the ESFRI Stakeholder Forum on 27 September 2023 in Tenerife. The event confirmed the validity of the findings from the surveys and highlighted the need to involve the research infrastructures and the stakeholders in the process of revising the Charter. The ESFRI Stakeholder Forum also triggered in-depth discussions on the sustainability of access and the need for access funding including transnational access (TNA).

REPORT OF THE ESFRI DRAFTING GROUP ON ACCESS

1. INTRODUCTION

Continued national and EU support to access, including transnational and virtual access, has significantly contributed to enhanced access to the best research infrastructures needed by researchers in Europe and beyond and contributed to more efficient, open, and effective use of these infrastructures.

However, there are still challenges to **broader and effective access** to research infrastructures as needed by users to tackle scientific and societal challenges and to underpin the new European Research Area (ERA), in line with Action 8 of the ERA Policy Agenda1. **The needs and related challenges should be identified as well as possible ways to address them.** This requires a common understanding of access types (such as physical, remote, or virtual access), access policies and specific dimensions (technology, data, legal aspects, etc.).

To this end, the ESFRI Drafting Group on Access implemented two parallel surveys in May 2023:

One survey targeted **individual European research infrastructures of European interest** including ESFRI Landmarks and Projects and European Research Infrastructure Consortia (ERICs) that are open to external users, notably from other countries. Networks of research infrastructures, such as ongoing Horizon INFRAIA or INFRASERV projects[1], having a joint access programme could also reply to the detailed survey.

A second survey targeted **stakeholders** such as those registered in the ESFRI Stakeholders or ERA Forum and which could bring a broader perspective, e.g., as (potential) users, technological partners, common trends from a network of RIs in a scientific domain, or potential access providers not (yet) open to external users notably from other countries.

The contents of both surveys are enclosed in Annexes A and B. When possible, definitions related to access were aligned to the European Charter of Access to Research Infrastructures (hereafter the 'Charter') and made explicit to the respondents to the survey. External individual experts appointed by the European Commission analysed the replies to the surveys, reporting on main findings and challenges for a broader and more effective access and drafted recommendations.

Annex C presents key policy background and Annex D provides the list of contributors (ESFRI Drafting Group members and experts appointed by the Commission).

Building on these findings, the Commission will propose a revision of the European Charter of Access to Research Infrastructures. The outcome will also feed the discussions on access policy at national and EU level, including the preparation of future actions under Horizon Europe and beyond.

[1] Horizon 2020 Integrating Activities ('INFRAIA' calls) combine in a closely coordinated manner three types of activities: networking activities, **transnational and/or virtual access** activities, and joint research activities. Horizon Europe 'INFRASERV' projects "focus on the **provision of integrated RI services** to enable R&I addressing major societal challenges, including health challenges, the green and digital transformation and the resilience to crises, as well as to support curiosity-driven research and advancement of frontier knowledge in broad scientific domains".

2. OVERVIEW OF RESPONDENTS TO THE SURVEY

Research Infrastructures

76 RIs or networks of RIs replied to the survey targeting RIs. As none of the questions were mandatory, the number of replies for a given question varies but is typically around 60. Unless otherwise stated, percentages in this report refer to the number of respondents to a specific question and not to the total number (76) of respondents to the survey.

Categories of RIs. More than 40% of respondents are ESFRIs/ERICs, then close to 25% are H2020 INFRAIA networks (half of them in PSE) and more than 20% "other RIs of European interest" (mostly in PSE). Each other category (non ESFRI Intergovernmental Organisations, networks with joint access, HE INFRASERV projects) are represented by 2-3 respondents.

Domains of RIs[2]. Close to half of respondents are from PSE (among which more than 75% are single site RIs) then 20% are from H&F and around 10% are from ENE, same for SCI; 7% are from ENV and 4% from DIGIT. PSE is clearly predominant compared to other domains. As a nuance to ENV and DIGIT being the less represented domains, these domains are the most selected second domain (respectively 18% and 14% of respondents).

Structure of RIs. 54% of respondents are distributed RIs (mostly ESFRIs/ERICs and H2020 INFRAIA) and 42% are single-site RIs (mostly PSE). PSE is largely dominated by single site structure, ENE is balanced, other domains are dominated by distributed structure. Overall, trends, if any, for single site RIs are likely to be trends for PSE while distributed RIs provide a more balanced representation of all domains including PSE.

Stakeholders

25 replies from RI stakeholders were received representing **15 different communities/associations** (considering that 11 replies are from the same neutron community spread among different countries).

Being asked which perspectives they were bringing to the survey, the respondents could select up to two replies distributed as follows: more than 60% qualified themselves as (potential) users of RIs, around 30% as established RI networks and close to 30% as potential access providers to external users. When excluding the neutron community, potential access providers come first (50%), followed by potential users (around 40%) and established RI networks (36%).

Most of respondents are representing or closely connected to research infrastructures. Only two respondents are exclusively representing users (an association of junior researcher and an association of users in PSE domain) and no respondent are technological partners of RIs.

[2] DIGIT: Data, Computing and Digital Research Infrastructures; ENE: Energy; ENV: Environment; H&F: Health & Food; PSE: Physical Sciences & Engineering; SCI: Social & Cultural Innovation.

3. ACCESS TO RESEARCH INFRASTRUCTURES

This section gives an overview of the replies and trends as expressed by the respondents.

3.1 State of play – types of access, access policies, users

The RI respondents express a large diversity of type of access (physical, remote, virtual), nature of service offered (access to equipment, to data, to collection etc.), including within an RI, often depending on the domain and the nature of the RI (single site or distributed). Described categories of users, access policies are more homogenous although there are also trends including per domain.

Type of access

Physical access to RIs remains the main type of access for the majority of RI respondents, both single-sited and distributed ones. This is the case for almost all RIs from PSE and ENE. It is balanced between physical and remote access for H&F, and between physical and virtual access for SCI. Virtual access appears predominant for ENV only.

About **expected trends**, physical access will remain important (except for domains where virtual access is already the main type of access) but **remote and virtual access appear increasingly important**. This was accelerated by the COVID-19 pandemic but will remain due to both environmental and cost constraints. Hybrid scenarios (smaller teams present while others are connected remotely) are also expected to increase. Several respondents suggested that the current classifications, while overall appropriate, might not fully capture all nuances of type of access.

These trends are **bringing new challenges to access providers as well as users** both on technicalities and training needs: ensuring effective interaction with researchers, tackling technical issues such as real-time remote interaction, handling larger data sets, training users remotely and onsite technical staff, addressing resource limitations of RIs etc.

Nature of access

RIs were asked to describe their core or additional offer for access by selecting as many as needed among a list of services used as examples in the Charter on Access[3] and, if necessary, by adding other access offers.

As could be anticipated, there are **clear trends per domain** considering the three most selected **core offer** per domain: machine time, setting up experiments and expert support are the prevalent core offer in PSE and ENE. The most selected by H&F RIs are setting up experiments, training and expert support. In ENV, access to data, analytical services and training are the prevalent ones. In SCI, access to archives, to data and training are the prevalent core offer. And as expected DIGIT RIs offer mainly access to data and data communication services as well as access to archives.

[3] Access amongst others "to machine time, computing resources, software, data, data-communication services, trust and authentication services, sample preparation, archives, collections, the set-up, execution and dismantling of experiments, education and training, expert support and analytical services"

Regarding trends per the structure of RIs, single-sited RIs replicate PSE results. Cumulated results for **distributed RIs** (covering all domains) reflect the **common importance in all fields of training and access to data as a core offer** while the third most selected choices replicate PSE and H&F results (PSE and H&F being 50% of distributed RIs respondents).

Looking at "additional offer", the most selected ones are access to software, expert support, training, access to data, computing resources.

Be it as core or additional access offer and cumulating all domains, **training, expert support, and access to data** are confirmed as an **almost systematically component of the access offer**.

With regards to **plans** to develop the access offer in the next five years, **access to data** is the most cited one followed by access to **software**.

Services beyond research. While RIs play a pivotal role in research and education, their involvement in operational services beyond research, such as public health and environmental monitoring, **remains limited**. Currently, around two-thirds of the respondents do not offer operational services beyond research, while a third do provide such services. However, ENE and ENV shows an inverse picture: 60% do offer such services. When asked about plans to develop or further enhance such services, there is a three-way split among respondents: ~30% indicated they do plan to develop them, the same share of RIs have no such plans, and the largest group is uncertain about future developments in this area.

Although treated separately in the survey, the type of access and nature of access are obviously connected as well as the profile of users. This might require high flexibility from RIs to adapt their access offer and support: physical access by specialists familiar with the facility does not require the same RI engagement as remote access by non-specialists expecting an integrated service, i.e. providing solutions to their scientific or technical questions. Such considerations are critical when discussing strategy for opening up to new research communities or users from industry or other sectors and will require careful attention to the level of resources needed to successfully implement strategy. See § on challenges.

Required staff resources and operating costs, number of users. Respondents suggest that "Machine/instrument time" and the "Set-up, execution, and dismantling of experiments" are notably resource-intensive, requiring significant staff and operational costs. In contrast, "Computing resources" and "Software" are perceived to be less demanding. The data also showed that services like "Data", "Software", and "Archives" draw the most significant user engagement annually, indicating their widespread utility.

Respondents' comments offer further insights into the dynamics of RIs. Their operations can be vastly different, with some being mature entities serving thousands and others still in the early stages. A notable focus lies in training and education, with many entities emphasising their contributions in this area. Several RIs mentioned future ambitions to increase their user base. There is also a strong emphasis on massive data resources, with some entities boasting repositories accessed by millions. At the same time, concerns were raised about data security and access restrictions due to the sensitive nature of some data. Moreover, budgetary considerations have shaped how resource allocations are perceived, suggesting that even "low" or "medium" resource allocations can be significant in absolute terms. At least one comment suggested that defining what exactly constitutes a "user" across these services remains complex due to the breadth of offerings ranging from hands-on services to webinars.

Main modes of access

Excellence-driven is highly predominant (+70% of RI respondents to the question) followed by wide access (16%) which is predominant for SCI. Very few RIs indicated market-driven (H&F, DIGIT, PSE) or 'other' as the main mode of access.

The large majority of RIs are **combining different modes** of access. For access other than wide access (usually reserved to virtual access), RIs were asked on the balance (%) among the different modes. On average (of ~40 respondents to this question), it is as follows: **75% excellence-driven, 17% market-driven and 8% other**. There is no specific trend per type of RI (single-sited or distributed RIs) but there are **trends per domain**: Excellence-driven mode reaches 85% for SCI, PSE and ENV but is less predominant for H&F and ENE, with a Market-driven access at respectively 33% and 25%.

Around 70% of respondents consider the three modes of access as defined in the Charter as appropriate. Around 30% are in favour of adding another mode of access: in most cases, it is a targeted access according to some criteria or priority (priority-driven -including own RI's research or technical needs, selected area with high impact, challenge-driven etc.). There are additional references to fast-track access, crisis-driven access (exceptional situations) or cross-domain priority access. Finally, linked to funding, there is also a reference to programme-based access catered to projects funded externally. Access for training needs is also mentioned.

Main Users

RIs were asked to select as many as needed categories of main users among listed options (researchers, PhD Students, public authorities, public services, private sector). As expected, all respondents confirmed **researchers** as their main users and almost all included PhD students as well. 57% of RIs also selected **private sector** (this rate goes up to +80% by H&F and ENV RIs), 31% selected **public services** (this rate goes up to +60% by SCI RIs) and 22% selected public authorities (this rate goes up to 60% by ENV RIs).

Within researchers, European researchers are the main users for all RIs. Beyond Europe, there is no difference with international researchers except for H&F (selected by 70% of RIs only). Two-thirds of RIs signal to have a significant number of users in one dominant area or application domain. More than half of RIs signal to attract multidisciplinary research teams among their main users.

Within the private sector, there is overall no difference between industry and SMEs, respectively, selected by 85% and 79% of RIs having private sector among their main users, while services sector is selected by only 10% of these RIs (and none of them from PSE and H&F).

Trends towards new users. There is a marked willingness for opening up to **new research communities** (~60% of respondents), and to **industry users** (+50 % of respondents). However, there are specific trends for some domains: targeting private sector goes up to 80% of respondents for ENV and H&F; and targeting users from public services is signalled by +60% of ENV and SCI RIs (only ~20% all domains together).

Such opening up to new research communities mean considerable challenges, the main one being that most RIs are set up to serve expert users. **Non-expert users will require a change in operation** with considerable ramifications (outreach to new stakeholder groups, new training offers for non-experts, and providing more counselling and support in proposal preparation, during the course of the experiments and for data analysis).

Industry users would in most cases require all of the above, notably the intensified support, and expect professionalised services that would require integrating a quality management culture into the research infrastructure that will standardise the protocols and procedures and guarantee the same level of quality of

the service. These changes would, therefore, demand significant changes in the priorities of the RI and require considerable additional funds.

Another angle for addressing new user groups is the movement towards the development of strategic access on highly strategic fields, e.g. batteries and quantum technologies, which again requires the efforts described above, and also makes it necessary to strengthen the collaboration between partnerships, missions or other pillar II initiatives and RI communities.

Access plans and policies

RIs are actively developing their access plan policies, moving towards automated management and remote access systems, with a significant emphasis on continuous feedback mechanisms and quality service delivery. EU-wide initiatives are influencing these shifts as they possess a broader reach compared to national programs, necessitating RIs to adapt to the changing user requirements and prioritise modes like need-driven and urgency-driven access.

European users dominate the RI user base and the combined numbers of international and European users exceed local or national engagements, highlighting the EU and global significance of RIs. In enhancing inclusivity, many RIs promote equality and diversity, focusing on underrepresented groups, aligning with established diversity charters, and introducing remote access and anonymous reviews.

The RI community and stakeholders have identified areas of improvement in the current access policies, notably addressing the **disparities among member states** and the need for universally funded pan-European RIs. There is wide support for excellence-driven models to ensure **fair opportunities across all researchers**, with particular emphasis on merit-based access, and **clearer pathways for industrial users**, emphasising the strategic significance of projects and fostering cross-border collaboration and access.

In the broader context of **open science policy**, one expert pointed that the tension between excellence-driven access mode, which is typically free access, and demonstrating a **return on investment** for funding members require specific attention and it is crucial for access policies to find the right balance. In addition, the interplay between the RI's access policy, **IPR policy and data policy** would benefit from being explicitly elucidated: these policies must be aligned within the same RI, but their distinct boundaries must also be clearly demarcated.

3.2 Barriers and challenges for a broad and effective access

Legal, institutional, financial and other dimensions

A significant proportion of respondents consider **legal** aspects, especially **IPR, data protection, and liability issues**, as relevant factors in improving access to RIs. While legal matters are addressed in various existing policies and frameworks, there is an evident call for streamlining, simplifying, and ensuring comprehensive legal frameworks to bolster access.

A significant portion of respondents, mostly distributed RIs, recognise the relevance of **institutional** aspects, but they are seen as primary barriers to RI access by less than 15% of respondents (all distributed RIs). Comments refer to formalisation and valorisation of in-kind contribution (staff, facilities); recognition of RI as structural elements for doctoral schools, university masters or training programmes; approval process to change scope and activity; harmonisation of access process to national and regional partner facilities.

Financial challenges, especially operational costs, infrastructure maintenance, and personnel costs, are viewed as **important barriers to broadening access**. The importance of EU funding for TNA and more generally, ensuring consistent, diverse, and adequate funding sources is essential. At the same time, reliance on project-based funding and the ending of specific funding streams pose sustainability threats to RIs. While user fees can be one avenue, they have their limitations and might deter broad access. Comments reflect that efforts should be directed towards identifying diversified funding streams, advocating for long-term support, and exploring innovative financial models to ensure both the sustainability and broadened accessibility of RIs.

Other challenges identified include the limitation for broader access due to limited human resources (example of more beam time), the significance of mutual benefits from RI access, challenges with policy alignment, and the need for greater visibility and streamlined ethical approval procedures across Europe.

Technical aspects

Respondents to the survey were asked which technical aspects are most relevant to discuss, in order to improve and broaden access, considering in particular technology development, interoperability, standards, access environmental footprint and others.

Technology development: The comments made by RIs suggest that continuous technological advancements and updates to scientific services are crucial for RIs due to rapidly evolving techniques. This necessitates a high technology turnover rate and an ongoing commitment to infrastructure development to meet user needs. **Balancing the introduction of** cutting-**edge technology with reliable operations is pivotal**. Facilities with the latest technologies not only attract outstanding users but are also essential for certain specific experiments, such as those in advanced physics. At the national level, a consistent focus on enhancing infrastructure to provide access to state-of-the-art technologies is vital.

Furthermore, there is a growing emphasis on exploring the potential of **remote access** wherever feasible. While the components for such remote operations exist, their integration is a complex, multidisciplinary task. This push for remote access aligns with the broader objective of making the best use of technology to offer both remote and virtual access to research data. This dual access approach is seen as fundamental for both the users and the RIs in the current scientific landscape.

Interoperability: The comments made by RIs highlight the significant benefits of interoperability, which include synergy between facilities, diverse experiment types, and efficient sample preparation. The emphasis is on providing both digital and physical resources that are interoperable, which in turn streamlines data exchange, facilitates equipment sharing, and simplifies access, especially when RIs use differing standards. The goal is to enable researchers to focus on their research by minimising logistical complexities and integrating different data sources.

Many comments also emphasised the broader scope of interoperability. It is evident that it is essential for harmonisation and plays a critical role in **multi-disciplinary research**. The application of **FAIR principles** to data and ensuring data interoperability between different analytical instruments has also been highlighted as an important factor.

Standards: Comments emphasise the importance of consistent standards across RIs. It is underscored that the same test procedures should be applicable regardless of the location of the installation. Standardising equipment and file types can lead to collaborative tool development, streamlined data processing, and enhanced benefits for users. Standardisation is key in promoting data and metadata quality, which in turn ensures **quicker user access to valuable information**. Such consistency not only guarantees the **quality of**

data and procedures but also focuses research efforts by minimising potential disparities and discrepancies in data handling.

Furthermore, several comments point towards ongoing efforts in standardising experimental protocols, image data management, and other procedures across distributed facilities to improve the overall quality of the services and data. There is an evident **push towards harmonisation**, not just at the facility level but also **across similar facilities**, especially regarding instrument and data acquisition standards. This extends to the treatment tools and file formats used. Maintaining these standards is recognised as crucial for research reproducibility and the application of FAIR principles to data, even though some find the implementation challenging.

Environmental footprint of access: Comments suggest that the environmental footprint of RIs is increasingly recognised as significant, with many seeing its importance growing in the future. There is an identified lack of tools to monitor these environmental aspects. The footprint of a facility should be closely monitored, and while some measures, like reducing user flights, can diminish negative impacts, environmental considerations should not deter research, especially when such research can offer solutions to current environmental challenges. Furthermore, embracing **autonomous technology** can help in mitigating the environmental footprint, for example, innovations such as durable batteries and materials requiring less upkeep can decrease the necessity for research vessels. The emphasis on reducing the environmental footprint is not universally applicable, as some RIs, like those in the SSH, may not find it as pressing. However, many RIs are adopting measures, such as promoting **remote access**, **energy-saving protocols**, and even considering **travel restrictions** like a train-travel rule, to both reduce their footprint and ensure continued, broad access to their resources.

Other comments: The comments emphasise the importance of managing large datasets, ensuring certified repositories, and the necessity of clear guidelines and transparent pricing structures. Additionally, there is a call for optimising resources to reduce environmental impact and accessing legacy data. Compatibility with other experiments is crucial, as is streamlining the user application process and managing users uniformly across RIs, not just within specific EU projects. Lastly, there is a concern about covering the costs of preparing materials for access.

The stakeholders' point of view

Researchers face challenges in accessing RIs due to financial, technical, and administrative complexities. The current system, which ties TNA funding to specific scientific fields, has unintentionally created intricate administrative processes that prove burdensome, especially for researchers aiming to tap into multiple funding sources.

Many potential users are not sufficiently informed about the opportunities provided by RIs and this needs to be addressed through **improved communication, publicity, and awareness initiatives**. A central coordinating entity at the national or European level could be considered to provide recommendations, share best practices, and effectively disseminate information about the opportunities provided by RIs. Additionally, consideration should be given to **integrating RIs into broader scientific communities**, for instance, by making the use of RIs a criterion for specific funding calls or incorporating RI representatives into academic faculties.

The **administrative processes** related to accessing RIs should be simplified while **increasing TNA funding**, also covering travel and subsistence costs for participation.

IPR, particularly in relation to industry users, has been highlighted as a concern with a lack of clear guidelines and legal frameworks, especially in situations involving shared IPR.

3.3 Specific issue

Complex scientific and societal challenges – multidisciplinary approach

Complex scientific and societal challenges: To better address multidisciplinary and interdisciplinary issues, various RIs have adopted a variety of strategies. Some of the most prominent strategies include promoting **interactions and collaborations between various stakeholders like users, service providers, and institutions**; establishing links with related RIs; forming consortia; and creating **platforms for collaboration**.

The responses highlight that most RIs understand the significance of **multidisciplinary and interdisciplinary** issues and have **mechanisms in place** to nurture it. Collaboration and networking, both internal and external to one's specific domain, are frequently deployed. It is noteworthy that while some RIs naturally are interdisciplinary due to their inherent content, others proactively push for the same through strategic partnerships, innovative funding mechanisms, and other project and initiatives.

Innovation

Innovation: There is a growing focus on innovation by those RIs who responded that they have **incentives** for innovation, with RIs **allocating resources** such as dedicated personnel, distinct evaluation sections, and incentives specifically tailored for innovative projects. **Industry involvement** is also highlighted, with several entities actively promoting collaborations with industries, especially SMEs (but one respondent explicitly referred to pharmaceutical companies), recognising their pivotal role in **converting research into practical products and technologies**. Initiatives such as **training** programs and **knowledge exchange platforms** like seminars are also encouraged, aiming to foster innovation.

When it comes to evaluation, originality and the potential for innovation have become integral components of the assessment criteria used by RIs to grant access or support. Collaboration is consistently underscored as a critical tool for promoting innovation, with institutions encouraging partnerships with industry, academia, and other research entities. Looking beyond their present operations, many organisations are proactively establishing offices and networks that champion technological transfers, co-development initiatives, and broader collaborations. All these concerted efforts underline a **systemic push across entities to integrate innovation into their daily operations and cultivate collaborations that cross various sectors**.

EU support to transnational/virtual access

A large majority of respondents benefitted from EU support, notably distributed RIs and networks.

Impact: Many RIs confirmed that support was pivotal in the establishment of access, refining accounting methods, and enlarging user bases. Nonetheless, some voiced concerns about the strict eligibility guidelines sometimes obstructing national initiatives. While some RIs are in the nascent or developing phases, they are currently formulating their access policies with the support of EU funding. Other noticeable impacts include harmonised application protocols, an emphasis on visibility, introduction of innovative access models, and enhancements in procedures and management through participation in EU projects. Many highlighted the operational improvements resulting from EU support, extending from streamlined access delivery to administrative tasks.

RIs Stakeholders' views: all respondents are aware that the EU supports transnational and virtual access to RIs. The respondents' general view is that the EU's support for RIs has been integral, especially for widening countries and less-funded groups. Since FP7 and FP8, there has been a commendable increase in funding, leading to a more integrated research environment. This integration has enabled elite research groups to access top-tier facilities without discrimination based on their country of origin. The financial backing,

particularly for travel, has been crucial, especially for areas without substantial RIs or limited national research funding. As a result, EU-funded TNA has effectively bridged the scientific divide in Europe, making premier RIs into global research and training hubs and enhancing collaboration and interdisciplinary approaches.

Weaknesses: Discontinuity i.e., lack of **sustained support for long-term projects** is recurrently raised. There is a noticeable lack of support for scientific domains not covered by specific projects, and current EU program often fall short in providing financial backing for simultaneous RI and user access development. **Large consortia** further dilute available funds, leading to challenges in coordination and **insufficient budgets** for participating entities. Additionally, the emphasis on accessing facilities outside the researcher's home country, while beneficial academically, poses significant challenges for SMEs, potentially hindering EU's innovation objectives.

RIs Stakeholders' views: Another significant weakness is the lack of TNA funding for a wider range of scientific areas, which limits user community growth, especially in lesser-investing countries. The multifaceted nature of funding, governance, and access mechanisms across different projects can be daunting for new users. Although the EU's focus on priority themes is noteworthy, its execution often appears fragmented and inefficient, with certain essential small and medium RIs overshadowed by larger RIs. This imbalance, combined with budgetary constraints and limited pan-European access, intensify these challenges.

Digital & green transition

The responses highlight the profound influence of Europe's ongoing green and digital transitions on RIs and how it led RIs to align their selection criteria with the relevant objectives, emphasising sustainable practices. In July 2023, ESFRI published a Report on Energy and Supply Challenges of Research Infrastructures recommending, among others, implementations of response plans to green the operations of RIs. **Several RIs are working towards reducing their environmental, energy, and resources footprints in relation to access.** A prominent strategy is the enhancement and development of **remote and virtual access** options to decrease the need for physical presence. This measure addresses the carbon emissions linked to **travel**, especially flights. In addition, **hybrid access**, which combines in-person and remote access, is also being increasingly adopted. Many entities are also **leveraging technology to facilitate remote work**, such as improved software and workflow performance, cloud storage, and collaborative document sharing. Some facilities are adopting **sustainable energy solutions** like solar photovoltaic for energy production, the implementation of green technologies, and innovative solutions like energy recovering accelerators.

However, this digital shift also brings **challenges** like **data management**, the **lack of direct human interaction** in research, and the integration of systems like **digital twins**. Some RIs are still in the early stages of integrating green transition **strategies**. While some have yet to formalise any measures, others are in the process of discussing and planning initiatives. There is an ongoing interest in acquiring **funding** for projects aimed at reducing footprints, suggesting that the focus on sustainable access will continue to grow.

More than 80% of respondents do not have incentives for providing access to users involved in research and innovation contributing to the green transition. Several RIs prioritise and incorporate green transition efforts in their operations. For some, the focus on green transition is intrinsic, with their research or access directly tied to environmental goals, such as **ECCSEL's** work within **CO2 management** and **ESRF's battery hub initiative** targeting energy challenges. Specific efforts include launching **new services** for research communities, like the **cutting-edge neutron and x-ray techniques in energy fields**, and **thematic access calls**

centred on carbon reduction and the Green Deal. Others have initiated working groups to delve into green transition incentives and develop policies to promote sustainability within their labs and nodes.

Data and online services

70% of respondents have their own specific access policy and in-house access management services. **More than 40% benefit from cross-cutting digital infrastructures** (such as Geant, EGI, EUDAT, OpenAIRE and PRACE). Out of 24 replies specifying which ones, OpenAIRE has the highest utilisation at 46%, followed by EGI at 42%. The least utilised infrastructure is PRACE at 13%.

Around 40% of respondents indicated their data is findable and accessible through EOSC but the impact on user access is varied from no change or premature to evaluate, to increased in visibility and access. Users either locate data via EOSC or use established platforms, and there is an anticipation of more cross-disciplinary users, yet the definitive advantages of EOSC are still ambiguous for many. For those which data is not findable and accessible through EOSC, the primary reasons include data still being made findable, challenges due to lack of standards or manpower, EOSC's unfamiliarity or unsuitability, and other factors like data reservation and early-stage planning.

Close to 70% of respondents confirmed the up-to-date status of their installations, instruments, and operations concerning digitalisation. The same share indicated there were **plans to upgrade** based on digital requirements. Regarding the expected impact of these upgrades on the quantity and quality of their access offer, +75% of 35 valid respondents anticipate a significant impact. RIs identified challenges with inconsistent digital access levels across different facilities, noting a significant **need for investment in digitisation**. ESRF, for example, is developing a ten-year data strategy focused on enhancing data processing and integrating advanced tools like machine learning. RIs are also proactively upgrading their digital platforms in response to the growing prevalence of online methodologies. Many facilities see the **handling of "big data" as a major challenge,** underlining the importance of efficient storage and data retrieval solutions. **Facilities are striving to improve both the quality and quantity of data access as well as adopting the FAIR data principles**.

4. PROPOSED WAY FORWARD TO ADDRESS CHALLENGES

The surveys and further consultations such as in the ESFRI Stakeholder Forum and specific discussions around the ERIC Legal Framework and the third Commission report on the ERIC Regulation[4] show recurrent elements across different dimensions of access (legal, institutional, financial or technical) and related barriers to broad and effective access with challenges expanding to the broader discussion of sustainability.

A first recurrent and cross-cutting element is the need for appropriate **guidance** and for appropriate - and often new- **skills** of RIs staff. A second element is the necessary efforts towards full **recognition** (and **visibility**) of pan-European research infrastructures notably distributed ones in national research and innovation systems. A third element is the necessary **resources** and related **funding** streams including at EU level.

The funding aspects were only one among many other aspects considered by the surveys and the work of this Drafting Group and close links with the ESFRI Drafting Group on Funding were anticipated. This was confirmed by the second meetup of the ESFRI Stakeholder Forum in Tenerife on 27 September 2023 where the research infrastructures themselves and stakeholders' representative highlighted the crucial financial dimension of access. In general, careful assessment and planning of the resources is essential e.g. resources needed to also serve 'non-specialist remote/virtual users' or expand access offer with new 'all-inclusive problem solving services' for cross-disciplinary scientific challenges or access by industry.

The recognition of distributed infrastructures in the national funding landscape must also be addressed and this has been raised in the above-mentioned Commission report on the application of the ERIC Regulation.

Ensuring acknowledgement in publications is often highlighted as very difficult, not only but especially with regards to virtual users – which means that this issue is going to become more important with the increase of virtual access. This highlights a problem which needs to be addressed, including in the Charter, in order to make the contributions of RIs to European research more transparent and visible.

The following recommendations aim to address the most recurrent and important barriers and challenges for a broader and effective access, as identified in this report.

[4] REPORT FROM THE COMMISSION TO THE COUNCIL AND THE EUROPEAN PARLIAMENT Third Report on the Application of Council Regulation (EC) No 723/2009 of 25 June 2009 on the Community legal framework for a European Research Infrastructure Consortium (ERIC) COM/2023/488 final

Legal, institutional, financial and other dimensions

- Develop targeted **legal guidance** focusing on IPR, data protection, and liability related to RI access. This guidance should further elucidate the intersections of Access, IPR, Data, and Data Protection policies.
- Explore the establishment of a **central platform** or coordinating entity
  - to develop, centralise and disseminate such guidance (such as ERIC Forum),
  - to raise awareness on access, services and opportunities provided by RIs notably for less expert users.
- Strengthen **visibility** and **recognition** of distributed RIs (notably distributed ERICs) in national research systems including national funding schemes, in training programmes, as promoters of harmonisation of access.
- Help identify **diversified funding streams** for access, advocating for long-term support, and exploring innovative financial models to ensure both the sustainability and broadened accessibility of RIs.
- **EU support**: more continuity in support to transnational access and appropriate budget to ensure that the best researchers in Europe can access the best RIs. A better balance between curiosity-driven and challenge-driven access should be carefully considered. Explore the use of widening budget for access.

Technology development

- Prioritise cutting-edge **technology developments** to address user needs and their integration in RIs, emphasising interoperable **remote and virtual access** platforms.
- Promote **interoperability, standardisation and harmonisation** within and across RIs including in support of **FAIR principles** and **multidisciplinary** needs.
- The **environmental footprint** of access must be assessed and mitigated.
- Support RIs in managing the challenge of "big **data**" and open science, of digitisation, in developing hybrid access mode and related **upskilling** of RI staff, including strengthening the data stewardship capacity and user-**training** capacity.
- Technology developments should go along with an **assessment of the resources needed**.
- **Innovation**: promote technological transfers, co-development initiatives, and broader collaborations with industry and SMEs.

5. CHARTER: MAIN ORIENTATIONS FOR REVISION

The proposed way forward to address access challenges has also impact on the expected orientations for revision of the Charter.

Overall, the Charter is positively regarded as promoting harmonised, transparent and fair access procedures, as well as open science. It offers clear and concise principles allowing for flexibility and broad applicability while not being too prescriptive.

These strengths are also perceived by some stakeholders as a weakness: non-legally binding, not specific enough. The relevance and benefit for digital infrastructures is questioned. Access policy could be expanded to additional access modes, considering possible internal research agenda or alignment with national or EU policies. In addition, several terms used in the Charter would deserve a definition. The existing definitions should also be cross-checked and adapted when appropriate. Reference to related EU policies and recommendations should be considered such as Commission communication on the Global Approach to Research and Innovation.

While many respondents appreciated the general nature of the Charter, some respondents called for more detailed guidelines in the Charter and links to very detailed guidelines, templates, examples etc. It is the opinion of the ESFRI Drafting Group and of the experts who supported this work that the Charter should remain a concise point of reference, outlining fundamental access principles and acting as a benchmark for RIs. The Charter should not become overly prescriptive with the risk of frequent revision. The Charter could however be supported through a dedicated Portal with appropriate guidance documents.

The main orientations for revision are as follows:

- The Charter should elaborate further on **open science**, on **data** and FAIR principles, on **digital** aspects and be in line with the latest relevant EU recommendations on these matters.
- A '**priority-driven access**' mode should be considered in addition to the existing modes (excellence, market, wide).
- A '**crisis access**' mode could also be considered.
- Reference to access for **education/training** is also proposed.
- The latest relevant EU recommendations on **reciprocity and sovereignty** could be introduced.
- **Acknowledgement** of the use of RIs, although already a principle in the current Charter, could be further elaborated notably in the context of wide virtual access.

ANNEXES

A. Survey for Research Infrastructures
B. Survey for Research Infrastructures Stakeholders
C. Background
D. Contributors

A. SURVEY for Research Infrastructures

ESFRI Drafting Group on Access

Continued national and EU support to access, including transnational and virtual access, have significantly contributed to enhanced access to the best research infrastructures (RIs) needed by researchers in Europe and beyond and contributed to a more efficient, open and effective use of these infrastructures.

However, there are still challenges to **broader and effective access** to research infrastructures as needed by users to tackle scientific and societal challenges and to underpin the new European Research Area (ERA), in line with Action 8 of the ERA Policy Agenda[5]. **The needs and related challenges should be identified as well as possible ways to address them.** This requires a common understanding of access types (such as physical, remote or virtual access), access policies and specific dimensions (technology, data, legal aspects etc.).

To this end, the ESFRI Drafting Group on Access[6] invites research infrastructures and stakeholders to answer specific surveys. Building on these findings, the Commission will propose a revision of the European Charter of access to research infrastructures[7]. The outcome will also feed the discussions on access policy at national and EU level, including the preparation of future actions under Horizon Europe and beyond.

Two parallel surveys are circulated:

- (**THIS DOCUMENT**) A detailed survey is targeting individual European research infrastructures of European interest that are open to external users notably from other countries. Networks of research infrastructures, such as ongoing Horizon INFRAIA or INFRASERV projects, having a joint access programme can also reply to the detailed survey.
  None of the questions are mandatory apart initial identification. We hope that individual research infrastructures can answer most questions. We understand that networks/projects may ignore questions that are not relevant or without clear common trend among the RIs of the network/project.
- A second survey is targeting stakeholders such as those registered in the ESFRI Stakeholders or ERA Forum and which can bring a broader perspective e.g., as (potential) users, technological partners, common trends from a network of RIs in a scientific domain, or potential access providers not (yet) open to external users notably from other countries.

The survey should be replied **exclusively via the online tool**. The enclosed questionnaire is for convenience only to help preparing the survey offline.

[5] European Research Area Policy Agenda (europa.eu)
[6] ESFRI Workplan | www.esfri.eu
[7] European Charter of Access to Research Infrastructures

SURVEY FOR RESEARCH INFRASTRUCTURES (or networks of research infrastructures having a joint access programme)

Content

I- Which research infrastructure(s) do you represent?

A. Full Name of (networks of) RI(s)***: [_____]
Acronym: [_____]
Contact email ***(in case we would like to contact you about this survey): [____@____]

B. Select which category your RI/network belongs to***:

¡ Individual ESFRI Landmark/Project and or ERIC
¡ European Intergovernmental Research Organisation (e.g., EIROforum member other than ESFRI Landmark/Project)
¡ Other research infrastructure of European interest (or research organisation providing RI access and services) open to external users notably from other countries
¡ Established network of RIs with joint access programme open to European researchers
¡ Horizon 2020 starting/advanced INFRAIA community
¡ Horizon Europe INFRASERV project

C. Specify if your RI is single-sited or distributed***:

¡ Single-sited RI (i.e., single site or few dedicated complementary sites)
¡ Distributed RI (i.e., central hub and interlinked nodes)
¡ Not applicable (i.e., network of single-sited and distributed RIs)

D. Main domain***:

¡ Data, Computing and Digital Research Infrastructures
¡ Energy
¡ Environment
¡ Health & Food
¡ Physical Sciences & Engineering
¡ Social & Cultural Innovation
¡ Not applicable (network of RIs from different domains)

E. Second scientific domain, if relevant:

¡ Data, Computing and Digital Research Infrastructures
¡ Energy
¡ Environment
¡ Health & Food
¡ Physical Sciences & Engineering
¡ Social & Cultural Innovation
¡ Not applicable (network of RIs from different domains)

F. Free scientific/technical keywords best describing the RI: [_____]

II- Characterisation of Access: different dimensions and trends

Nature of access offer and expected trends

The European Charter of access to research infrastructures defines access as follows:

'Access' refers to the legitimate and authorised physical, remote and virtual admission to, interactions with and use of Research Infrastructures and to services offered by Research Infrastructures to Users. Such Access can be granted, amongst others, to machine time, computing resources, software, data, data-communication services, trust and authentication services, sample preparation, archives, collections, the set-up, execution and dismantling of experiments, education and training, expert support and analytical services.

On this basis, the following questions will help to describe (i) the access provided by the RI (as core offer or additional support/service) and the expected future trends, (ii) the relative resources needed and (iii) the respective number of users.

A. Among the **categories of access** listed in the Charter (or, if needed, by adding up to three other categories), select the ones that best describe your current offer (specify core offer – additional offer e.g., support to users) and or the categories that are part of your plan for the next 5 years (specify future core offer – future additional offer)

- Machine/instrument time	¡core ¡additional ¡future core ¡future additional
- Computing resources	¡core ¡additional ¡future core ¡future additional
- Software	¡core ¡additional ¡future core ¡future additional
- Data	¡core ¡additional ¡future core ¡future additional
- Data-communication services	¡core ¡additional ¡future core ¡future additional
- Trust and authentication services	¡core ¡additional ¡future core ¡future additional
- Sample preparation	¡core ¡additional ¡future core ¡future additional
- Archives	¡core ¡additional ¡future core ¡future additional
- Collections	¡core ¡additional ¡future core ¡future additional
- Set-up, execution and dismantling of experiments	¡core ¡additional ¡future core ¡future additional

- Education and training	¡core ¡additional ¡future core ¡future additional
- Expert support	¡core ¡additional ¡future core ¡future additional
- Analytical services	¡core ¡additional ¡future core ¡future additional
- Other: [_____]	¡core ¡additional ¡future core ¡future additional
- Other: [_____]	¡core ¡additional ¡future core ¡future additional
- Other: [_____]	¡core ¡additional ¡future core ¡future additional

Comment on categories of access, if needed: [_____]

B. Among the above selected categories of access, please estimate the indicative level (low-medium-high) of required **staff resources** and **operating costs** as well as the estimated **number of users** per year for your current offer. If appropriate, you might also give indication for categories part of the future offer. In case you are operating several facilities, please report common/aggregated trends or report on the most used one (estimated number of users) by external users notably from other countries.

Categories of access	Staff resources	Operating costs (other than staff)	Number of yearly users (approx.)
	[Low-medium-high]	[Low-medium-high]	[number]
Machine/instrument time	¡ ¡ ¡	¡ ¡ ¡	[____]
Computing resources	¡ ¡ ¡	¡ ¡ ¡	[____]
Software	¡ ¡ ¡	¡ ¡ ¡	[____]
Data	¡ ¡ ¡	¡ ¡ ¡	[____]
Data-communication services	¡ ¡ ¡	¡ ¡ ¡	[____]
Trust and authentication services	¡ ¡ ¡	¡ ¡ ¡	[____]
Sample preparation	¡ ¡ ¡	¡ ¡ ¡	[____]
Archives	¡ ¡ ¡	¡ ¡ ¡	[____]
Collections	¡ ¡ ¡	¡ ¡ ¡	[____]
Set-up, execution and dismantling of experiments	¡ ¡ ¡	¡ ¡ ¡	[____]
Education and training	¡ ¡ ¡	¡ ¡ ¡	[____]
Expert support	¡ ¡ ¡	¡ ¡ ¡	[____]
Analytical services	¡ ¡ ¡	¡ ¡ ¡	[____]
Other: [_____]	¡ ¡ ¡	¡ ¡ ¡	[____]
Other: [_____]	¡ ¡ ¡	¡ ¡ ¡	[____]
Other: [_____]	¡ ¡ ¡	¡ ¡ ¡	[____]

Comment on resources or number of users, if needed: [_____]

C. Do you offer **operational services** beyond research (e.g., for public health, environment monitoring)? ¡ Yes - ¡ No.
Do you plan to (further) develop such services? ¡ Yes - ¡ No - ¡ Do not know
If yes, which type of services are envisaged (or already in place)? [_____]

D. The Charter refers to **physical, remote and virtual** access.

Physical access is "hands-on" access when users physically visit an infrastructure, facility or equipment. Remote access is access to resources and services offered by the RI without users physically visiting the infrastructure, facility. In both cases, the services or resources are not unlimited and a selection is required.

Virtual access means free access to users provided through communication networks; the available services or resources can be simultaneously used by an unlimited number of users and the users are not selected. Virtual access typically concerns access to data and digital tools. (from ESFRI White Paper 2020)
Access to digital tools that are not unlimited (e.g., high performance computing) and require a selection should be considered as remote access, not virtual access.

Which type is predominant in your RI? ¡ physical – ¡ remote – ¡ virtual
Are the above types and definitions appropriate to describe your access offer? ¡ Yes - ¡ No
If no, please explain [_____]
What are the expected trends with regards to the type of access (physical, remote or virtual)? [_____]
What are the related challenges to address these (new) needs? [_____]

Categories of users

We would like to understand which categories of users are relevant for your RIs
- *because they represent your main users, or*
- *because there are plans to better reach out and serve these categories of users, or*
- *because specific privileged or restricted access conditions apply, or*
- *because (compared to your standard access offer and main category of users) they have very specific needs, which require to customise or develop the access offer.*

E. Who are your **main category(ies) of users** - if relevant, signal also sub-category(ies)

¡ Researchers
  ¡ specific area*[_____]
    *(*scientific area or application domain if predominantly addressed by many of your users)*
  ¡ strongly multidisciplinary area of research*
    *(*profile of the individual research groups -or of their research topic- accessing the RI, not the capacity of the RI to serve different domains)*
  ¡ national researchers
  ¡ researchers from country members of the RI
  ¡ European researchers
  ¡ international researchers
¡ (PhD) Students
¡ Public authorities
¡ Other users from public/non-profit initiatives
¡ Users from private sector
  ¡ SMEs
  ¡ industry
  ¡ services (e.g., consultants, insurance, banks)
¡ Other: [_____]
¡ Other: [_____]
¡ Other: [_____]

F. If you have plans to better reach out or serve users, which specific categories of (incl. new) users, if any, are especially **targeted** (if relevant, signal also sub-categories)

¡ Researchers
  ¡ specific area*[_____]
    *(*scientific area or application domain predominantly targeted)*
  ¡ strongly multidisciplinary area of research*
    *(*profile of the individual research groups -or of their research topic- accessing the RI, not the capacity of the RI to serve different domains)*
  ¡ national researchers
  ¡ researchers from country members of the RI
  ¡ European researchers
  ¡ international researchers
¡ (PhD) Students
¡ Public authorities
¡ Other users from public/non-profit initiatives
¡ Users from private sector
  ¡ SMEs
  ¡ industry
  ¡ services (e.g., consultants, insurance, banks)
¡ Other: [_____]
¡ Other: [_____]
¡ Other: [_____]

G. Which categories of users, if any, have **privileged/exclusive or restricted conditions*** of access (if relevant, specify also sub-categories)
*(*Access restrictions in the Charter: Research Infrastructures may restrict Access by means of quota or pre-defined User groups, as long as they clearly communicate such conditions to the Users. Such restrictions may be based on established acceptable practices such as, but not limited to, training and education, research programmes, ethics, legal and contractual obligations, financial contributions, resources and membership.)*

¡ Researchers	¡ privileged - ¡ restricted
¡ specific area*[_____]	¡ privileged - ¡ restricted
*(*scientific area or application domain)*	
¡ strongly multidisciplinary area of research*	¡ privileged - ¡ restricted
*(*profile of the individual research groups -or of their research topic- accessing the RI, not the capacity of the RI to serve different domains)*	
¡ national researchers	¡ privileged - ¡ restricted
¡ researchers from country members of the RI	¡ privileged - ¡ restricted
¡ European researchers	¡ privileged - ¡ restricted
¡ international researchers	¡ privileged - ¡ restricted
¡ (PhD) Students	¡ privileged - ¡ restricted
¡ Public authorities	¡ privileged - ¡ restricted
¡ Other users from public/non-profit initiatives	¡ privileged - ¡ restricted
¡ Users from private sector	¡ privileged - ¡ restricted
¡ SMEs	¡ privileged - ¡ restricted
¡ industry	¡ privileged - ¡ restricted
¡ services (e.g., consultants, insurance, banks)	¡ privileged - ¡ restricted
¡ Other: [_____]	¡ privileged - ¡ restricted
¡ Other: [_____]	¡ privileged - ¡ restricted
¡ Other: [_____]	¡ privileged - ¡ restricted

H. Which categories of users, if any, (would) require to significantly **customise** your access offer or develop **new services** and or adapt your **selection procedure** (if relevant, specify also sub-categories)

¡ Researchers
  ¡ specific area*[_____]
    *(*scientific area or application domain)*
  ¡ strongly multidisciplinary area of research*
    *(*profile of the individual research groups -or of their research topic- accessing the RI, not the capacity of the RI to serve different domains)*
  ¡ national researchers
  ¡ researchers from country members of the RI
  ¡ European researchers
  ¡ international researchers
¡ (PhD) Students
¡ Public authorities
¡ Other users from public/non-profit initiatives
¡ Users from private sector
  ¡ SMEs
  ¡ industry
  ¡ services (e.g., consultants, insurance, banks)
¡ Other: [_____]
¡ Other: [_____]
¡ Other: [_____]

Further comments on categories of users, if relevant: [_____]

Legal, institutional, financial dimensions

I. Which aspects are most relevant to discuss, in order to improve and broaden access?

	Relevance	Detail - comment
Legal (Intellectual property, data protection, liability issues, acknowledgment in publications etc.)	Low – medium – high ¡ ¡ ¡	[_____]
Institutional	¡ ¡ ¡	[_____]
Financial	¡ ¡ ¡	[_____]
Others	¡ ¡ ¡	[_____]

Technical aspects

J. Which technical aspects are most relevant to discuss, in order to improve and broaden access

	Relevance	Detail - comment
Technology development	Low – medium - high ¡ ¡ ¡	[_____]
Interoperability	¡ ¡ ¡	[_____]

Standards	¡ ¡ ¡	[_____]
Access environmental footprint	¡ ¡ ¡	[_____]
Others	¡ ¡ ¡	[_____]

III- Access policies

Level of openness (national/international)

A. Level of **openness to users from other countries**: estimated share (%) between local/national, European and international users.
(For RI offering both virtual and physical/remote access, please report on physical/remote access; for pan-European distributed RI mostly relying on access by its nodes, please report to your best knowledge the prevalent situation in local/national nodes, if any. For networks, please report common/prevalent trend if any).

- Local/national [____]%
- European [____]%
- International [____]%

Level of openness to Principal Investigators from other countries (when significantly different from above reply):

- Local/national [____]%
- European [____]%
- International [____]%

Comment, if needed: [_____]

Access modes

B. The Charter refers to "three different **access modes**, i.e. `excellence-driven`, `market-driven` and `wide`" or a combination of them:

The excellence-driven Access mode is exclusively dependent on the scientific excellence, originality, quality and technical and ethical feasibility of an application evaluated through peer review conducted by internal or external experts. It enables Users to get access to the best facilities, resources and services wherever located. This Access mode enables collaborative research and technological development efforts across geographical and disciplinary boundaries.

The market-driven Access mode applies when Access is defined through an agreement between the User and the Research Infrastructure that will lead to a fee for the Access and that may remain confidential.

The wide Access mode guarantees the broadest possible Access to scientific data and digital services provided by the Research Infrastructure to Users wherever they are based. Research Infrastructures adopting this mode maximise availability and visibility of the data and services provided.

a. Are these modes and their definition appropriate? ¡ Yes - ¡ No
If No, please explain [_____]

b. Should a new access mode be added e.g., priority-driven? ¡ Yes - ¡ No
If Yes, which one(s) [_____]

c. What is your main access mode? ¡ Excellence-driven - ¡ Market-driven - ¡ Wide - ¡ Other
If other, specify: [_____]

d. If different modes are combined, what is the estimated share (number of users or units of access as appropriate) among the different access modes?
(For RIs offering both wide virtual access and physical/remote access, please report on physical/remote access)
- Excellence-driven [____]%
- Market-driven [____]%
- Other [_____] [____]%

e. Do you apply access restrictions e.g., by means of quotas or pre-defined groups of users? ¡ Yes - ¡ No – please explain [_____]
Do you have specific conditions of access for users from countries members of the RI? ¡ Yes - ¡ No – please explain [_____]

f. Do you have an evaluation process: ¡ Yes - ¡ No If yes:
- describe the approach (e.g., key steps, evaluation managed by the RI or by a scientific community or part of a broader selection process at national level, internal or external reviewers, individual proposals or community approach –see example of hubs/bags here-, others?) [_____]
- For excellence-driven access, do you consider the impact in the evaluation process? ¡ Yes - ¡ No; if yes, how? [_____]

g. If relevant, describe further conditions, if any, linked to the access modes in place? [_____]
Please describe plans, if any, to change your access policy (access modes, access conditions)? [_____]

Access modes per category of users

C. Please indicate access modes applied (or predominant) to specific categories of users:

¡ Researchers	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ specific area*[_____]	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
*(*scientific area or application domain)*	
¡ strongly multidisciplinary area of research*	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
*(*profile of the individual research groups -or of their research topic- accessing the RI, not the capacity of the RI to serve different domains)*	
¡ national researchers	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ researchers from country members of the RI	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ European researchers	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ international researchers	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ (PhD) Students	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ Public authorities	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ Other users from public/non-profit initiatives	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ Users from private sector	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ SMEs	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ industry	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ services (e.g., consultants, insurance, banks)	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ Other: [_____]	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA
¡ Other: [_____]	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA

¡ Other: [_____]	¡Excellence - ¡Market - ¡Wide - ¡Other - ¡NA

Comment, if appropriate (e.g., explain specific conditions or challenges for some categories of users) [_____]

D. Would a **common approach** e.g., within appropriate clusters of RIs be appropriate? ¡ Yes - ¡ No -¡ No opinion
If yes, which type of clusters, for which category of users? [_____]

E. Does your RI have an **access management plan**[8]? ¡ Yes - ¡ No
- If yes, what are the main features? [_____]
  If available, link to your access management plan: [_link_____]
  Does it include a crisis access mode? ¡ Yes - ¡ No If yes, briefly describe. [_____]

F. Do you have specific **strategies to broaden access**? ¡ Yes - ¡ No
If yes, under which conditions (excellence based etc.?) and do you target specific categories of users? [_____]

G. Do you promote **equality and diversity** in your access policy, modality of access or support to users? ¡ Yes - ¡ No
If yes, how? [_____]
If no, is it considered for the future? ¡ Yes - ¡ No

IV- Specific needs and opportunities

A. Complex scientific and societal challenges often require **multidisciplinary** approach.
Are such needs considered by your RI for your users, including in collaboration with other RIs? ¡ Yes - ¡ No
Is there a specific support for users (e.g., with interdisciplinary questions) which require use of different RIs? ¡ Yes - ¡ No
What is the approach to (better) address multidisciplinary/interdisciplinary issues? [_____]

B. Do you have incentives for **innovation** in your access offer? ¡ Yes - ¡ No
If yes, please explain. [_____]

C. Have you benefitted from **EU support to transnational/virtual access**? ¡ Yes - ¡ No
If yes, was there any impact on your own access policy? ¡ Yes - ¡ No Please comment [_____]
What are the main strengths of the EU access scheme? [_____]
What are the main weaknesses? [_____]
What would be your recommendations or specific needs, if any, for 2025-2027 (Horizon Europe)? Please describe and justify [_____]
What would be your recommendations, if any, in the longer term? [_____]

V- Digital & green transition

A. In general: how do/will these transitions impact your access policy and what are the main challenges? [_____]

[8] access management plan might cover aspects such as: mechanism of exchange with users; catalogue of services for users; operational single entry point for access; selection; assistance to users (from the proposal till after the access); monitoring of access; IPR policies; dissemination programmes including innovation actions; crisis access mode.

B. Priority-driven access for **green transition**: do you have incentives for providing access to users involved in R&I that contributes to the green transition? ¡ Yes - ¡ No
Comment, if any [_____]

C. Greening of access: which measures are in place/planned to decrease the environment/energy/resources footprint of access? [_____]

D. With regards to **data and online services**: do you have your own specific access policies and in-house access management services? ¡ Yes - ¡ No
If yes, could you provide a link to your access policies? [_link_____]

E. Does your access offer take benefit from cross-cutting digital infrastructures such as Géant, EGI, EUDAT, OpenAIRE, PRACE? ¡ Yes - ¡ No
If yes, which ones?
¡ Géant – ¡ EGI – ¡ EUDAT – ¡ OpenAIRE - ¡ PRACE – ¡ Other [_____]
Do you see a role for EOSC to aggregate access to these cross-cutting digital infrastructures for the benefit of your RI and other RIs? ¡ Yes - ¡ No

F. Are your data findable and accessible through EOSC? ¡ Yes - ¡ No
If yes, what is the EOSC impact on access by your users? [_____]
If NO, what is the main reason? [_____]

G. Do you consider your installations, instruments, and operation up to date with regards to **digitalisation**? ¡ Yes - ¡ No
Are there plans for up-grade based on digital requirement? ¡ Yes - ¡ No
If yes, do you expect significant impact on your access offer (quantity, quality)? ¡ Yes - ¡ No
If relevant, please explain [_____]

VI- European Charter for Access to Research Infrastructures

The Charter sets out non-regulatory principles and guidelines to be used as a reference when defining access policies for Research Infrastructures and related services. It is not having any legally binding nature. In the context of the new European Research Area's objectives, the evolution of the landscape of research infrastructures, the review of the relevance and applicability of this Charter is timely and, if appropriate, its update should be considered.

A. Do you use the Charter as guiding principles for your access policy? ¡ Yes - ¡ No
Do you explicitly refer to it? ¡ Yes - ¡ No

B. In your view, what are the main strengths of the current Charter? [_____]
In your view, what are the main weaknesses of the current Charter? [_____]

C. Which aspects are missing, if any? [_____]

D. Do you have suggestions to better consider the **digital dimension** of RIs in the Charter? ¡ Yes - ¡ No If yes, which ones [_____]

E. Do you have suggestions to better address the needs of **industry** and related specific conditions and aspects (e.g., IPR) in the Charter? ¡ Yes - ¡ No If Yes, which ones [_____]

F. Do you have suggestions to better address **services** for users **beyond research** (e.g., for public health, environment monitoring) in the Charter? ¡ Yes - ¡ No If yes, which ones [_____]

G. If you had to amend/re-write two existing key paragraphs:
… [_____]
… [_____]

H. If you had to add two new key paragraphs:
… [_____]
… [_____]

Further comments on the Charter: [_____]

B. SURVEY for Research Infrastructures Stakeholders

A. Full name of your organisation, network, association***
Acronym [_____]
Contact email (in case we would like to contact you about this survey)***: [____@____]

B. Which main perspective(s) does your organisation/association bring to this survey: ***
¡ established networks of research infrastructures
¡ (potential) users of RIs
¡ potential access provider to external users
¡ technological RI partner
¡ other (please specify) [_____]

About access

The European Charter of access to research infrastructures defines **access** as follows:
'Access' refers to the legitimate and authorised physical, remote and virtual admission to, interactions with and use of Research Infrastructures and to services offered by Research Infrastructures to Users. Such Access can be granted, amongst others, to machine time, computing resources, software, data, data-communication services, trust and authentication services, sample preparation, archives, collections, the set-up, execution and dismantling of experiments, education and training, expert support and analytical services.

The Charter also refers to "three different access modes, i.e. `excellence-driven`, `market-driven` and `wide`" or a combination of them.

C. In your view, what are the main challenges for a **broad and effective access** to research infrastructures and to their services? [_____]

D. In general, are the **access policies** of RIs appropriate? ¡ Yes - ¡ No
What could be improved? [_____]

E. Are there **categories of users** and specific **needs** which should be better considered?
[_____] How? [_____]

F. Which specific **aspects** (legal, technical, financial etc.) if any, would require special attention?
[_____]

G. The EU (Horizon Europe) is supporting **transnational and virtual access** to research infrastructures: are you aware of these opportunities? ¡ Yes - ¡ No
What are the main strengths of the EU support? [_____]
What are the main weaknesses of the EU support? [_____]
What would be your recommendation for the future, if any? [_____]

About the Charter itself

The Charter sets out non-regulatory principles and guidelines to be used as a reference when defining access policies for Research Infrastructures and related services. It is not having any legally binding nature. In the context of the new European Research Area's objectives, the evolution of the landscape of research infrastructures, the review of the relevance and applicability of this Charter is timely and, if appropriate, its update should be considered.

H. In your view, what are the main strengths of the Charter? [_____]

I. In your view, what are the main weaknesses of the Charter? [_____]
What would be your recommendations, if any? [_____]

C. Background

Access to research infrastructures is an essential aspect of the European policy on research infrastructures as recently reflected in political statements and policy documents notably in Council Conclusions, in the ESFRI White Paper, in Reports of Commission Expert Groups and publications from the research infrastructures (some relevant excerpts below). The Task Force will consider these inputs and will also take into account the above-mentioned international crises and challenges, which are not only affecting R&I priorities but also research practices and research infrastructures (including their operations and access conditions). More generally, the footprint of access (climate, resources and environment) and other societal impact should also be carefully considered.

Competitiveness Council (2022)

32. INVITES the Commission to present an initiative, following the consultation within ESFRI, on a revised European Charter for Access to Research Infrastructures by the end of 2023 in view of the evolving European RI ecosystem and landscape of RI facilities, which accommodate their user strategies and access policies for operations under various business models, serve users in the physical, remote and virtual access modes via secure connectivity, and enable mission-oriented and fast-track access to perform experiments and conduct studies of urgent societal and economic relevance

Competitiveness Council (2021)

- CC Conclusions on the 'on the future governance of the European Research Area (ERA)', 26 November 2021

Point 11. AGREES on the common ERA Policy Agenda for 2022-2024 as presented in the Annex,… Annex: (Action 8) 8. Strengthen sustainability, accessibility and resilience of research infrastructures in the ERA – 'Broader and more sustainable access for all countries to European research infrastructures and their services and revision of the European Charter of Access to Research Infrastructures'

- CC Conclusions on the 'New European Research Area', 1 December 2020

Point 17. RECALLS that providing sufficient open access to national and transnational RIs, their increased collaboration and integration across the EU, and improving the exchange of information on the existing capacities e.g. through national RIs Roadmaps and the ESFRI process is key for excellence and inclusiveness

- CC Conclusions on 'Governance of the European Research Area' , 30 November 2018

Point 7. NOTES the need (…) to increase transnational and open access to European Research Infrastructures (…); CALLS upon the Commission and Member States to implement these measures as soon as possible and upon the pan-European Research Infrastructures to promote their services at international level and to reach out, where appropriate, to new international members

- CC Conclusions on 'Accelerating knowledge circulation in the EU', 29 May 2018

Point 21. CALLS on the Commission and Member States to explore new measures to make European Research Infrastructures more broadly available and affordable, building on the European Charter of Access to Research Infrastructures thereby developing common transparent access policies, including for training and skills enhancement purposes of researchers and to establish cross-border access schemes, for example on the basis of co-funding

ESFRI White Paper (2020)

- MAKING SCIENCE HAPPEN - A new ambition for Research Infrastructures in the European Research Area - ESFRI WHITE PAPER 2020

Key messages

"RIs based on physical or remote access should continue to offer services on an excellent basis in line with the European Charter for Access to Research Infrastructures (e.g. access should be granted according to the quality of proposals submitted by the relevant research community and evaluated following a process of peer review). For each RI, a proper balance must be found between RI member and non-member access as well as priority, excellence-based, and fee-based access. RIs based on virtual access should offer services on an open and FAIR basis.

With the support of ESFRI, the MS/AC are invited to promote the convergence of national policies and frameworks on RI access and funding models; to reduce the overhead of establishing and operating (especially distributed) RIs and thereby facilitating transnational access. Furthermore, the EC and MS/AC are invited to consider additional, sustainable funding models, complementing the existing funding model, which approaches (transnational) access (TNA) as an element of EC projects.

The EC and MS/AC are invited to make RI access costs eligible for an expanded set of funding sources, including national funds, European structural and investment funds, and appropriate EC framework funds (e.g. all Pillar 1 and Pillar 2 instruments in Horizon Europe)."

Report of the High-Level Expert Group (2020)

Supporting the transformative impact of research infrastructures on European research - Report of the High-Level Expert Group to assess the progress of ESFRI and other world class research infrastructures towards implementation and long-term sustainability

(H2020 Integrating Activities 'IAs')

"IAs have been key to the development of RIs and RI services. Two types of IA beneficiaries have been addressed: those national RIs with international scope that could benefit from coordination of transnational user access, and those research laboratories that could start opening their extra capacity (beyond their own research needs) to TA, thereby developing good practice as providers of infrastructure services and integrating the technical development strategies with similar laboratories.

Some RIs, e.g. national synchrotron radiation laboratories, neutron scattering facilities, hadron physics facilities, astronomical observatories, have applied repeatedly to IAs as a useful contribution to transnational users. These RIs remain nevertheless frustrated at the lack of direct contribution to the operational costs result from the European and international openness of merit-based access. The available IAs budget however, cannot support these long-term IAs at a satisfactory level so that the Joint Research Activities and Networking Activities that were elements of the structuring scope of IAs, have been progressively sacrificed to concentrate the resources to the Transnational Access activity.

Another class of beneficiaries of IAs have generated some efficient infrastructure services based on extra capacity of national and institutional resources not originally designed to operate as RIs. These IA-networks involve state-of-the-art laboratories that benefit from Joint Research activities and Networking Activities and offer a valued TA service to broad user communities.

Special attention should be paid to this type of IA-networks that operate high-quality and unique RI services, but that do not plan to evolve into an ERIC or other centrally coordinated RI. They rely on IAs, and therefore repeatedly apply to make their infrastructure services sustainable, but they do not see this action as a preliminary to actually becoming a formal RI. Consolidating these very useful infrastructure services, without forming a new RI, while introducing appropriate monitoring instruments, is a relevant option for the next Research Infrastructure Programme under HE."

European Research Infrastructures Consortia (ERICs)

- Assessment on the implementation of the ERIC Regulation by Commission Expert Group chaired by C. Rizzuto (2021)

"Outcome: ERICs appear to be actively supporting both the open access to FAIR data and the setting-up of EOSC, even if they are not individually the largest producers of data. With few exceptions, the ERICs are definitely the aggregators of multidisciplinary data, and potentially the best route of access to data which allow to synthesise social and technological aspects, allowing the possibility also to research related to the acceptability of specific technological aspects. In the wider context of open science, there is a definite potential based on ongoing activities.

Issues and recommendation: within the governance issue, the potential of the ERICs as aggregators of multidisciplinary data as well as the best way to synthesising social and technological data and developing open science methodologies should be specifically addressed, also by implementing an open and FAIR collection and curation of their operational data while defining the scope and role of EOSC in the support of the ERA governance."

"Issues and recommendation: The development of a visible set of multidisciplinary capabilities, as, e.g., services accessible also by non-expert users, is not yet visible through the available documentation. Collaborations between ERICs of different clusters to respond to multidisciplinary challenges and requirements should be supported by focused projects and strengthened to allow a full multidisciplinary response of the ERIC as a coherent 'system'."

- ERIC Forum policy brief "Funding models for access to ERIC multinational / transnational services'' (2020)

"The existing barriers for ERIC eligibility and recognition by national funding agencies and, consequently, for ERA-Net calls, have reduced opportunities for cohesive cross-border cooperation. Eligibility and full recognition of ERICs by Member States is therefore essential, as is cross-border funding for ERICs and their national nodes. Co-funding from the EU budget could also be explored to support cross-border or multinational ERIC services. ERICs have successfully supported regional development and competitiveness through the use of regional funding schemes, and will strive to further their engagement in Smart Specialisation Strategies.

A regional funding mechanism able to fund ERICs beyond the region and support the international dimensions of regional projects, would create bridges and enhance the international network of the region while providing high-level expertise and resources.

The launch of Horizon Europe provides an opportunity for the adaptation of grant application and financial processes to the specificities of ERICs, evolving towards a seamless integration of ERICs' headquarters and national nodes. Transnational access (TNA) mechanisms have proven to be essential in allowing ERICs to provide unique services to research communities for little or no cost, and therefore must be safeguarded. As this mechanism evolves, it can expand its support to the early stages of service provision, while also becoming a stable instrument for sustainable transnational access for all European researchers. Furthermore, a joint

approach of ERICs and funding bodies to boost ERIC visibility, increasing their attractiveness for potential users, can lead to a broader and more efficient use of ERICs.

Given the diversity of the ERICs and the complexity of their service provision mechanisms, there is no one-size-fits-all solution, and funding mechanisms must be carefully adapted to the long-term operational needs of each individual ERIC. A continuous and open dialogue between ERICs and all funding bodies is required to identify and adopt solutions that will lead to the optimised and sustained use of ERICs."

D. Contributors

This report has been prepared by the **ESFRI Drafting Group on Access** with significant contributions from three individual experts appointed by the Commission who made an in-depth analysis of the surveys and presented key finding and preliminary recommendations.

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