

Contribution of Research Infrastructures to the renewed European Research Area

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Executive Summary

At the end of 2019, the European Research and Innovation Area Committee (ERAC) adopted a report on a new paradigm of the European Research Area (ERA), proposing new priorities. Around the same time, the European Strategy Forum on Research Infrastructures (ESFRI) published its White Paper (WP), presenting the new ambition for research infrastructures in the ERA.

Historically, the ERA has been important to the field of research infrastructures (RIs), and vice versa, with the field of RIs often serving as a shining example of the achievements of the ERA. In the light of the newly proposed ERA priorities and the ESFRI WP, which invites the RIs community to address certain actions, the time is ripe for the RIs to consider their response. This is even more important at a time when the Commission is preparing its Communication on the ERA, and the Council its Council Conclusions on the ERA.

The aim of the present paper is to examine potential contributions of the RIs to the priorities of the renewed ERA, as proposed by ERAC, and how to fulfil the actions, proposed to the RIs by the ESFRI WP. It is not a review of the contribution of the versatile landscape of the RIs to the ERA, but addresses mainly the potential of RIs that offer open “physical” access of international users to their facilities.

The paper is organised along the proposed ERAC priorities, being aware that these might change as the renewed ERA is developed further by the Commission and by the Council. The main messages, emphasized also throughout the text are as follows:

1. Framework conditions for the production, circulation and use of knowledge, including research career issues

- ***Interconnecting ecosystems across EU.*** Distributed RIs integrate different national communities and resources at European level. They are examples of well-functioning partnerships, and their potential contribution to ERA goes well beyond the provision of open access to their facilities. Yet this potential remains poorly visible and largely underexploited. Some good practices of activities that the RIs can strengthen and undertake in a more systematic way are support to joint R&D projects, joint

investment in research infrastructure, scholarships, training and exchanges of managerial practices. Stressing the importance of these activities in the ERIC Practical Guidelines would contribute to their uptake by the future ERICs.

- **Pooling of funds and synergies of funding sources.** RIs should actively contribute to the development of the S3 strategies in their member countries and regions, while considering the framework of the new Cohesion Policy. As a matter of urgency, the RIs should also look into the investment priorities of their member countries under the Next Generation EU, and elaborate funding proposals involving the capabilities of the RIs to contribute effectively.
- **Linking research and higher education.** At the onset of the renewed ERA and the Horizon Europe programme, RIs might consider strengthening their links with universities even further, also through their association with the relevant European University Networks, thus strategically linking these institutions and contributing to an increased connectivity of the ERA.
- **Contributing to EU's competitiveness.** RIs already contribute to technological innovation, support industrial research and technology transfer and act as intermediaries, also by better directing the researchers to the funding and/or investment opportunities. Distributed RIs also provide opportunities for knowledge exchange on technology transfer and industrial liaison between the different seats and nodes of the RIs. These activities can be further strengthened by increased integration of the RIs into the innovation ecosystem, be it at regional, national or European level, also by exploiting the opportunities of Horizon Europe, such as Eureka, European Innovation Council, European Institute of Innovation and Technology, as well as other partnerships of Horizon Europe. Furthermore, they can connect to intermediary institutions, such as financial funds and technology parks, and thus contribute to the removal of bottlenecks in the commercialization of inventions and innovations.
- **Increased international cooperation.** Several European RIs are already part of global networks or have established close links with their global counterparts. A good practice for pan-European RIs is to have internationalization strategies, defining the objectives and prioritizing Countries and/or Regions best suited for their international cooperation. In addition to those of the particular RI, such strategies should optimally also consider the priorities of their stakeholders (e.g. Member Countries) and of the EU.
- **Mobility and human resource development.** In response to the invitation by ESFRI, RIs, together with Member's administrations, should consider setting up clear career paths for staff aiming at a level playing field for them inside the ERA. They should also engage in the development

of actions on mobility and exchange of experience, and in training programmes, including life-long learning, while keeping in mind equal opportunities policies.

- **Open science.** The RIs are strongly involved in the development of open science and should continue contributing to it, also by supporting the newly established European Open Science Cloud Association (EOSC Association) in the delivery of the EOSC. Of particular importance are the preparation of well elaborated business plans, the creation of quality certified FAIR data, and increased attention to the vital need for data professionals for the development of their services. Additionally, they may consider offering data science support and training as a service to users either through open access, or complementary to it.

2. R&I-driven joint action with other policy areas in a global context

- While several of the domain specific ESFRI RIs already address particular challenges, such as those in the domain of health, food and environment, this is often not the case for more general facilities, such as the analytical ones. RIs should respond to the call of ESFRI to focus on EU's strategic agendas by reviewing their current services and optimising their support to specific communities for specific challenges.
- Communication efforts should involve compelling narratives as well as indicators that would, for example, clearly show to the funders the share of access granted and share of the most cited papers, per SDG, European Green Deal, or other policy objectives. Such a system, which is very much needed, is currently not yet in place.

3. Broad inclusiveness

- While the main objective of the RIs is and should remain enabling excellent science, RIs should dedicate more efforts to contributing to the ERA objective of inclusiveness, which goes beyond a balanced construction of RIs across the EU. To address the priority better, RIs need to design specific measures to attract members and users from the less R&I intensive regions and develop user communities in these countries. In addition, measures should be put in place to facilitate gender equality and the involvement of minority groups.

The EC is invited to consider updating the European Charter for Access to Research Infrastructures, while ESFRI could consider including RIs' contribution to inclusiveness in their monitoring and evaluation system.

Introduction

The ERA process was launched two decades ago with the aim of contributing to the creation of a more favourable environment for research in Europe, where, at the time, national research policies and EU policy overlapped without forming a coherent whole.¹ ERA brought together the concept of an 'internal market' for research, improvement of the coordination of national research activities and policies, and the development of a European research policy that looks beyond funding.² The concept of the ERA, and its governance, policy implementation mechanisms and monitoring, have gradually evolved³ and, in 2018, the Competitiveness Council invited the Commission to publish by mid-2020 a new ERA Communication for the period beyond 2020.⁴ To this end, the ERAC, a policy advisory body assisting the European Commission and the Council of the European Union in the field of research, innovation and technological development, adopted a report on a new paradigm and narrative of the ERA, proposing new objectives and ERA priorities.⁵

The ERAC report proposes four priorities:

1. Framework conditions for the production, circulation and use of knowledge, including research career issues;
2. R&I-driven joint action with other policy areas in a global context;
3. Relevance and visibility of R&I for society;
4. Broad inclusiveness.

In parallel with the ERAC, ESFRI discussed its White Paper,⁶ with the aim of optimising the organisation of the research infrastructure landscape, inviting also the Commission, Member States and RIs to contribute to the delivery on key actions.

This paper follows this invitation and discusses some potential contributions of RIs to the renewed ERA - to a more connected and inclusive Europe - through the sustainable development goals and other wider policy goals. The third priority, relevance and visibility of R&I for society is also discussed in the frame of the other three priorities. It also addresses the recommendations of the ESFRI WP to the RIs* and proposes some potential activities of the RIs that would help to respond and contribute better to the renewed ERA.

1. Framework conditions for the production, circulation and use of knowledge, including research career issues

* The paper focuses on RIs that offer "physical" open access to international users to the facilities. These are either national infrastructures, such as light or neutron sources, or multinational single-sited or distributed RIs.

According to the ERAC, this priority aims to contribute to a truly effective ERA in its capacity to produce, circulate and use research-based knowledge.³ This entails increasing the interoperability of European research and innovation ecosystems, as well as improving the framework conditions for researchers, innovators, industry and institutions, including higher education and skills development.

Without a doubt, of the three priorities, this is the one to which RIs, and their surrounding policy framework, can contribute most. Europe is the home of many RIs of pan-EU interest, either multinational or national institutions, which are open to international users. Yet what is of particular relevance to this discussion is the policy framework, which, for almost two decades, has been developed within the frame of ESFRI, which has periodically proposed to the Competitiveness Council for endorsement, its activities and the updates of its ESFRI roadmap for new research infrastructures. European landscape of RIs now covering all scientific domains, with over 50 European Research Infrastructures, and it has mobilized investments of approximately €20 billion across the EU.⁶ The ESFRI roadmap process has led to the establishment of national roadmaps in most of the EU member and associated states, thus contributing to the creation of an EU-wide ecosystem for the setting-up and operation of Research Infrastructures and the pooling of resources. ESFRI also undertakes periodic assessment of its RIs and in 2019 adopted a monitoring framework of its RIs.⁷

A marked success in this field was also the adoption of a new international legal entity through the ERIC regulation,⁸ which facilitates the establishment and operation of Research Infrastructures of European interest, also beyond the ESFRI roadmap remit.

Below, various contributions of the research infrastructures to the priority of creating framework conditions for the production, circulation and use of knowledge, including research career issues.

1.1 Interconnecting ecosystems across EU

Of particular importance to this priority are RIs that operate in several different countries, both giving access and integrating the research activities of multiple sites or distributed nodes. This approach has been built gradually in several decades, and has been specifically strengthened by the availability of the ERIC Regulation and the drive of the ESFRI Roadmap. At present, most of these infrastructures are organized as ERICs, or are planning to become ERICs. These distributed RIs are firmly rooted in the regional ecosystems and connect the different national communities and instrumental/technical resources at European level, integrating their capacities. Instruct, for example, brings together the complementary capacities and research communities of the European structural biology, E-RISH those on cultural heritage, and CERIC those on material sciences , to name a few. This strong asset of the ERA is not yet visible at

policy level. Even if not considered as such, these are examples of well-functioning partnerships, and their potential contribution to ERA goes well beyond the provision of open access to their facilities. CERIC, for example, supports and tops up joint research projects in a manner similar to research partnerships, thus contributing to structuring of the community and coordinated and centralized investments support scholarships and infrastructure development. Similarly, Instruct offers joint research awards and funds internships for scientific exchanges. These activities, however, are at present rather sporadic among the distributed RIs but, due to their contribution to this ERA priority, would deserve a more systematic approach, and a stronger visibility.

Distributed RIs integrate different national communities and resources at European level. They are examples of well-functioning partnerships, and their potential contribution to ERA goes well beyond the provision of open access to their facilities. Yet this potential remains poorly visible and largely underexploited. Some good practices of activities that the RIs can strengthen and undertake in a more systematic way are support to joint R&D projects, joint investment in research infrastructure, scholarships, training and exchanges of managerial practices. Stressing the importance of these activities in the ERIC Practical Guidelines would contribute to their uptake by the future ERICs.

1.2 Pooling of funds and synergies of funding sources

The success and sustainability of RIs is critically linked to the availability of sufficient funding and its efficient use, and the sustainability with a diversity of funding sources is a topic of ongoing efforts of the RIs.^{9,10} Several RIs bring together investments from many countries and different funding streams (national, EU, regional) thus pooling their resources towards a shared objective. Some countries, such as IT and SI, have also published dedicated calls in the frame of the Cohesion Policy for the ESFRI and ERIC infrastructures on their national roadmaps. To strengthen this further, the ESFRI WP emphasizes the importance of the inclusion of RIs in the renewed Smart Specialization Strategies (S3), which are a strategic framework for investments of (mostly) Cohesion Policy funds. The new Cohesion Policy¹¹ continues and enhances thematic concentration on smart growth via S3. In order to be able to benefit from these funds, RIs need to consider that, complementary to Horizon Europe, which will focus on European Excellence, the Cohesion Policy will focus on "regional relevance", supporting the diffusion of existing knowledge and technology, rather than their creation, embedding it locally via S3, and they should develop strategies taking into account also their contribution to these objectives.¹¹ This becomes increasingly important in the light of the new Cohesion Policy, which, in contrast to the previous Multiannual Financial Framework (MMF), does not consider RIs per se as an investment priority.

An additional opportunity that RIs should consider is the newly adopted recovery effort under Next Generation EU,¹² aiming to tackle the effects of the present crisis. The total of 750 billion EUR, of which 312.5 billion as grants, is to be committed by the end of 2023, with 70% of the grants being committed before the end of 2022, demonstrating the need for swift action. Member States will prepare their national recovery and resilience plans, setting out the reform and investment agenda, considering country-specific recommendations within the European Semester,¹³ as well as strengthening the growth potential, job creation and economic and social resilience of the Member State. As is the case of the MMF, an overall climate target of 30% will apply to the total amount of expenditure.

At a moment when countries have started, in a rush, to prepare their national recovery and resilience plan, RIs are advised, as a matter of urgency, to look into the investment priorities in their member countries and propose investment opportunities in their RIs.

RIs should actively contribute to the development of the S3 strategies in their member countries and regions, while considering the framework of the new Cohesion Policy. As a matter of urgency, the RIs should also look into the investment priorities of their member countries under the Next Generation EU, and elaborate funding proposals involving the capabilities of the RIs to contribute effectively.

1.3 Linking research and higher education

Research infrastructures, as institutions enabling excellent science, are inherently linked to universities and in many cases parts of the infrastructures operate within universities. Thus Solaris, for example, is a part of Jagiellonian University and connects with facilities in other Countries through its participation in CERIC and the networks of light sources.. Also, the staff of the RIs and universities are closely interlinked, with many researchers holding positions at both institutions. This close interconnection with universities offers, according to ESFRI WP 'unique training opportunities and plays an important role in the education and upskilling of new generations of scientists, engineers and data professionals'. Most RIs rely on universities to provide, through their users and collaborations, the specific challenge to develop research and new knowledge and improved techniques, which could be missing in facilities strongly dedicated to service for external users. For example, CERIC, as a general-purpose infrastructure for the characterization of materials, is using experts from knowledge institutions to help with the improvement of the knowledge needed to increase services for specific communities, such as energy storage,¹⁴ and drives the research training of new users in this field by scholarship schemes.

However, the specific links between universities and RIs can be strengthened further.

At the onset of the renewed ERA and the Horizon Europe programme, RIs might consider strengthening their links with universities even further, also through their association with the relevant European University Networks, thus strategically linking these institutions and contributing to an increased connectivity of the ERA.

1.4 Contributing to EU's competitiveness

RIs contribute to the EU's competitiveness through technological innovation, and the non-proprietary as well as proprietary research performed through their facilities. ESFRI WP recognises that RIs are a powerful resource for industry, enabling cutting-edge technology development. It also proposes that the spin-offs can be supported in future by better links with the European Innovation Council.

In their own regions, the single-sited facilities and the nodes of distributed facilities are generally already well integrated into the surrounding innovation ecosystem. However, distributed RIs, with their interaction between the nodes/facilities from many countries, are in the position to bring particular added value to the Countries in which they operate. They can also attain the needed critical mass to become attractive for funding and investment opportunities. This can be achieved both through the exchange of good practices related to technology transfer and industrial liaison, as well as through the critical mass and visibility achieved by linking national centres of excellence. The ERICs can contribute in a special way by implementing this into Europe-wide international organisations.

RRIs already contribute to technological innovation, support industrial research and technology transfer and act as intermediaries, also by better directing the researchers to the funding and/or investment opportunities. Distributed RIs also provide opportunities for knowledge exchange on technology transfer and industrial liaison between the different seats and nodes of the RIs. These activities can be further strengthened by increased integration of the RIs into the innovation ecosystem, be it at regional, national or European level, also by exploiting the opportunities of Horizon Europe, such as Eureka, European Innovation Council, European Institute of Innovation and Technology, as well as other partnerships of Horizon Europe. Furthermore, they can connect to intermediary institutions, such as financial funds and technology parks, and thus contribute to the removal of bottlenecks in the commercialization of inventions and innovations.

1.5 Increased international cooperation

International cooperation is an integral part of the R&I policy, at national, as well as at EU level. It was added as an ERA priority in 2015.¹⁵ Furthermore, the Treaty establishing the European Community (A 164) mandates the EC to complement activities of the Member States in the field of research and a dedicated

Communication was published in 2012.¹⁶ Recently, on the basis of a presidency note,¹⁷ ministers exchanged views on the EU strategy regarding international cooperation in research and innovation. They acknowledged the importance of international cooperation for maximising the potential of research and innovation within the EU, moreover, several ministers stressed the need for cooperation agreements to meet the conditions of reciprocity, added value and respect of EU values.¹⁸

International cooperation is an important objective of the EU, and this is reflected among the missions of ESFRI to 'facilitate international research cooperation and strengthen European research in a global perspective,' and its White Paper 'invited RIs to exploit their potential for international cooperation.'

Several RIs are already parts of global networks or have established close links with their global counterparts.¹⁹ A good practice for pan-European RIs is to have internationalization strategies, defining the objectives and prioritizing Countries and/or Regions best suited for their international cooperation. In addition to those of the particular RI, such decisions should optimally also consider the priorities of their Members and of the EU.

1.6 Mobility and human resource development

Mobility of researchers has been a priority of the ERA since its creation and is also enshrined in Article 179(1) of the Treaty on the Functioning of the European Union, which defines the ERA as 'a unified research area open to the world based on the Internal Market, in which researchers, scientific knowledge and technology circulate freely and through which the Union and its Member States strengthen their scientific and technological bases, their competitiveness and their capacity to collectively address grand challenges.' By now, many of the bottlenecks to mobility of researchers have been removed, as is also demonstrated by the emphasis on the problem of the 'brain drain'. This process is however lagging for the personnel not employed in research, although critical for the functioning of the RIs, such as highly specialised technicians, data practitioners and managers, for which many of the obstacles to mobility remain. As a potential intervention in the renewed ERA, the ERAC emphasizes the development of a European framework for career evaluation and progression for researchers. This is echoed by the ESFRI WP, which, however, extends it to RI management and administrators.

In response to the invitation by ESFRI, RIs, together with Member's administrations, should consider setting up clear career paths for staff aiming at a level playing field for them inside the ERA. They should also engage in the development of actions on mobility and exchange of experience, and in training programmes, including life-long learning, while keeping in mind equal opportunities policies.

1.7 Open science

Open science, facilitating access to publications and research data, is a policy objective of the EU due to its many potential benefits, from increased quality, efficiency and reliability of science, its better understanding by society, to enabling growth and innovation through the reuse of scientific results.²⁰ RIs, which produce vast amount of data, are at the forefront of the development of FAIR and open data sharing with 'EOSC cluster projects',²¹ and the ESFRI WP invited the EC, the MS/AC and EOSC to take full advantage of the best practices in data management, storage and curation implemented at RIs. ESFRI WP also invited the RIs, the EC, and the MS/AC to take account of the vital need for data professionals in their education and innovation activities and to consider supportive measures on an appropriate scale. RIs may also consider offering to their users data science support and training, as a complementary service to the open access. Furthermore, data analysis tools, introduced or developed by the RIs, can make it easier for the users with no or little experience in analytical facilities to elaborate on the results of their experiments and shorten time of data evaluation, thus attracting broader user communities.

The RIs are strongly involved in the development of open science and should continue contributing to it, also by supporting the newly established European Open Science Cloud Association (EOSC Association) in the delivery of the EOSC. Of particular importance are the preparation of well elaborated business plans, the creation of quality certified FAIR data, and increased attention to the vital need for data professionals for the development of their services. Additionally, they may consider offering data science support and training as a service to users either through open access, or complementary to it.²²

2. R&I-driven joint action with other policy areas in a global context

According to ERAC, the ERA should contribute both to the Sustainable Development Goals (SDGs) and to Europe's wider policy objectives. This priority follows the decision of the EU and its Member States to be fully committed to the 2030 Agenda for Sustainable Development, and its implementation.²³ Further policy directions were provided by the European Council's 'A New Strategic Agenda for 2019–2024',²⁴ which provides an overall framework and direction for shaping the future of the EU, and the 'A Union that strives for more', including Political Guidelines for the European Commission 2019 – 2024'.²⁵ Among these, two wider policy objectives are of particular importance to the field of research and innovation, namely a "European Green Deal" and a "Europe fit for the Digital Age".

All these political inputs constitute the set of wider policy objectives to be addressed by Horizon Europe, but also by the Member States and by all stakeholders, including the RIs.

To this end, ESFRI in its White Paper invited the RIs 'to include outreach to wider policy objectives as part of their strategic approach' and proposed that 'sectoral research agendas should be considered for formulating RI missions and objectives, e.g., in relation to the UN SDGs.'

Addressing societal challenges is not new to the RIs, as clearly demonstrated during the current pandemic, with a number of RIs setting up dedicated COVID-19 services within weeks,^{26,27} with several of them providing continuous services to users throughout the pandemic.²⁸ In fact, RIs have always contributed to solutions to societal challenges, in the fields of energy, environment, health, and cultural heritage, to name a few. However, the call of ESFRI for an increased focus on EU strategic agendas demonstrates that this is not yet widely visible and that the message is not yet getting across to a sufficient extent. Many RIs are well aware of the need to contribute to wider policy goals, as demonstrated in their position papers detailing possible contributions to missions, as well as to the European Green Deal.^{29,30,31,32,33}

As an example of an approach to introduce a sharper focus on wider policy goals is that followed by CERIC. Starting from the general nature of its current facilities for materials characterization, it has reviewed EU's wider policy priorities,³² the current RI landscape and its own current strengths with the aim to respond better to the priorities. Based on this review, it has selected two focus fields, energy and life science, and has then selected and charged a group of experts to advise on how to optimize its offer and improve its service to the battery research community. Based on the Expert's report,²² which reviews the current offer of CERIC and propose improvements to services in order to address the battery research community, CERIC has now started a program aimed at focusing a substantial part of its activities, including the upgrade of in-house research, training of young researchers and upgrade of instruments, to better address this field.

While several of the domain specific ESFRI RIs already address particular challenges, such as those in the domain of health, food and environment, this is often not the case for more general facilities, such as the analytical ones. RIs should respond to the call of ESFRI to focus on EU's strategic agendas by reviewing their current services and optimising their support to specific communities for specific challenges.

In addition to the strategic orientation of RIs to address the wider policy goals and the development of dedicated services, it is of high relevance to devote suitable attention and resources to the communication of their achievements. As mentioned earlier, RIs have already been contributing to the development of solutions to societal challenges, but these efforts have been largely overlooked, also due to insufficient communication. To this end, the ESFRI White Paper invites the EC, the Member States/Associated Countries and ESFRI 'to support RIs in communicating to stakeholders, including citizens, their contribution

to Europe's competitiveness, through activities connected to finding answers to global challenges and tackling the SDGs.'

Communication efforts should involve compelling narratives as well as indicators that would, for example, demonstrate to funders the share of access granted and share of the most cited papers, per SDG, European Green Deal, or other policy objectives. Such a system, which is very much needed, is currently not yet in place.

3. Broad inclusiveness

According to the ERAC, ERA policies and actions at all levels should increase inclusiveness, openness, brain circulation and integrity, pursuing scientific excellence throughout Europe. To this end, the ERA should ensure a more synchronized development of R&I systems across Europe and reduce inequalities among regions, foster brain circulation and counteract brain drain, ensuring gender equality and access opportunities for all minority groups, fostering connectivity and pan-European R&I collaborative links etc.³ Among the three objectives of the renewed ERA, the objective of inclusiveness appears, at first sight, to be the least suited to RIs, the main objective of which is to enable scientific excellence. While several institutions have equal opportunity policies, and specific policies addressing gender issues, thus providing good examples, the field of RIs is often criticised for not contributing enough to reducing existing regional/geographic/territorial inequalities. Since RIs need an excellent research environment and, for physical facilities, large funding at national and regional level, they have been, so far, built in the most developed regions. The recently constructed Extreme Light Source Infrastructure in Hungary, Czech Republic and Romania and the synchrotron Solaris are two main large-scale infrastructures newly built in the so-called new member states (EU13), which have joined the EU since 2004, while several of the new ERICs are now connecting seats and nodes between the EU 13 and the rest of the EU.

It also does not help that current policies in the field of RIs do not take inclusiveness into account. The main access modes for non-proprietary research, as described by the European Charter for Access to Research Infrastructures, are Excellence Driven Access, applicable to many of the RIs offering access to instrumentation, and Wide Access, providing the broadest access to data and digital services.³⁴ Access to the facilities solely based on excellence tends to discriminate researchers from less developed regions, who might be less familiar with techniques not available in their countries. In addition, the recently adopted ESFRI monitoring framework for RIs does not include indicators related to gender, minority groups or contributions to synchronised R&I development across Europe.⁷

While most RIs are currently not strong contributors to the objective of inclusiveness, this should change with the renewed ERA. The ESFRI WP invites RIs to 'properly account for gender issues' and emphasizes that 'Research and RIs have the potential to promote greater cohesion in Europe through their capacity for facilitating excellent science. A Europe-wide distribution of RIs would help to reduce the "excellence gap" caused by lagging capacities in parts of the EU.'

Although the topic of inclusiveness does not appear to be an explicit objective of the RIs, a closer inspection of their activities reveals that this goal is currently served by many of the distributed ERICs, such as INSTRUCT in structural biology, Euro Bioimaging in biological and biomedical imaging and CERIC in material characterisation, which have several of the EU13 countries among their membership. Through exchanges of management practices and joint research and training activities, such institutions are in a unique position to contribute successfully to fostering connectivity and pan-European R&I collaborative links. The inclusion of RIs in these countries in ERICs and ESFRIs improves their capabilities to attract funding as it exposes them to the best international researchers, leading to their inclusion in successful project partnerships. Furthermore, RIs enable researchers across Europe to access the best research infrastructures and thus foster brain circulation and counteract brain drain, since the users can reside in their own regions while being able to use advanced equipment and services elsewhere. However, user communities in some of the EU13 countries are less familiar with the opportunities offered by RIs and with the international facilities, and therefore are often less successful in their applications. Specific measures, such as dedicated training schools and dedicated access support may help in developing user communities in these regions.

While the main objective of the RIs is and should remain enabling excellent science, RIs should dedicate more efforts to contributing to the ERA objective of inclusiveness, which goes beyond a balanced construction of RIs across the EU. To address the priority better, RIs need to design specific measures to attract members and users from the less R&I intensive regions and develop user communities in these countries. In addition, measures should be put in place to facilitate gender equality and the involvement of minority groups.

The EC is invited to consider updating the European Charter for Access to Research Infrastructures, while ESFRI could consider including RIs' contribution to inclusiveness in their monitoring and evaluation system.

Conclusion

Research Infrastructures have been an important cornerstone of ERA since its establishment, and are generally considered to be a success story. In order to continue delivering their share to the development

of the ERA, they need to consider how best to contribute to the renewed ERA, as proposed by ERAC, and follow its imminent developments over the next few months. They should also consider how best to implement the activities highlighted by the ESFRI White Paper. This is the role of RIs as important institutions of the ERA, but one that might also have a significant impact on their sustainability.

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