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SYNTHETIC REPORT ON BEST PRACTICES OF LINKING RIS AND SOCIETAL NEEDS, ECONOMICS AND POLICY

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ABSTRACT

This document provides a synthesis of the role of environmental research infrastructures (ERI) play in European science and innovation. In particular, it addresses the relationship between ERIs and industry and illustrates the contribution that RIs make to policy and decision making in Europe. The issues and improvements that could potentially be made in the relationships between ERIs and both industry and policy makers to maximize the potential socio-economic benefit are also considered as part of this report.

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TERMINOLOGY

A complete project glossary is provided online here: envriplus.manageprojects.com/s/text-documents/LFCMXHHCwS5hh

PROJECT SUMMARY

ENVRIplus is a Horizon 2020 project bringing together Environmental and Earth System Research Infrastructures, projects and networks together with technical specialist partners to create a coherent, interdisciplinary and interoperable cluster of Environmental Research Infrastructures across Europe. It is driven by three overarching goals: 1) promoting cross-fertilisation between RIs, 2) implementing innovative concepts and devices across RIs, and 3) facilitating research and innovation in the field of environmental understanding and decision-making for an increasing number of users outside the RIs.

ENVRIplus aligns its activities to a core strategic plan where sharing multi-disciplinary expertise will be most effective. The project aims to improve Earth observation monitoring systems and strategies, including actions to improve harmonisation and innovation, and generate common solutions for many shared information technology and data related challenges. It also seeks to harmonise policies for access and

provide strategies for knowledge transfer amongst RIs. ENVRIplus develops guidelines to enhance trans-disciplinary use of data and data-products supported by applied use-cases involving RIs from different domains. The project coordinates actions to improve communication and cooperation, addressing Environmental RIs at all levels, from management to end-users, implementing RI-staff exchange programs, generating material for RI personnel, and proposing common strategic developments and actions for enhancing services to users and evaluating the socio-economic impacts.

ENVRIplus is expected to facilitate structuration and improve quality of services offered both within single RIs and at the inter-RI (European and Global) level. It promotes efficient and multi-disciplinary research offering new opportunities to users, new tools to RI managers and new communication strategies for environmental RI communities. The resulting solutions, services and other project outcomes are made available to all environmental RI initiatives, thus contributing to the development of a coherent European RI ecosystem.

TABLE OF CONTENTS

1 Introduction

Research Infrastructures (RI) have been defined as “facilities, resources and related services that are used by the scientific community to conduct top-level research in their respective fields and covers major scientific equipment or sets of instruments; knowledge-based resources such as collections, archives or structures for scientific information; enabling Information and Communications Technology-based infrastructures such as Grid, computing, software and communication, or any other entity of a unique nature essential to achieve excellence in research. Such infrastructures may be “single-sited” or “distributed” (an organized network of resources)” [European Commission, 2010]. This definition specifically refers to the infrastructure to support public research, but its use (also called physical access) is open to the private sector as defined in the European Charter for Access to Research Infrastructures published by the European Commission. https://ec.europa.eu/research/infrastructures/pdf/2016_charterforaccessto-ris.pdf

Environmental Research Infrastructures (ERI) began to emerge a few decades ago. The associated costs, although lower than in other areas, remain high throughout their lifecycle (+/-25 years): design, building (usually called implementation), operation, updating or termination. A specificity of ERIs is their geographic distribution, per (sub) domain or topic (the four environmental domains being hydrosphere, atmosphere, biosphere/ecosystem and solid Earth). Methodologically individual platforms are dedicated to observation or experimentation, both often leading to modelling. In Europe Environmental Research Infrastructures build up, at least in part, from the federation of national platforms, their design and development being incentivized by EU funding. It is usually during this phase that European ERIs prepare their policies, establish physical access, including to data. Note that ERI concept varies from one continent to the other, and are largely still lacking in developing countries.

Linking RI with stakeholders pursues four goals: research excellence, efficiency, socio-economic impact and income generation. Private sector accumulates know how and data that can be valuable for public research and can collect data at low cost on request while doing business. At the same time, research output is meant to be applied.

Bridging the gap between public research (infrastructure) and stakeholders is a challenge across all domains (Veugelers and Del Rey, 2014), and even more so for the environment. The term ‘stakeholders’ is referred to in the broadest sense.

Research excellence will be the starting point of our reflection, as it is the prerequisite for efficiency and socio economic impact. We then explore the ERI mission beyond excellence that will determine how they are also evaluated. Lastly we will begin to look at a collaborative framework for working with the private sector.

2 Research excellence, basis for efficiency and socio-economic impact

2.1. Independence

For excellence, legitimacy, efficiency and socio-economic impact, the public research community should design, manage and use RI depending on expertise, according to mandate, and on an excellence basis. In other words, the public research community needs independence, which includes from policymakers, allowing specialists to deliver reliable and unbiased science.

Conditions must be such that public researchers are able to freely choose the majority of their research topics (the rest upon request of policymakers etc.), and able to manage research output according to a defined mission. This freedom should include a secured public budget and allow them to manage their own resources within certain limits. This clear separation of responsibilities and resources potentially brings citizens closer to public research, ensuring their right to independent and unbiased information. It also empowers and raises the accountability of all stakeholders, including the public research community. Transparency makes up a large part of public research accountability. Policymakers can legitimately decide to what extent they make use of this public research output

Public research output

As part of its independence, the public research community needs to ensure ownership of the quality selection process of its outputs (e.g. publications etc.). This already happens at the institutional or inter-institutional level and includes dissemination. Public research institution's websites remain largely underused, yet they offer an authoritative direct link to stakeholders. This reform includes free access to research output (benefitting also own public research and education). The quality selection system remains reputation based through citations (Smits, 2018)

To complement the existing resources, a website for the environmental public research community capitalizing on state of art research would provide further benefits including: strengthening the environmental public research community, fostering consensus, contributing to independence, optimizing popularization and improving communication. However, this requires participation of environmental research communities at the global level.

2.2. Combining drivers for excellence

Alongside independence, excellence requires a combination of selected complementary drivers:

- Collaboration and credit
- Coordination and liberty
- Integration and specialization
- Long-term and dynamism

Furthermore an enabling environment for collaboration must be put in place. At the present time Europe is at the forefront in this respect.

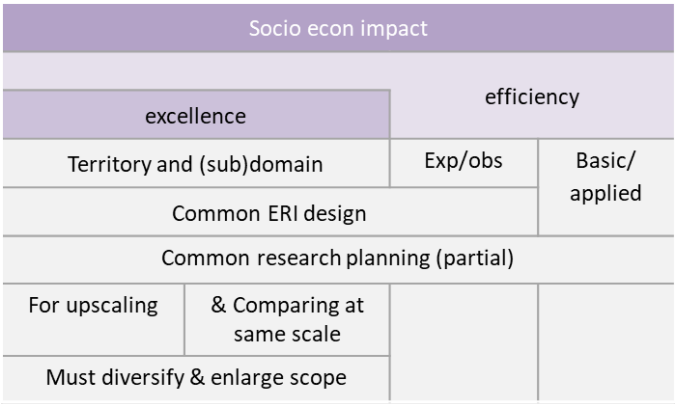
Among environmental research specificities, long-term measurements are necessary to fully understand natural cycles and non-linearity while integration is all the more important to understand highly interconnected localized processes.

2.3.Integration

We refer to 'integration' as research collaboration across territory, (sub) domain, methodology, and/or basic/applied research (Chabbi, 2017). However, the latter two improve efficiency rather than excellence. A territorial approach is needed for upscaling and comparison at same scale; research collaboration remains low even within one geographically distributed environmental RI.

The next section will highlight the importance of integration for excellence, efficiency and socio-economic impact. The public research community tends to overlook integration yet it enriches specializations.

Research collaboration implies common planning; fair budget allocation to subdomains and upstream planning that helps to prevent competition.

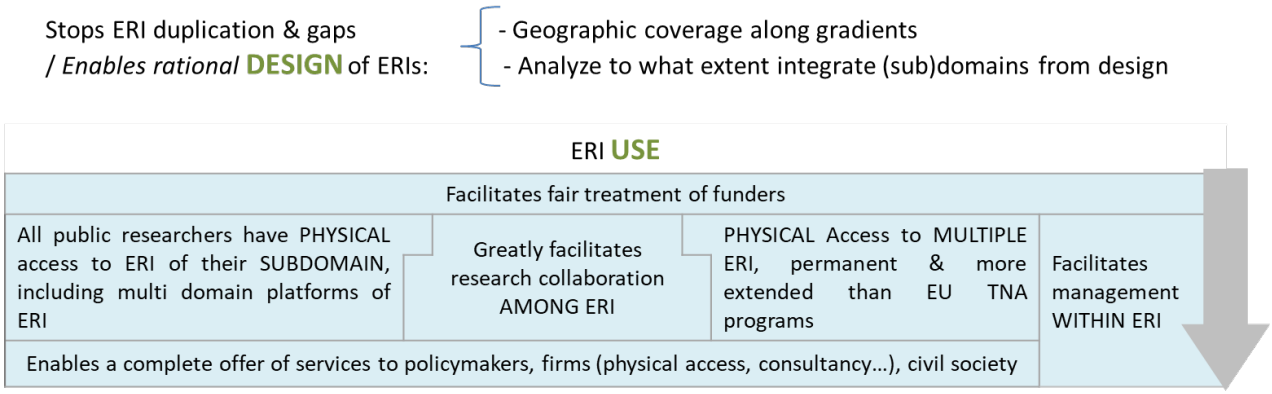


2.4.Benefits of EU competence for ERI

The current emphasis on national ERI competence results in environmental Research Infrastructures that depend to different degrees on one or more Member states. Yet excellence, efficiency and socio-economic impact call for ERI competence at the regional (EU) level. Firstly it enables a rational design of ERI by preventing gaps and duplications. ERI must follow geographic gradients and ensure the liaison between (sub) domains.

Users of ERI face obstacles to accessing the relevant research infrastructures due to the policies of funders. Except for EU transnational access (TNA) programs, public researchers that are not part of the environmental RI for their specialism cannot always access them (not including open data products); and physical access to multiple ERIs can be difficult even for commercial organizations. Much needed research collaboration across ERIs is hampered, affecting excellence, efficiency, and impeding the delivery of a comprehensive suite of services to stakeholders (policymakers, firms, citizens). It is not so much that a single entry point is needed but access to an interconnected rational system of ERIs.

Finally, even within individual ERIs the changes within the member states can potentially constrain their management and threaten data set continuity.



From a legal perspective, subsidiarity and proportionality, key principles of the EU construction, point to the same conclusion, by stating that a competence should be exercised by the EU as soon as and to the extent to it is more relevant at this level. On a positive note, research (as well environment) is currently a shared competence between EU and Member states governed by those principles. EU competence for ERI can therefore be exercised without a treaty amendment.

We have seen above how excellence of ERIs potentially contributes to efficiency and supports stakeholders. The next question relates to the ERI mission beyond excellence.

3 Maximizing ERI socio-economic impact

3.1. ERI mission

Environmental public research infrastructure's role is indispensable to tackle societal challenges. Therein lies their highest added value. Specifically, understanding and predicting environmental process to assess current development patterns and ultimately design more environmentally friendly ones – but this requires research prioritization. Socio-economic analysis complements this public service; this reinforces the need for independence of public research, highlighted in the first chapter. Note that assigning a goal to research beyond understanding facilitates much needed integration of environmental research. The highly localized natural conditions demand that support for stakeholders is decentralized.

Assessment

An assessment framework is logically derived from the ERI mission, an example of which is shown in the table below. When considering indicators, the number of citations would measure excellence in a more flexible and accurate way than publications. Proposed indicators exclusively focus on results (not on necessary means), to preserve flexibility.

Environmental public research

	MISSION	INDICATORS
Outcome	DESIGN (options of) green patterns	No of citations (rather than publications) on the matter
Output	ASSESS development patterns environmentally	Idem
	UNDERSTAND & PREDICT nature	Idem

4 Collaborative framework with private sector

Finally, how can environmental research infrastructures combine independence (chapter I) and income generation? (Knai, Gilmore and McKee, 2010)

Pricing ERI service delivery to industry according to environmental impact and priority set up by ERI would direct public investment where it is the most needed. (Knai, Gilmore and McKee, 2015): environmental preservation benefits human health as part of nature and avoids high costs derived from dysfunctional ecosystem services. Providing discount to firms developing products/services that converge with ERI mandate appears logical. Organized on a dynamic basis (evolving per task throughout project), the proposed pricing system offers flexibility to firms.

Environmental impact	Price related to costs
0	3 %
Very low	15 %
low	40 %
Medium	105 %
High	120 %
Very high	130 %

Providing discounts involves some pre-conditions. Product/service development process by firms (and R&D if possible) must happen in parallel to ERI research. It also implies liberty for researchers to publish. An indicative pricing table follows, to be modulated by environmental priority.

5 Concluding remarks

Public research excellence to a large extent supports efficiency and socio-economic impact. Key drivers include independence and, with regard to the environment, EU competencies. Public research independence, which embraces RI design through to output management, enhances democracy. EU competence enables rational design of ERIs, and research collaboration across them.

Beyond excellence, ERI are indispensable to tackle societal challenge, and ultimately design green development production and consumption patterns. This optimized public service implies research prioritization.

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Transforming the economy towards sustainability requires the participation of all stakeholders. Providing discount to firms working on environmental priorities defined by ERI preserves ERI independence and research prioritization in corporate support and income generation.

<table>
<tr><th colspan="5">SOCIETAL CHALLENGE</th></tr>
<tr><td colspan="3">Env publ research EXCELLENCE
(at the same time legitimacy, efficiency & support to stakeholders)</td><td>Research PRIORITIZATION</td><td>Collabo with non env publ research</td></tr>
<tr><td colspan="2">Collaboration within env publ research community</td><td>Data set continuity</td><td>Researchers liberty</td><td></td></tr>
<tr><td>Across territory, domains, topics</td><td>Specialization</td><td colspan="3" rowspan="5"></td></tr>
<tr><td>Fair budget allocation to each subdomain upstream planning</td><td rowspan="4">Enabling env for collabo in general</td></tr>
<tr><td>Common design of ERI (along geog gradients…)</td></tr>
<tr><td>Common research planning across ERI</td></tr>
<tr><td>EU competence for ERI</td></tr>
<tr><td colspan="5">Independence of public research (including from policymakers)</td></tr>
<tr><td rowspan="5">Secured public budget</td><td rowspan="5">Accountability: transparency</td><td colspan="3">ERI design, management and use by env publ research comm, on an excellence basis (+ quota per country)</td></tr>
<tr><td colspan="3">Choice of % of research topics following mandate</td></tr>
<tr><td colspan="3">Own (inter)institutional quality selection of research output</td></tr>
<tr><td colspan="3">Free output on own institutional website</td></tr>
<tr><td colspan="3">Website of env publ research comm with state of the art recommendations, from general to local</td></tr>
<tr><td colspan="5">Pricing services to firms proportionately to env impact & priority (with publication)</td></tr>
</table>

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