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

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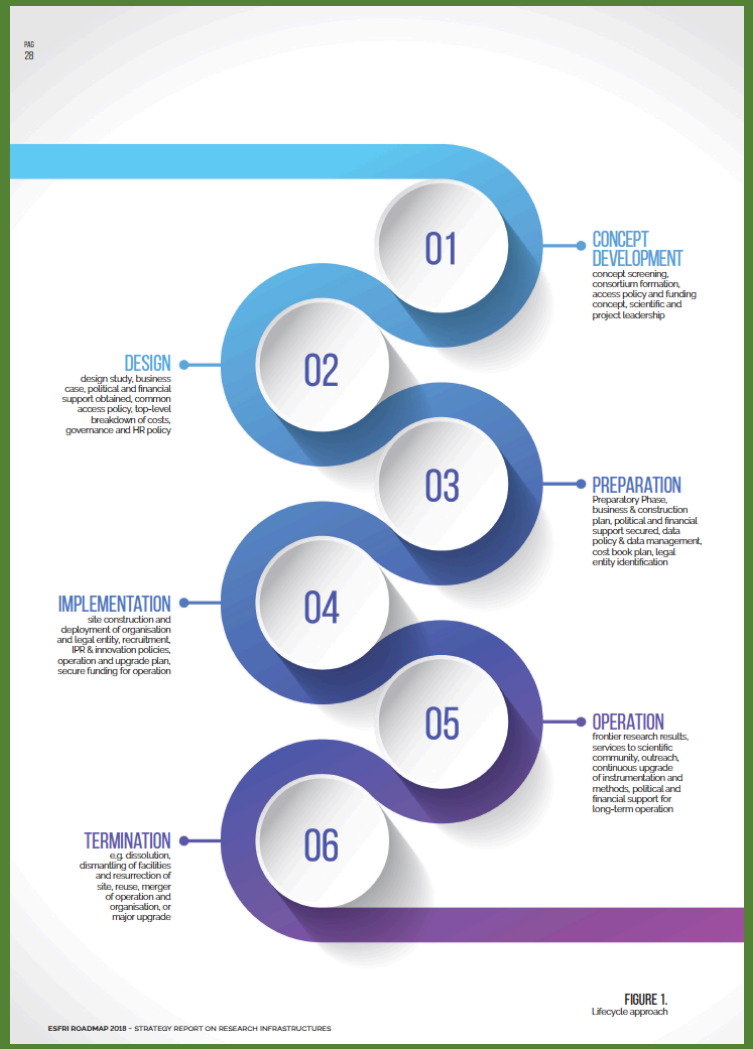
RATIONALE

The RI system, promoted and supported by the European Union has contributed to transforming the way science is done in Europe with an emphasis on collaboration, inclusiveness and open, merit-based access to world-class infrastructures across the research landscape. RIs are providers of new knowledge for pursuing complex goals as identified in the missions of Horizon Europe.

The effectiveness of the investments in promoting, operating and assuring the Long-Term Sustainability of pan-European RIs are the central issues.

This High-Level Expert Group (HLEG) was assigned the task of assessing the effectiveness of the EU measures supporting the development of a well-balanced and competitive European Research Infrastructure system, and to analyse the state of play of a representative group of RIs and their strategies for ensuring LTS.

THE HLEG METHOD OF ANALYSIS OF RESEARCH INFRASTRUCTURES BASED ON THEIR LYFECYCE



THE IMPLEMENTATION READINESS LEVELS methodology builds on proposals made by the Assessment Expert Group in 2013 and other national practices and **DEFINES A NOVEL REFERENCE GRID** for assessing the progression through the lifecycle stages.

THE READINESS LEVELS (RLS) capture the main features and milestones of the implementation of a RI in a practical and measurable way.

THE RLS PROVIDE A SNAPSHOT OF AN RI'S STAGE OF DEVELOPMENT ALONG ITS LIFECYCLE.

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RL	Lifecycle and RL description
	Concept Development, Design
RL1	Design Study – Conceptual Design Report – Initial agreement with at least 3 MS/AC; readiness to apply to ESFRI Roadmap
	Preparation
RL2	Technical Design Study – advanced RI architecture, siting option evaluation and solutions - Cost Book, Data Management Plan
RL3	Advanced Financial Plan and minimum consortium plan – in-kind contributions estimate and policy; construction and operation cost analysis and relative discounted cash flow needs for both construction and early operations; 'business plan' for the consortium.
	Implementation and Construction
RL4	Advanced legal setup, ERIC, AISBL or other. Stable minimum Consortium with 5-10 years financial commitment. European Investment Bank loan study, Structural Funds eligibility and suitability analysis with respect to financial/business plan.
	Operation
RL5	Established RI, construction completed, operational budget in place, ESFRI-Landmark status or other (EIROforum etc.). Delivery of Science results, Open Access to Users, Science Services and Services for Innovation, Open Data facilities and basic FAIR Services, continuous upgrade
RL6	Advanced Science Services, FAIR Data and Data Services to support interoperability, progressing towards EOSC readiness, Clustered RIs, Synergy with other RIs and Integration of Access, continuous upgrade
	Termination
RL7	Termination Phase, end of scope and evaluation of site conversion, or establishment of a decommissioning plan leading to dismantling, or disruptive reorientation of assets.

OBJECTIVE1: THE EFFECTIVENESS OF THE RESEARCH INFRASTRUCTURE EC-FP FUNDING INSTRUMENTS

Analysing our assessments of 43 individual RIs, we found that the average number of grants received by each RI under FP7 and H2020 was 4.8.

The median number of grants to move from RL1 to RL4 was two with a range from 1 to 4.

The **average funding** received during the preparation and implementation stages was EUR 10.2 million with a **range from** EUR 1.5 million to 41.2 million. (**INCLUDING DIRECT AND COLLABORATIVE FUNDING**)

Finally, we found that it took RIs between 2 and 12 years to move from RL1 to RL4 with the average being 8.4 years.

SOME PATTERNS CLEARLY EMERGED:

The envelope of support from EC grants that are not uniquely allocated to an individual RI but of which the RI is one of the beneficiaries, we observe that an ***average of EUR 35 million is equally available to all RIs***, with the Health & Food (**H&F**) RIs reaching EUR 40 millions and **PSE** reaching EUR 32 million. This is WEAKLY CORRELATED with the actual cost of the RIs or need for national funds.

	Int. Actions	Des. Studies	Ad hoc	Prep.Phase	Ind. Supp.	Cluster
Community building	X					
Concept development – CDR		X				
Project development –TDR		X	X	X	X	
Community consolidation around RI project	X	X		X		
Submission to ESFRI	X	X	X			
Cost book, HR management, governance				X	X	
Legal set-up, temporary / stable				X	X	
Siting / financial set-u to reach coverage of 80% cost-book				X	X	
Financial / business plan: in-kind / coverage of oper. costs				X	X	
Operation stage / running costs / users access / TA	X					
e-need costs related to DPM, services, HPC, EOSC				X	X	X
Clustering						X
Cross-domain integration						X
Merging	X					X
Major upgrades / disruptive upgrades / reorient				X	X	
Internationalisation / GSO-GRI						X
Termination / decommissioning						

RATIONALE OF NEW SUPPORT MEASURES

***TARGETED FUNDING**, focused on RIs undertaking a subset of all possible call-related activities in a serial manner, may improve effectiveness of funding.*

***RIS COULD TAILOR THEIR PROJECT ACTIVITIES** to optimise their likelihood of progressing between readiness levels.*

*By tailoring the funding instrument to allow RIs to address a subset of specific activities, we believe that the time needed to progress between RL1 and RL4, in a staged way, would be reduced as RI efforts would be **focused** where they are most needed rather than dispersed across less urgent activities.*

A 'personalised' approach should be developed to ensure maximum European added value for all RI types, while avoiding the creation of long-term dependence on EC funds.

*The HLEG concluded that a **staged approach** for RIs could be a much preferable solution, mapped onto the lifecycle approach and **RL-achievement rationale**.*

TO ADOPT AND ENFORCE THE RL-ACHIEVEMENT MONITORING

A panel of independent experts should be set-up by EC in collaboration with ESFRI*, with fixed term engagements, a consistent methodology, and rotation mechanisms to balance continuity and renewal.*

***THE PANEL** would evaluate the successful achievement of an RL at the end of each FP-funded grant or contract, as well as upon request by the MSs and ACs that are financing the development of the RI.*

***THE PANEL** should make use of all established indicators but should also independently analyse the specific features of the RI, its consolidated status in the lifecycle, as well as the evolution of the Landscape, in order to help in optimising the next steps.*

- Integrating Actions have beneficial effects for all types of communities, but the IA experience does not necessarily have to lead to the development of RI as a sustainable as an independent legal entity and nor should it. Reiterated application to IAs is often due to a lack of funding alternatives for collaborative research that de facto forces to explore the RI option as a research funding instrument.

- Stabilising **SUCCESSFUL IAS AS INFRASTRUCTURE SERVICE CONSORTIA**, co-funded by the EU and MS-AC, could be an effective solution to several relevant research sectors. The continuing need for such consortia should be periodically monitored along with their quality/quantity of scientific and innovation productivity.

- *Essential services for the integration and competitiveness of European research can be ensured without creating new entities (RIs) in those cases when a well-coordinated consortium of independent institutions can operate them successfully.*

- *Special measures to ensure the sustainability of the services, and the adequate monitoring of the quality and persistence of the scientific community needs, should be designed as a way of optimising the* ***LANDSCAPE OF RI SERVICES****.*

RESEARCH INFRASTRUCTURE PROGRESS TOWARDS IMPLEMENTATION AND LONG-TERM SUSTAINABILITY

In evaluating the future outlook of 43 RIs (ERICs, ESFRI,and the ensemble of the EIROForum) with respect to their long-term sustainability the HLEG used a number of indicators that describe the seven elements of the *EC-SWD Action Plan* for a sustainable RI (SCIENTIFIC EXCELLENCE, TRAINING MANAGERS AND USERS, UNLOCKING INNOVATION, SOCIO-ECONOMIC IMPACT, EXPLOITING DATA, GOVERNANCE AND L-T FUNDING, INTERNATIONAL OUTREACH)

They can be applied to the main part of the RI lifecycle (**RL3-RL5**) with, for example, policies or practices in development, in place or in operation depending on the RL of the RI.

In broad terms,

- at **RL3** all the seven LTS elements should be present in the preparation plan of the RI, whilst
- at **RL4** each LTS element should be under construction with final policies put in place and
- at **RL5** all LTS elements should be implemented and operational.

The operational costs burden

One common bottleneck for RIs, is to ensure adequate funding of their operational costs. These costs are often of the order of 10% of the initial construction investment per annum, but are too often treated as a separate issue to the construction budget.

The delivery of science is the very reason why the RI was designed and built, **but this productive phase turns out to be a bigger financial problem than the construction.**

On the RI side, a **culture of 'costing' must be fostered**. Not having a completed and validated cost-book is a pitfall of most RIs, and the risks connected with unknown cost influence decisions.

RIs that experienced large increases of cost, not foreseen or covered by contingency, put a stress on the whole RI system.

One alternative planning instrument could be to reverse the budget engineering and to evaluate **what operational costs are considered sustainable for the 20-50 years** during which the successful operation will generate return, then trace this back to determine the initial maximum investment size.

Much of the **operational cost burden has to do with insufficient planning**, design of the RI, and/or governance and management during the initial stages. Specific **checkpoints** must be established in a business plan that covers the entire lifecycle of the RI.

FINDINGS – 1 (EC, but also MS, AC)

HLEG RECOMMENDATION

Funding instruments should address LTS early in the lifecycle of RI development.

- A staged approach with funding targeted at helping RIs to move through defined lifecycle stages or readiness levels, with checkpoints to verify progress, should be adopted.
- An independent assessment should verify the RI progress at the end of each phase (contract, grant) and to recommend future actions. Generally accepted criteria should guide reviewers and experts to operationalise the assessment of new proposals, and in-itinere follow-up.
- The RI should fulfil certain criteria and should show the progress made before applying for the next round of funding support.
- To allow for more effective future reviews, a ‘dossier’ for each RI should be created tracking its funding history and successful achievement of its own goals against its schedule. The RI-dossier should be the reference for all assessments.

FINDINGS - 2

HLEG RECOMMENDATION

- In order to improve the prospects for sustainability, the EU should insist on Member States' contributions to the funding of Preparatory and Implementation Phases with a significant element of this funding being provided as cash.

- Projects should be encouraged to work to increase financial commitment from MS/AC alongside political endorsement.

- Integrating Activities (IAs) have been key to the development of RIs and their services. The PILOT RIs should develop a **new model** for providing stable and reliable, unique RI services, possibly elaborating a **light-but-robust consortium** model to engage institutional partners.

- The requirement on RIs to align to, and actually contribute to the definition of, the European Open Science Cloud (EOSC) services and operational instruments requires a higher level of coherence in the funding from different chapters (RTD, CONNECT) of the Framework Programme, and across the three pillars of Horizon Europe. RLs may be used in connection with the EOSC readiness criteria.

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Joy Davidson is the Coordinator for the UK's Digital Curation Centre (DCC) - a Research Infrastructure specialized in data management planning, curation and Open Science. Joy currently leads WP3 of the EC funded FAIRsFAIR project, which aims to increase the production and use of FAIR data. She has been involved in reviews for previous ESFRI Roadmaps and several H2020 Research Infrastructure funding programmes

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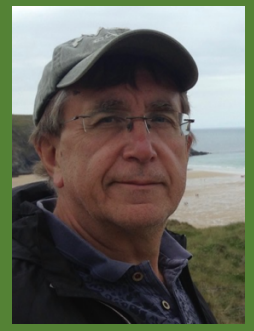

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