



## The ENVRI Reference Model for Environmental Research Infrastructures

### The ENVRIplus project

The ENVRIplus (<http://envriplus.eu/>) project builds upon the work of the original ENVRI project in providing shared solutions for environmental science and society, particularly as regards defining common operations for environmental research infrastructures. Addressing the need for interoperable services for such diverse topics as identification and citation, curation, provenance and cataloguing, the Data for Science theme of ENVRIplus brings together a cluster of environmental research infrastructures (RIs) and ICT institutions to develop practical solutions to long-standing problems.

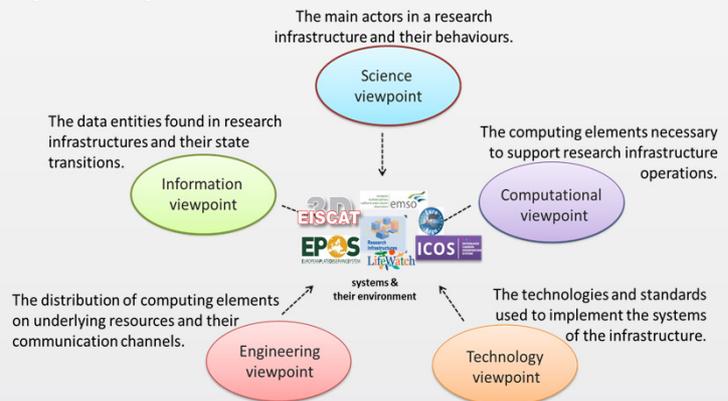
### ENVRI Reference Model

The ENVRI Reference Model (ENVRI RM) offers a design framework to promote interoperability between infrastructures. It enables reuse and sharing of resources and experiences. It encourages common language, and reduces unnecessary duplication of effort. It speeds up identification and understanding of distinctive requirements.

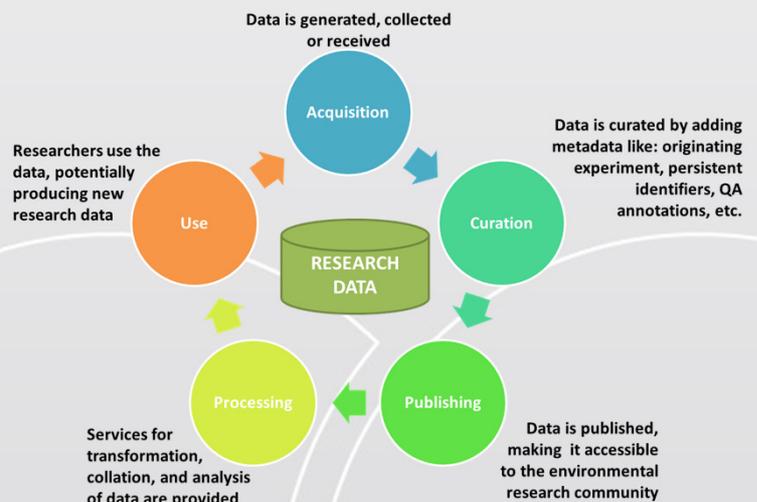
The ENVRI RM provides a set of modelling templates that address different aspects of an environmental RI and allow the sharing of experiences, solutions and common understanding. The ENVRI RM is derived from the Reference Model for Open Distributed Processing (RM-ODP), an industrial standard widely used for defining complex open distributed systems.

### Research Data Lifecycle

The development of the ENVRI-RM is based on analysis of 21 existing research infrastructures in the context of a typical research data lifecycle. The ENVRI RM is built to support the description of the systems and processes that are applied to the data, the communities involved, the systems and methods utilised, and the formats and standards applied.



**The ENVRI RM divides the modelling of RI systems across five viewpoints. This offers the mechanisms to map and keep the consistency of design across viewpoints, facilitating analysis, maintenance and evolution of systems.**



**The data lifecycle helped to identify a set of functional requirements distributed across five phases.**



## Core Competencies

Research Infrastructure (RIs) focus on subsets of the phases of the data lifecycle. Not all RIs have the capacity or the interest in supporting the complete data lifecycle. Some RIs are interested in optimising data acquisition, others are focused on the curation of data and publishing data products, or on providing further processing services for analysis and visualisation. There are also ambitious initiatives, aimed at providing support across all data lifecycle phases.

## Benefits

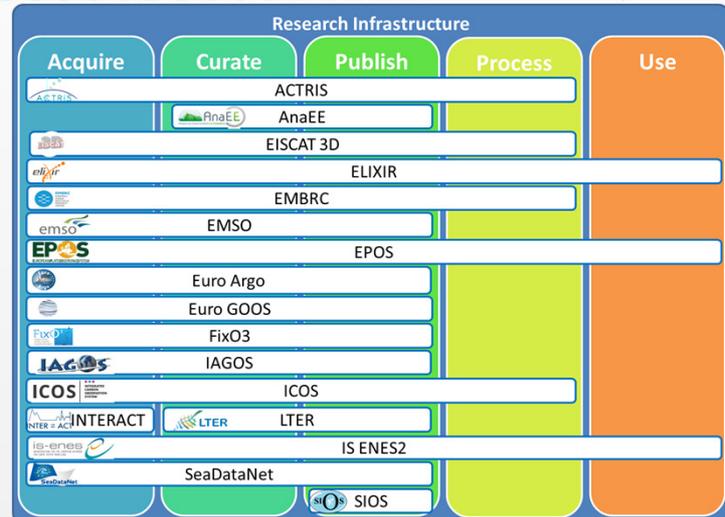
The adoption of the ENVRI RM can dramatically reduce the cost (time, effort, resources) for the development of RI systems, allowing them to concentrate on their core competencies. The ENVRI RM helps RIs take advantage of existing solutions provided by e-Infrastructure providers (such as EGI, EUDAT, PRACE, or national facilities).

## Open Science Clouds

The ENVRI RM can identify the considerations that shape the design and management of OSCs; the data and information they are expected to handle; and the nature of the computation (in its widest sense), delivering a trusted environment for hosting and processing data.

## ENVRI and RDA

The resources of RDA influence and inform the revisions of ENVRI RM, for instance the terminology defined by the Data Foundation & Terminology IG, and the work of the Data Fabric IG. The ENVRI RM can be of value to the RDA community, offering a framework of typical research and data infrastructures in which considerations about future needs and recommendations can be explored.



**Core Competencies: The RIs participating in the ENVRIplus project provide examples of the variance of coverage of the data lifecycle within four environmental research areas: Atmosphere, Biosphere, Marine, and Solid Earth.**

## Current Status

The current work on the ENVRI RM focusses on the integration needs of RIs from engineering and technological viewpoints. The RIs core competencies and the dependence on third parties to facilitate integration through recommended APIs e.g., for cataloguing are key aspects being analysed.

## Resources

<http://envriplus.eu>

The current project supporting all ENVRI activities.

<http://envri.eu/rm/>

The home of the ENVRI Reference Model v2.1, includes documentation, articles, examples and guidelines on how to use the ENVRI RM.

<http://oil-e.net/ontology/>

The ENVRI RM is captured as the Open Information Linking for Environmental science research infrastructures (OIL-E), a set of ontologies providing formal semantics for RI architecture and behaviours.

<http://envri.eu/>

ENVRI Community: A network of environmental research infrastructures, projects and networks as well as others interested in environmental research development, maintenance and improvement.

