



Session | Advancing Environmental Science through Integrated Research Infrastructures

Convener: Anna Santoro | **Co-conveners:** Gustavo Naumann, Quertenmont Pierre, Elena Garbarino

Towards Harmonised Environmental Research: The Role of ITINERIS in Integrating Italian Research Infrastructures

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Poster on site | Attendance Mon, 28 Apr, 16:15–18:00 (CEST) | Display Mon, 28 Apr, 14:00–18:00 | **Hall X4**

The Earth's system approach to environmental challenges

Most critical issues currently faced by our society involve key environmental challenges: pollution, land use and climate change, and their impacts on biodiversity and ecosystem integrity.



Research Infrastructures (RIs) play a crucial role to realize a comprehensive and integrated approach that extend beyond the different environmental sub-domains for understanding and predicting the Earth's system and developing effective actionable strategies.



The environmental research in Italy



A fragile country from an *environmental* point of view with a strong and *multidisciplinary* scientific community working in this sector for many years.

Actively involved in almost all the *ENV ESFRI* RIs, contributes to other pan-European ENV RIs and hosts other nationally relevant RIs, testifying the importance that Italy places in environmental research.

A *Coordinated actions* are essential to build on this commitment and integrate the large number of research infrastructures.

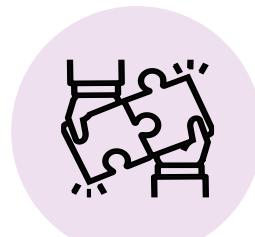
ITINERIS: Empowering Italy's Environmental Future

ITINERIS establishes *the Italian Hub of Research Infrastructures in the environmental scientific domain* for the observation and study of environmental processes in the atmosphere, marine domain, terrestrial biosphere, and geosphere.



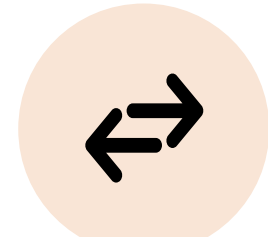
Harmonizing RI developments

to ensure interoperability and highest accessibility to data, tools and services.



Developing cross-disciplinary actions

to empower research and foster innovation



Promote transfer of best practices

from the most mature to the new and developing RIs to strengthen the national RI landscape



ITINERIS: Empowering Italy's Environmental Future

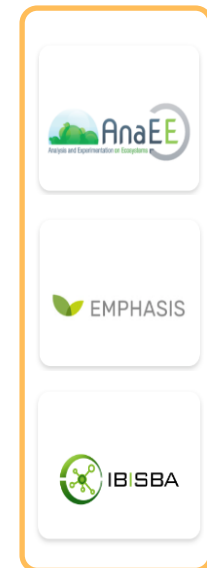
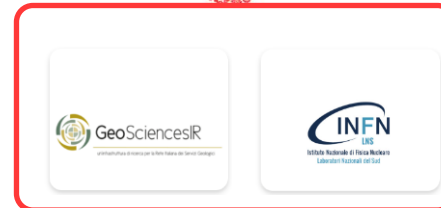
ITINERIS - *Italian Integrated Environmental Research Infrastructures System* is a project funded by EU – Next Generation EU PNRR- Mission 4 “Education and Research” – Component 2: “From research to business” – Investment 3.1: “Fund for the realization of an integrated system of research and innovation infrastructures”.

The project is coordinated by the [CNR \(National Research Council\)](#). It started in November 2022, and during 30 (+6) months will carry out an ensemble of cross-disciplinary actions across the different [environmental sub-domains](#).





A network of excellence



ITINERIS include the national nodes of **22** ESFRI/European/National RIs in the Environment, Physical science, Health & Food domains.





ITINERIS: main Objective

ITINERIS will build the Italian *Hub of Research Infrastructures* in the environmental scientific domain for the observation and study of environmental processes in the atmosphere, marine domain, terrestrial biosphere, and geosphere, providing access to data and services.

The *main goal* is to develop *cross-disciplinary* research in environmental sciences through the use and re-use of existing data and services and new observations, to address scientifically and societally relevant issues such as sustainable use of natural resources, pollution reduction, ecosystem management and restoration, mitigation of the downstream effects of climate and environmental change.

This broad-scale vision of environmental research, sustained by the main Italian environmental scientists involved in European RIs, is truly innovative and it will support the Country (and not only) *to address current and expected environmental challenges*.



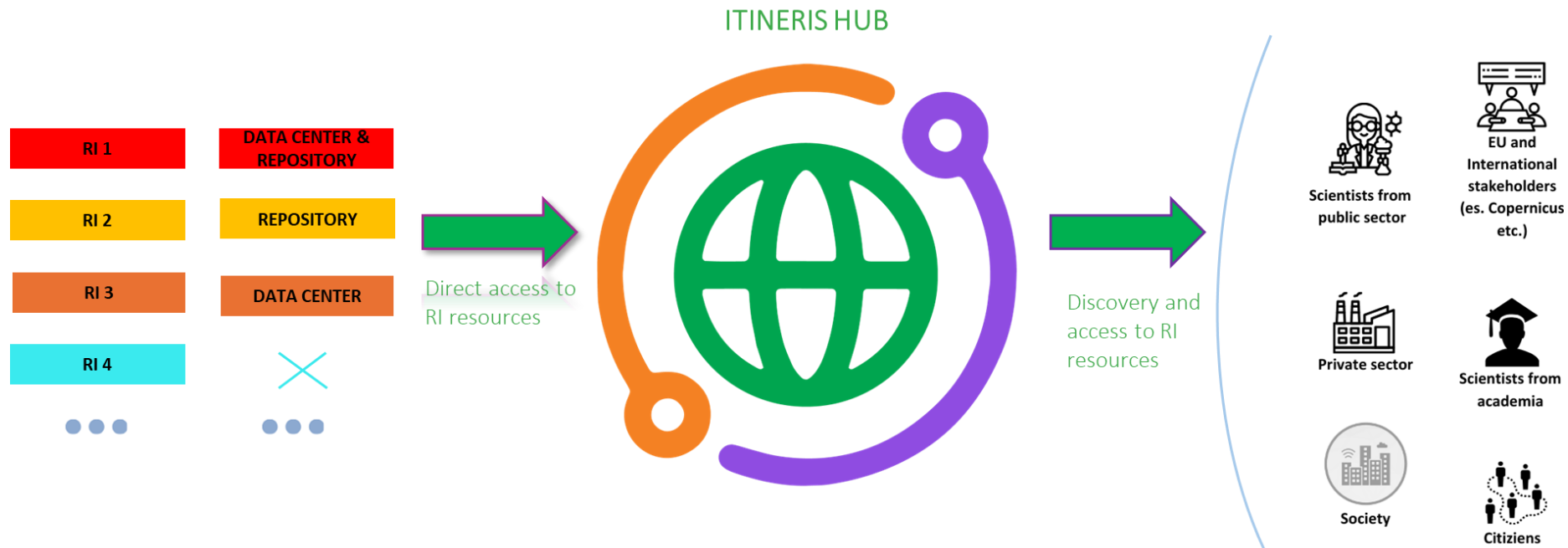
The ITINERIS HUB - Mission



The ITINERIS HUB is the *unique access point* to the comprehensive collection of knowledge, data, analytics tools and services *provided by the Italian RIs in the environmental scientific domain* for the observation and study of processes in the atmosphere, marine domain, terrestrial biosphere, and geosphere.



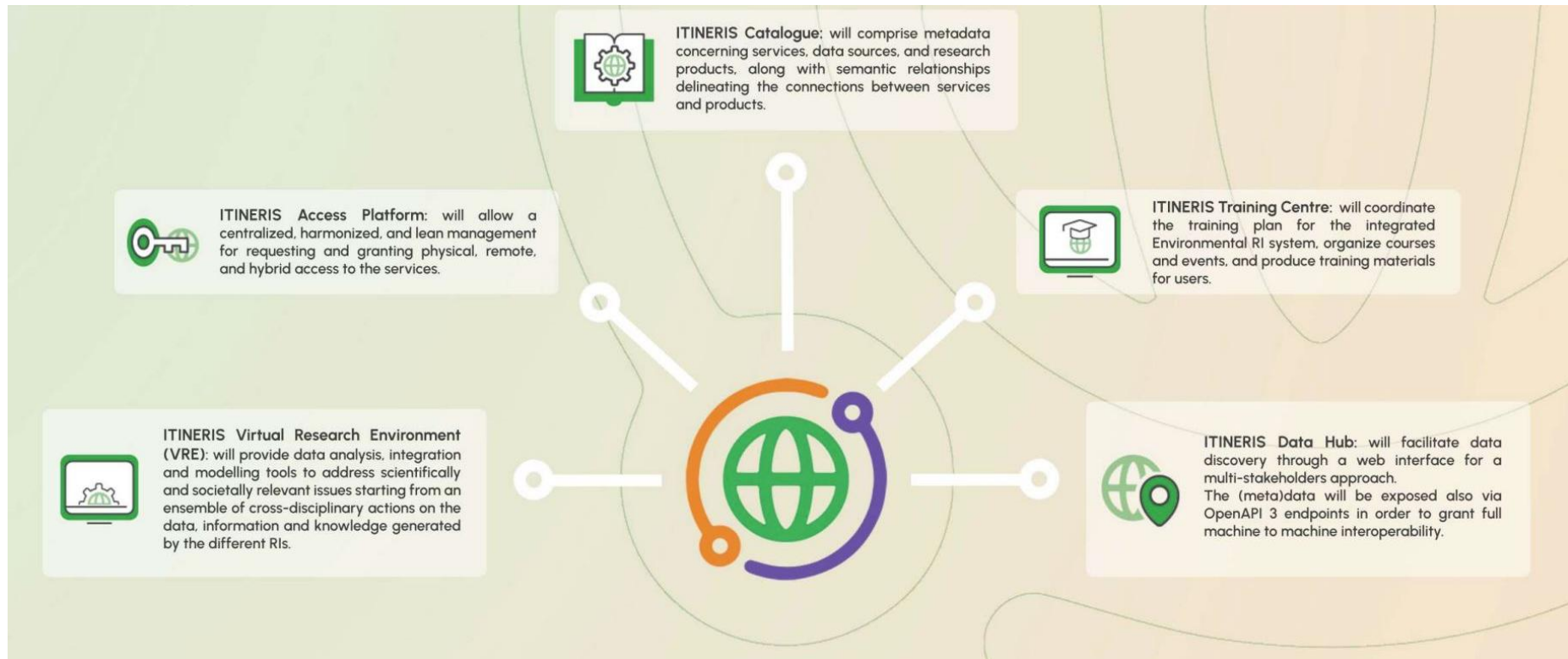
The ITINERIS HUB - Goals



- Maximization of resource accessibility
- Minimization of redundancy
- Propose a solution to be applied as a model for similar initiatives at international scale for fostering harmonization and integration among RIs in the environmental domain.

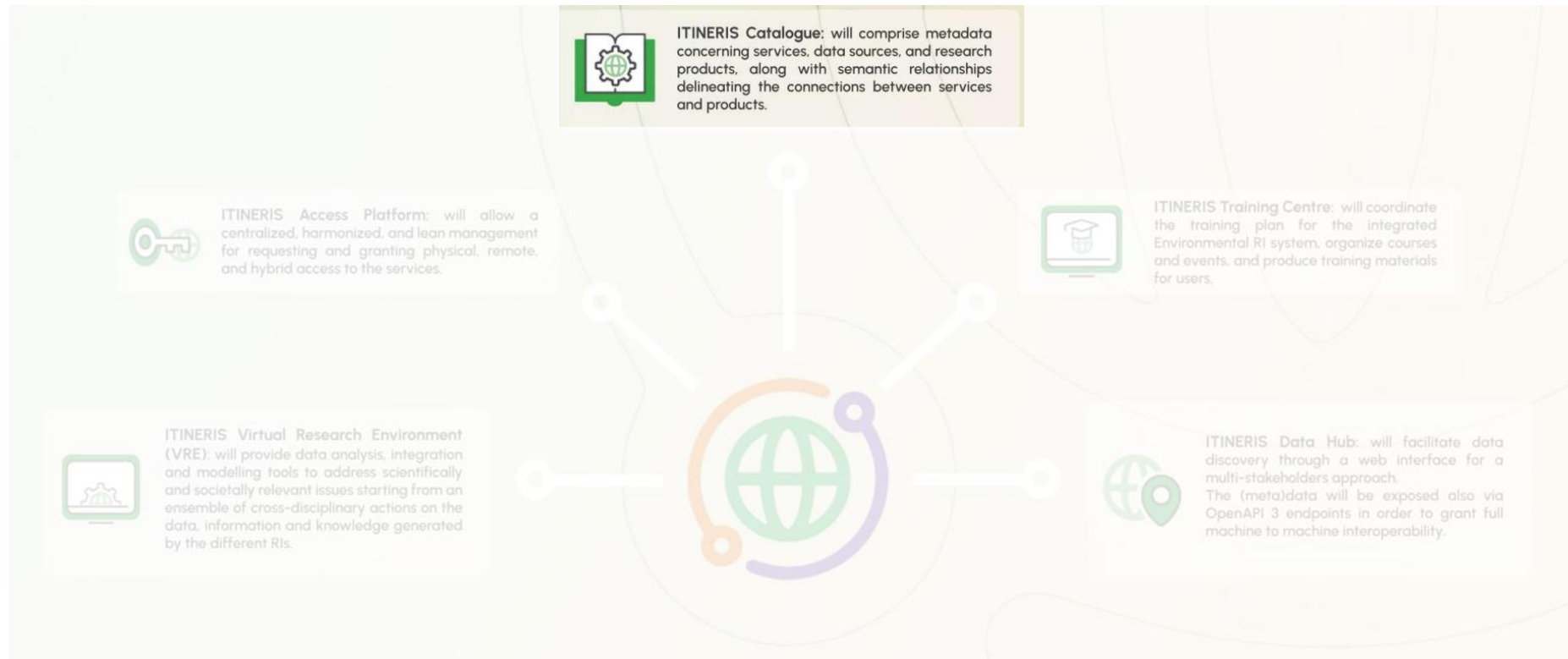


The ITINERIS HUB



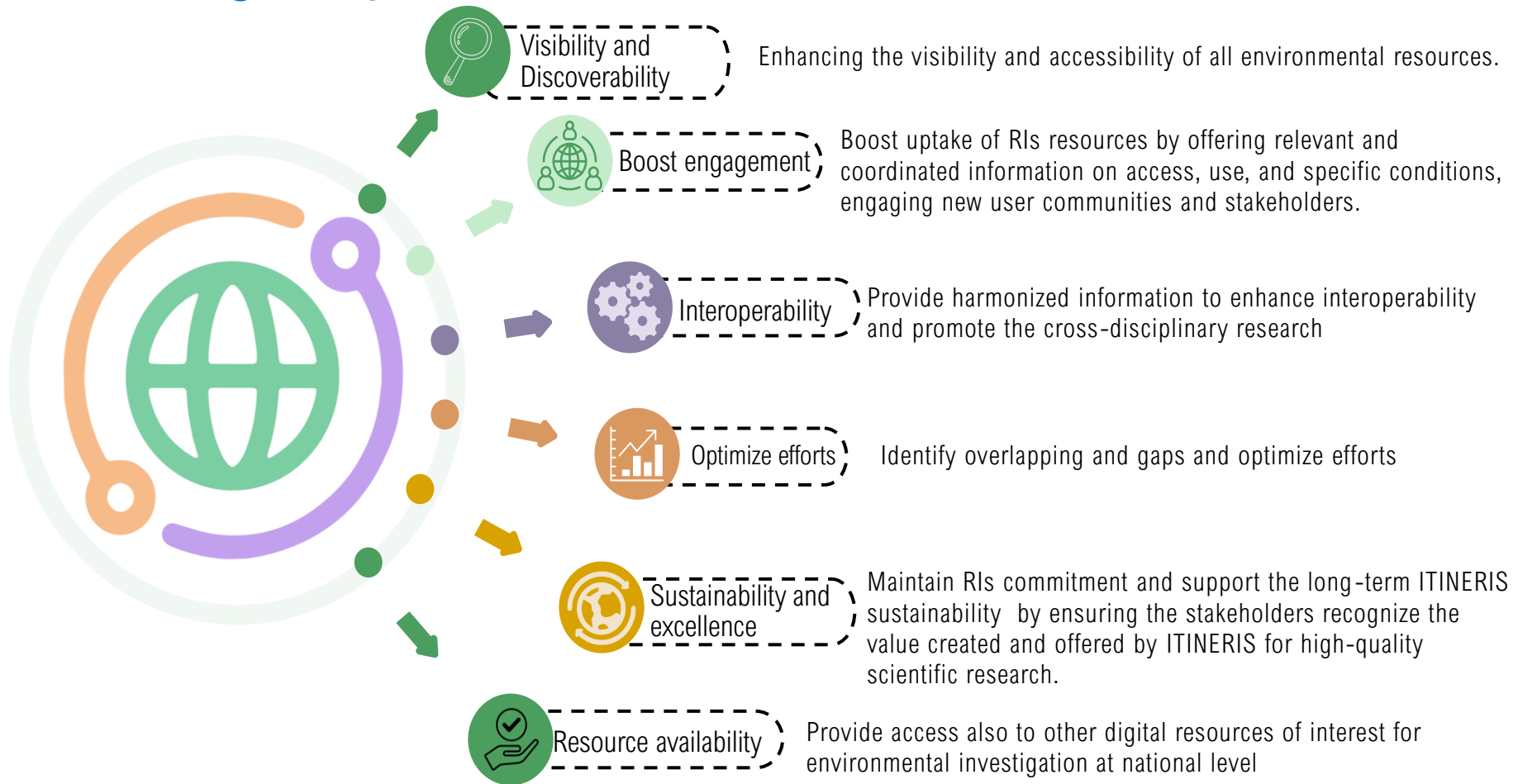


The ITINERIS Catalogue





Unlocking the potential of RIs: ITINERIS as a catalyst for Science and Innovation





The ITINERIS Catalogue of Resources

- It serves as a *comprehensive online registry* with a user-friendly interface, advanced search capabilities, and detailed metadata empowering users with easy access to the knowledge, data, analytical tools, and services provided by the network of environmental RIs.
- Existing RI catalogues and repositories will serve as the foundation for the developments within ITINERIS.
- Nevertheless, resources often remain difficult to locate and integrate since they are currently dispersed or not yet openly provided, due to inaccuracies of their description or the lack of interoperability between standards.
- The Catalogue aims to bridge the gaps between the *different maturity levels* of the RIs participating in ITINERIS by establishing common references and uniform positioning of their offer.



Building the ITINERIS Catalogue

A metadata catalog serving as a standardized framework for organizing and detailing information pertaining to resources within Research Infrastructures (RIs) across the various environmental research domains.

Despite its simple premise, the implementation of this concept involves a considerable amount of complexity.





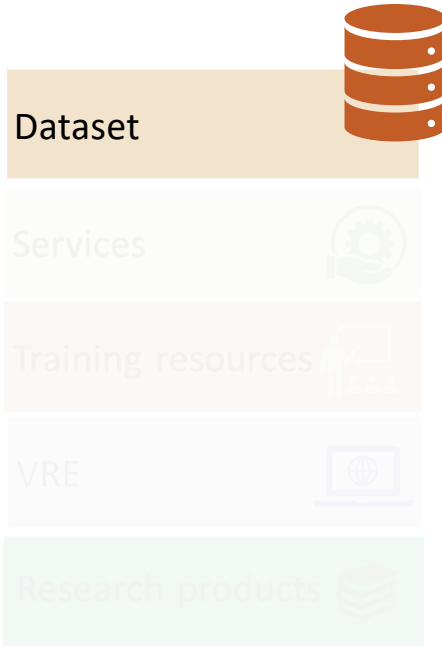
Resources and scope of the Catalogue



- **Resources resulting from the ITINERIS activities** and delivered through the ITINERIS HUB (e.g., Virtual Research Environments, Training platform, Access Platform and the data HUB)
- **RIs' existing resources** openly accessible and already offered by the RIs via their own catalogues/repositories.



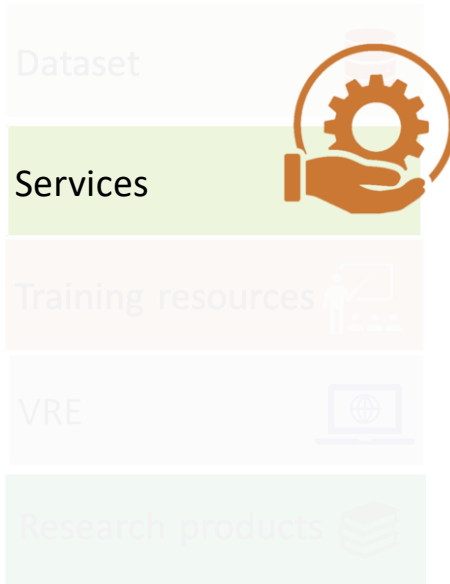
Resources and scope of the Catalogue



- Data is any observation, measurement or fact digitally represented as text, numbers, or symbols that form the basis to extract information.
- A **dataset** is a collection of data organised in the same format and associated with a unique body of work .
- **Metadata describing the dataset** includes descriptive information about its contents, structure, provenance, and context. They are systematically gathered and organized according to specific criteria and methodologies.



Resources and scope of the Catalogue



- In the context of research infrastructures, “a **Service** refers to any support, tool, or functionality provided to facilitate scientific research activities. Services are integral to enabling researchers to effectively conduct their work by offering the necessary infrastructure, resources, and expertise. “
- Services are provided by RIs to deliver value for the end-user **through physical, remote, virtual and hybrid access**.
- Example of services: access to facilities / platforms / research sites, consultation, experts, analysis tools, users support and much more.



Resources and scope of the Catalogue



- Any “persistent resource that has one or more physical or digital representation, and that explicitly involves, specifies or entails a learning activity or learning experience”.
- ITINERIS Training resources will be [provided by the ITINERIS Training Platform](#) developed in WP3 and include, for example: tutorials, webinars, and video lectures, documentation (manuals, user guides, etc.), workshops and courses, interactive modules (quizzes, simulations, and hands-on exercises to reinforce learning), etc.



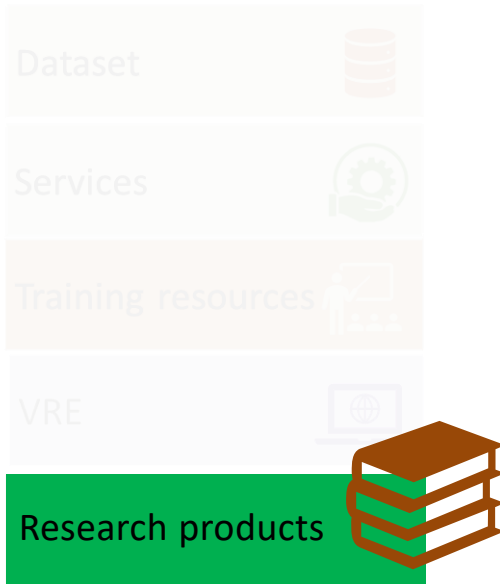
Resources and scope of the Catalogue



- ITINERIS VREs are sophisticated platform designed to integrate data analysis and external datasets (such as Copernicus, NASA, and local data) enabling users to gain comprehensive insights into various problems and incorporate their own data and analysis methods to address evolving needs.
- Each ITINERIS Virtual Research Environments (VREs) will be listed in the catalogue to describe the focus on specific topic and the services aimed at addressing environmental issues with significant societal impacts, with potential for extension to other topics and challenges.



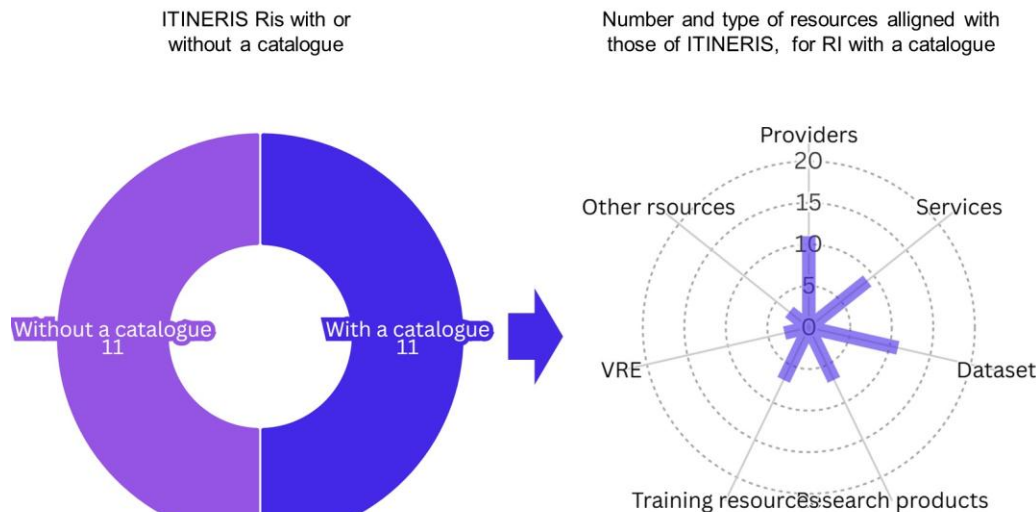
Resources and scope of the Catalogue



- Any “digital objects, described by metadata, resulting from a scientific process”.
- It includes [Publication](#), [Software](#) and [Other research products](#).
- Examples can be:
 - Publication: Article, Book, Conference object, Contribution for newspaper or weekly magazine, Doctoral thesis, Research, Review, Preprint, Report, Patent, Data Paper, Software Paper, Other literature type, Journal, Thesis, Data Management Plan, Presentation etc.
 - Software: software or other software type
 - Other research products: Lecture, Annotation, Other ORP type, Event, Interactive Resource, Model, etc.

Different maturity level of RIs

The RI catalogues show a wide range of maturity levels: some have fully developed catalogues with a large number of resources, some have partial catalogues with limited entries and some are still in the early stages of development or do not have a catalogue at all.



ITINERIS RI	CATALOGUE	PROVIDERS	SERVICES	DATASET	RESEARCH PRODUCTS	TRAINING RESOURCES	VRE	OTHER RESOURCES
ACTRIS	✓	✓	✓	✓	⌚	✓	✓	✓
ICOS	✓	✓	✓	✓	⌚	✓	✓	✓
SIOS	✓	✓	✗	✓	✗	✓	✗	✗
EUFAR	✓	✓	✓	✓	✓	✗	✗	✗
CeTrA	⌚	✗	✗	⌚	✗	✗	✗	✗
DANUBIUS-RI	⌚	✗	⌚	⌚	⌚	⌚	✗	⌚
GeoScienceR	✗	✗	✗	✗	✗	✗	✗	✗
EURO ARGO	⌚	⌚	✗	✓	✓	⌚	✗	✗
N/R Laura Bassi	✗	✗	✗	✗	✗	✗	✗	✗
Eurofleets	✓	✓	✓	✓	✓	✓	✗	✗
INFN-LNS	⌚	✗	⌚	⌚	✗	✗	✗	✗
EMSO	✓	✓	✓	✓	✓	✓	✗	✗
JERICO	✓	✓	✓	✓	✓	✗	⌚	✗
eLTER	⌚	✓	✓	✓	✓	⌚	✓	✓
LifeWatch	✓	✓	✓	✓	⌚	✓	✓	✗
DiSSCo	✗	⌚	⌚	⌚	✗	⌚	✗	✗
IBISBA	✓	✓	⌚	✓	✓	✗	✗	✓
EMPHASIS	⌚	✗	✗	⌚	✗	✗	✗	✗
AnaEE	✓	✓	✓	✓	✓	✗	✗	✗
ECORD	✓	✓	✓	✓	✓	✓	✗	✗
ATLAS	✗	✗	⌚	✗	✗	✗	✗	✗
SMINO	✗	✗	✗	✗	✗	✗	✗	✗

LEGEND: ✓ RI with a catalogue/coherence of existing resources with ITINERIS catalogue ⌚ RI with a "on building" catalogue/coherence of existing resources with ITINERIS catalogue ✗ RI without a catalogue/coherence of existing resources with ITINERIS catalogue



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