



WP2 – Access To Facilities, Fair Data And Related Services

Carmela Cornacchia, Ilaria Rosati
and all WP2 team

IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System

(D.D. n. 130/2022 - CUP B53C22002150006) Funded by EU - Next Generation EU PNRR-
Mission 4 "Education and Research" - Component 2: "From research to business" - Investment
3.1: "Fund for the realisation of an integrated system of research and innovation infrastructures"



WP2: Access To Facilities, Fair Data And Related Services



FINAL GOAL:

WP2 aims to **identify, design and implement** *methodologies, protocols, standards and technological resources* to favor the access to multidisciplinary services and data which will enable all national environmental RIs to improve their existing work and will represent a strong step forward for the less mature communities by accessing consolidated best-practices.

SPECIFIC Objectives

- ❑ **harmonisation of National Environmental RIs to build a community** around a **central HUB** enabling access to the environmental data and resources of distributed national RIs to enhance cross-disciplinary interoperability.
- ❑ **Definition of a common framework for Access Provision and implementation of a single-entry point** to the whole national network of environmental RIs and to their facilities, resources and knowledge to reinforce the national contribution to scientific excellence in Europe.
- ❑ **Encourage the application of FAIR principles** to support the advancing cross-disciplinary Research through environmental domains.

ITINERIS HUB

🌐 A single access point providing seamless access to the wide range of data, cutting-edge facilities, analytical tools, and services provided by the Italian environmental Research such as:

- environmental datasets from Italian ENV RIs.
- Facilities, observatories, specialized labs, advanced instrumentation, research vessels ...
- FAIR-enabling services: metadata, persistent identifiers (DOI), terminology services ...
- Digital infrastructures and computational resources ...

<https://hub.itineris.cnr.it>

The screenshot displays the ITINERIS HUB website. At the top right is the ITINERIS logo. Below it is a green banner with the text "Welcome to ITINERIS HUB" and a descriptive paragraph: "The ITINERIS HUB is the unique access point to the comprehensive collection of knowledge, data, analytics tool and services provided by the Italian Research Infrastructures (RIs) in the environmental scientific domain for the observation and study of processes in the atmosphere, marine domain, terrestrial biosphere, and geosphere." Below the banner is the "ITINERIS Catalogue" section, which includes a search bar and icons for "Research Infrastructures", "Services", "Research product", "Training resources", "Virtual Research Environment", and "Provider". A green button labeled "Go to all resources" is positioned below these icons. To the right of the catalogue is a grid of six service cards: "ITINERIS Access Platform", "ITINERIS metaData HUB", "ITINERIS VRE", "ITINERIS Training Centre", "Dataset", and "Terminological Service". Each card contains a brief description of the service.

Catalogue technology and resources

The screenshot displays the 'Resources' section of the ITINERIS metadata catalogue. At the top, there are icons for Research Infrastructure, Providers, Dataset, Services, Training Resources, VRE, and Research Products. A search bar contains the text 'Actris'. On the left, a 'Refine your search' sidebar includes filters for Types, Tags, Provider, and Scientific Domain. The 'Provider' filter is expanded, showing 'cnr' (1), 'cnrret' (1), and 'iret' (1). The 'Scientific Domain' filter is expanded, showing 'scie' (2), 'natur' (1), and 'social' (1). The main content area lists three resources:

- ACTRIS Aerosol Clouds Trace Gases RI** (Research Infrastructure)
The ACTRIS vision is to become an important European RI in the atmospheric field, in order to increase the excellence in Earth system observation and research and developing...
- National Research Council - Institute of Methodologies for Environmental Anal...** (Provider)
L'Istituto di Metodologie per l'Analisi Ambientale (IMAA) afferisce al Dipartimento Scienze del Sistema Terra e Tecnologie per l'Ambiente del Consiglio Nazionale delle...
- CIAO - CNR IMAA Atmospheric Observatory** (Service)
CIAO represents a well-established ground-based remote-sensing observatory for the study of weather and climate. The observatory consists of a combination of advanced systems...



At the HUB core, the **metadata Catalogue** serves as the comprehensive online registry with a user-friendly interface and advanced search capabilities empowering users with easy discovery and access to data, tools, and services provided by the network of ENV RIs.



Moderated Catalogues and roles

- 🌐 The ITINERIS catalogue is configured as a **moderated catalogue**, with publication flows controlled through validation and approval before public visibility.
- 🌐 In the ITINERIS metadata catalogue, users can be assigned different roles, defined hierarchically, which establish levels of access and responsibility; the assignment of roles is the exclusive responsibility of the catalogue manager.

NEXT-Step

- 🌐 Each RIs has to nominate responsible persons as **Catalogue-Editor**. They will receive catalogue login credentials as to start resource onboarding, supported by WP2 team (user manual, tutorial, ...)



*short oral presentation for details:
Saganeiti et al.*

First results – focus on DATA

11 RIs in the HUB



- 🌐 The infrastructures in place expose metadata in a standard format and via a CSW service.
- 🌐 To integrate ACTRIS and ICOS, the ACTRIS-ARES DC unit took responsibility for standardising the metadata and developing code to enable harvesting.

ITINERIS HUB – focus on FAIR enabling services (DATASET& DOI)



🌐 34 DOI assigned to WP4 Atmosphere dataset (CNR-ISP, CNR-IMAA, CNR-ISAC-BO, CNR-ISAC-LT, UniVE) - approximately 27 pending release

11 DOI assigned via ITINERIS HUB

19 via SIOS/IADC data portal

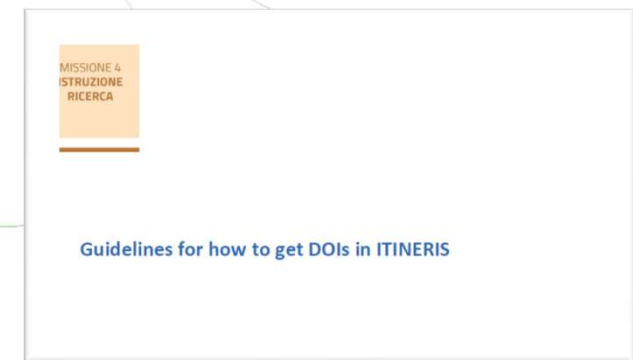
4 via CeTrA data portal

NEXT STEP

🌐 It is still possible to request ITINERIS DOI assignment

🌐 Metadata tagging of the dataset with DOI and their integration into the HUB

🌐 Automation of DOI assignment



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Common framework for Access Provision

**Access is how the stakeholders' communities use the RIs
and have their needs and interests addressed.**



Access Policy



Access Management Plan



Access Management Platform

ITINERIS Training courses

- Access Management

ITINERIS Access Policy – Key Elements



Access Policy

- 🌐 Purpose: common, transparent, equitable framework
- 🌐 Applicability: environmental RIs in ITINERIS, aligned with EU Charter
- 🌐 Definitions: RIs, services, data, users, access modes
- 🌐 Principles: open science, FAIR data, integrity, inclusivity, compliance
- 🌐 Access Modes: excellence-driven, market-driven, wide virtual, priority-driven
- 🌐 Users: Researcher, academia, industry, business, and public services.
- 🌐 Implementation: simplified procedures, national & transnational access, central entry point, user support



Deliverable 2.2

Elements for the ITINERIS
Access Policy formulation



Promoting open science and FAIR principles

The revised Charter champions open science, and advocates for the transparent sharing of knowledge, results and tools. It also emphasises compliance with the FAIR (Findable, Accessible, Interoperable, and Reusable) principles, ensuring that research data and results are widely accessible, usable, and reproducible.

Adapting to new users

Recognising the growing role of Research Infrastructures in fostering innovation and entrepreneurship, the revised Charter considers the needs of new users, particularly from industry and small and medium-sized businesses (SMEs) so that they can access cutting-edge facilities and expertise.

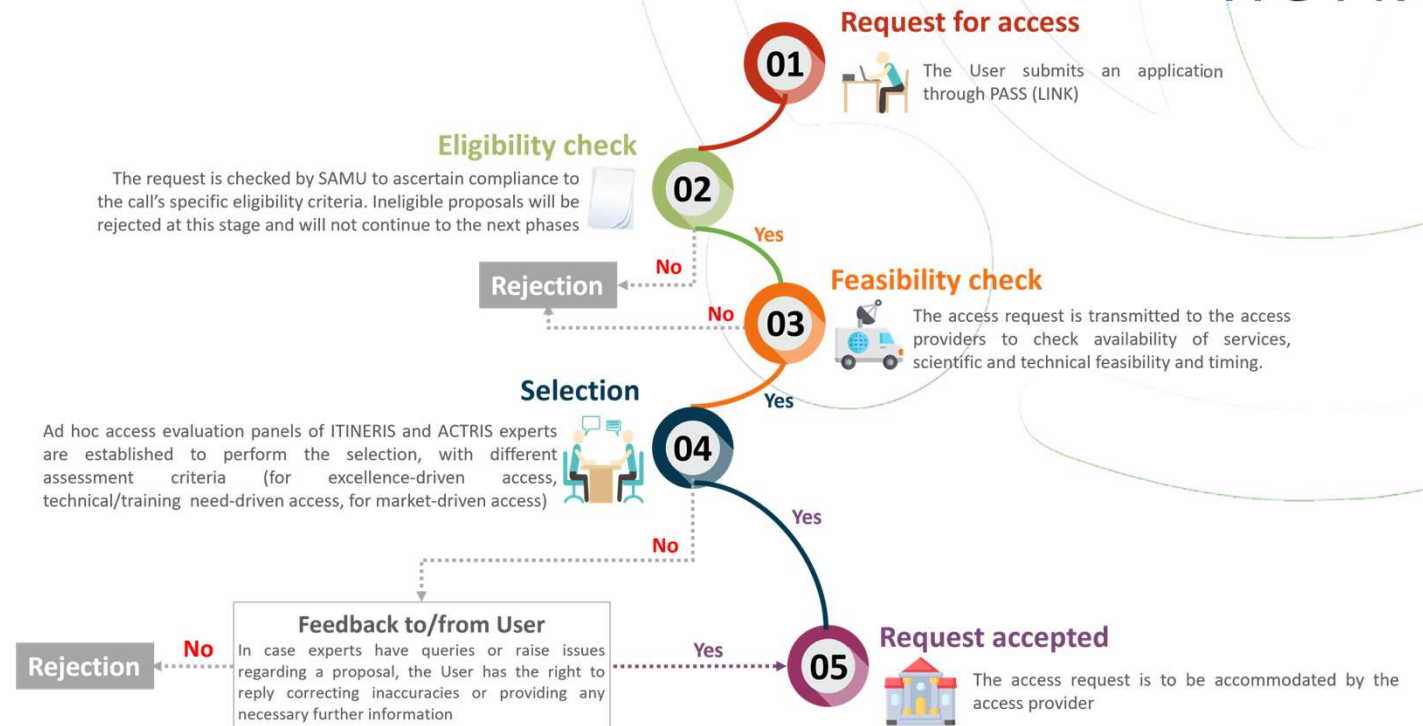
ITINERIS ACCESS MANAGEMENT PLAN



Access Management Plan

We build on commonalities among the RIs to propose harmonized practices to recommend for the Access Management Plan and the national framework for access.

ITINERIS – ACTRIS pilot TNA selection process workflow



The ITINERIS–ACTRIS Access Pilot Call in Numbers



61 Total access requests received



157 Total users involved



34 Italian users accessing facilities abroad



Users accessing facilities in Italy
(from both Italy and abroad):

- **61** Italian users in Italy
- **62** Foreign users in Italy



ITINERIS–ACTRIS Pilot Access Call in number

*short oral presentation for details:
Ricciardi et al.*

Common framework for Access Provision

Access is how the stakeholders' communities use the RIs and have their needs and interests addressed.



Access Policy



Access Management Plan



Access Management Platform

Guarantee a seamless and harmonized process to users is part of a more general user strategy oriented to impact on society and economy.

*short oral presentation for details:
Loperte et al
Russo et al*

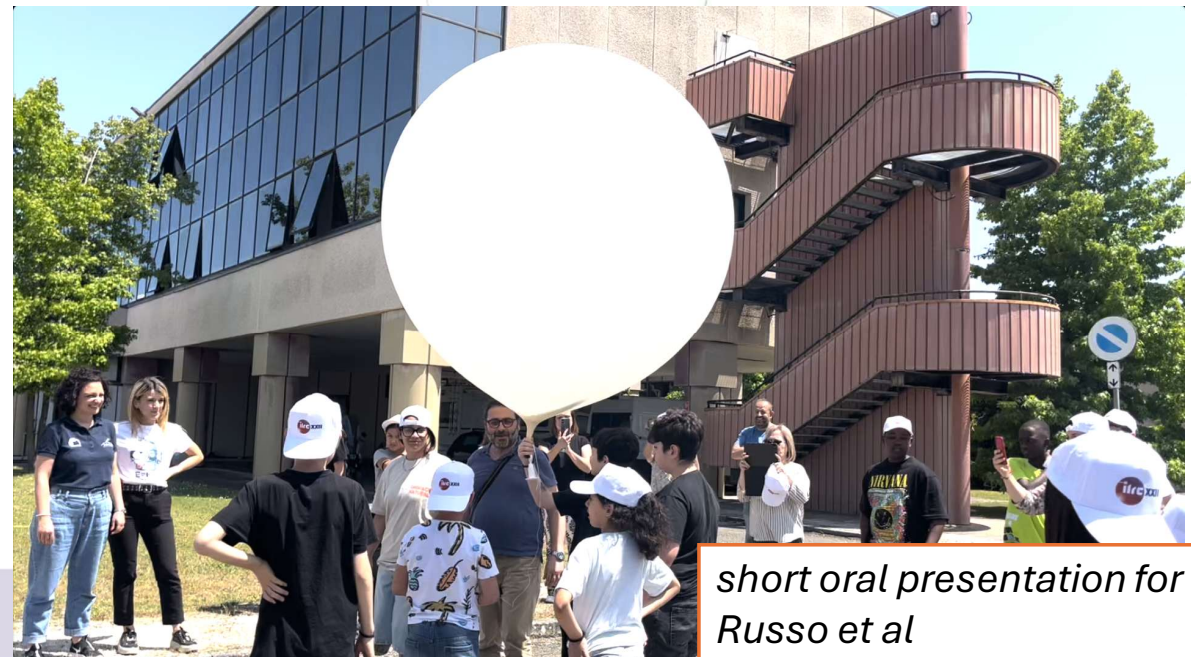
Research Infrastructure social impact



Incredible experiences with a special group of young people in education poverty framework had at CNR-IMAA and CNR-IRET. **ACTRIS and Lifewatch** staff participated in engaging educational activity, an initiative aimed at increasing the societal impact of research infrastructures. young students from 10 to 14 years old were scientists for a day.



We firmly believe that access to science and knowledge is a right for everyone, and that Research Infrastructures can play an important role.



The initiative is promoted by **ITINERIS project, University of Bari**, with schools and social services of Salento.

short oral presentation for de Russo et al

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FAIR principles vs FAIR technological choices



FAIR is a set of principles:
what are the **RIs technological choices adopted?**

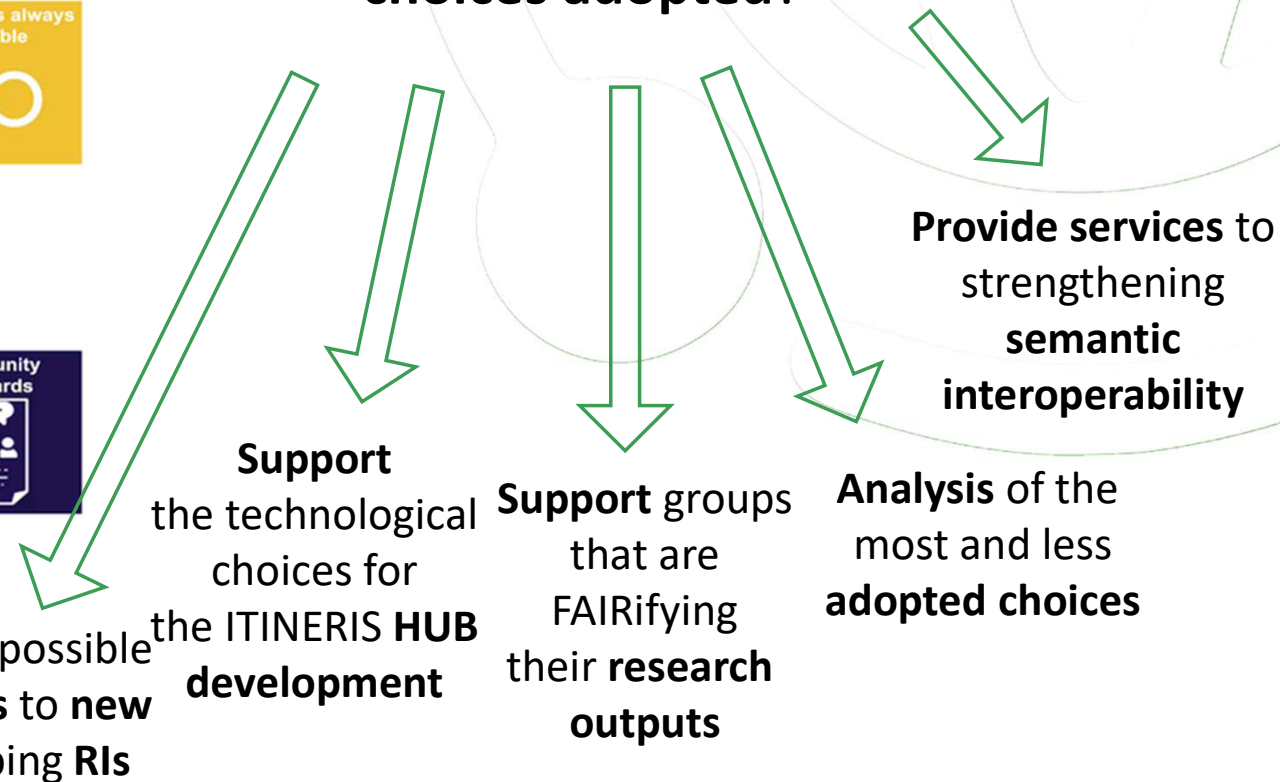
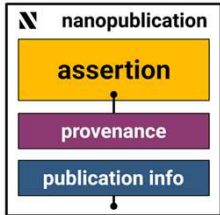


Image credit: Freepik from www.flaticon.com and ARDC <https://conference.eresearch.edu.au/fair-go-new-resources-to-support-fair-data/> licensed under a CC by 4.0 International License

Methodology: FAIR Implementation Profile



ITINERIS Training course

- FAIR Awareness
- FAIR Assessment via FAIR Implementation Profiles

Collection of **technological implementation choices (FERs)** adopted by a **community** to satisfy each one of the FAIR subprinciples, in **machine-actionable format**

Wilkinson et al. 2016

Box 2 | The FAIR Guiding Principles

To be Findable:

F1. (meta)data are assigned a globally unique and persistent identifier

F2. data are described with rich metadata (defined by R1 below)

F3. metadata clearly and explicitly include the identifier of the data it describes

F4. (meta)data are registered or indexed in a searchable resource

To be Accessible:

A1. (meta)data are retrievable by their identifier using a standardized communications protocol

A1.1 the protocol is open, free, and universally implementable

A1.2 the protocol allows for an authentication and authorization procedure, where necessary

A2. metadata are accessible, even when the data are no longer available

To be Interoperable:

I1. (meta)data use a formal, accessible, shared, and broadly applicable language for knowledge representation.

I2. (meta)data use vocabularies that follow FAIR principles

I3. (meta)data include qualified references to other (meta)data

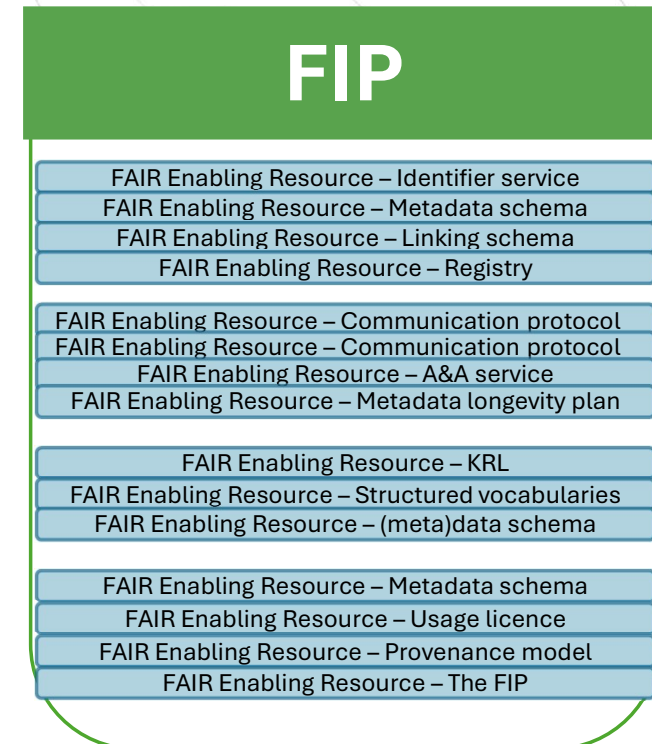
To be Reusable:

R1. meta(data) are richly described with a plurality of accurate and relevant attributes

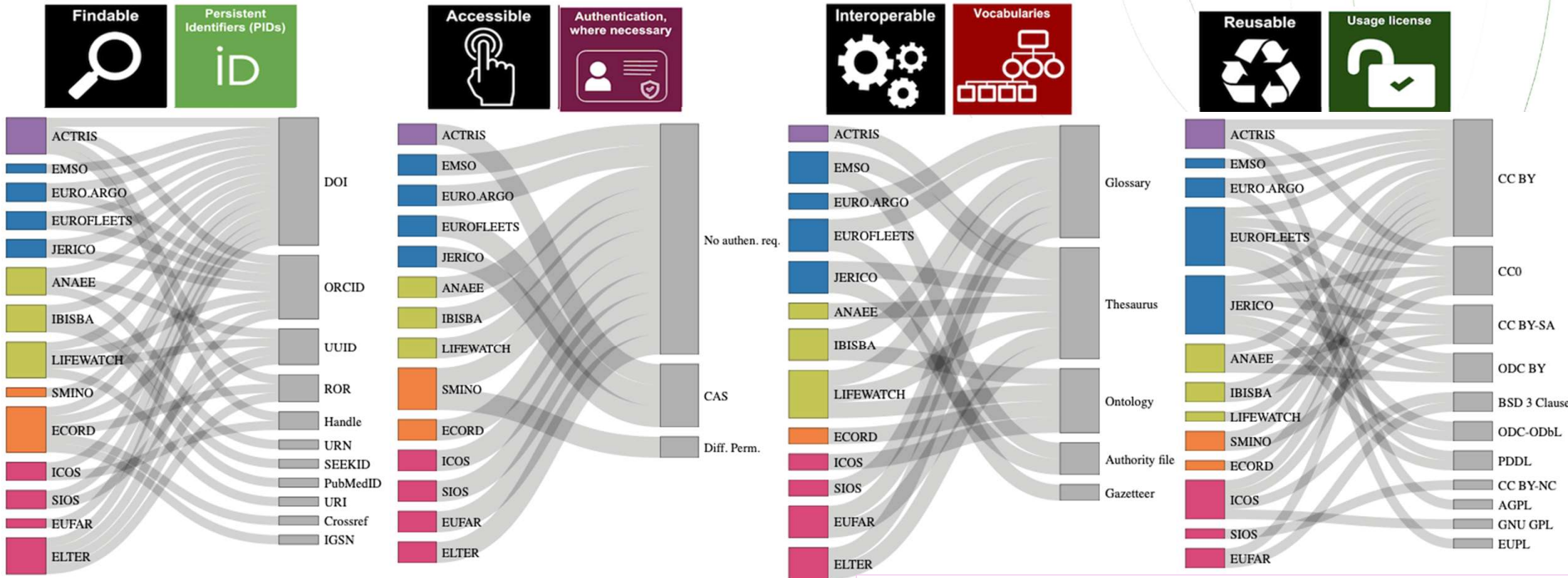
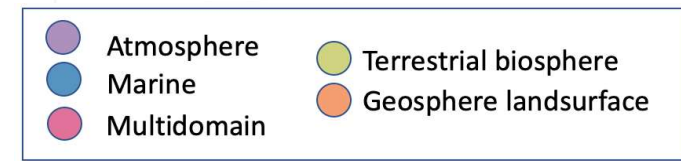
R1.1. (meta)data are released with a clear and accessible data usage license

R1.2. (meta)data are associated with detailed provenance

R1.3. (meta)data meet domain-relevant community standards



Results: FAIR-enabling best practices



Nestola E. et al., 2025. Adopting the FAIR Principles in Italian environmental Research Infrastructures: An Overview, Accepted for publication in Patterns

First systematic analysis of FAIR practices across environmental RIs at the Italian and European level establishes a baseline to monitor future FAIR adoption and track progress over time

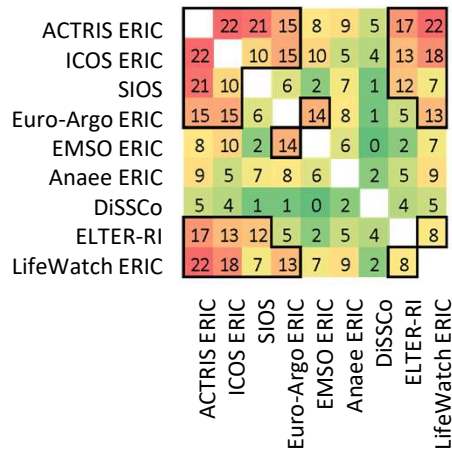
Results: FAIR Implementation Profiles convergence



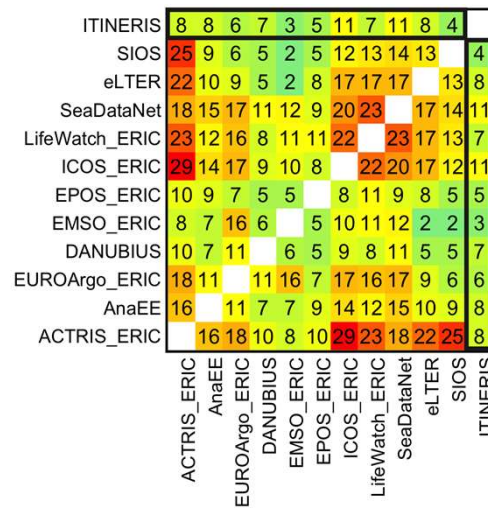
13 RIs produced new FIPs

1. ATLaS
2. CeTra
3. DiSSCo
4. EMSO ITA
5. SMINO
6. IBISBA EU
7. IBISBA ITA
8. IT-IOOS
9. IADC
10. ITINERIS (ITINERIS_metadata catalogue + ITINERIS_Training_Platform)
11. JERICO ITA (JERICO_Italia + European_High_Frequency_R)
12. LifeWatch Italy
13. SNAP

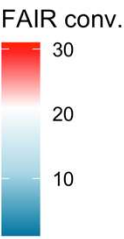
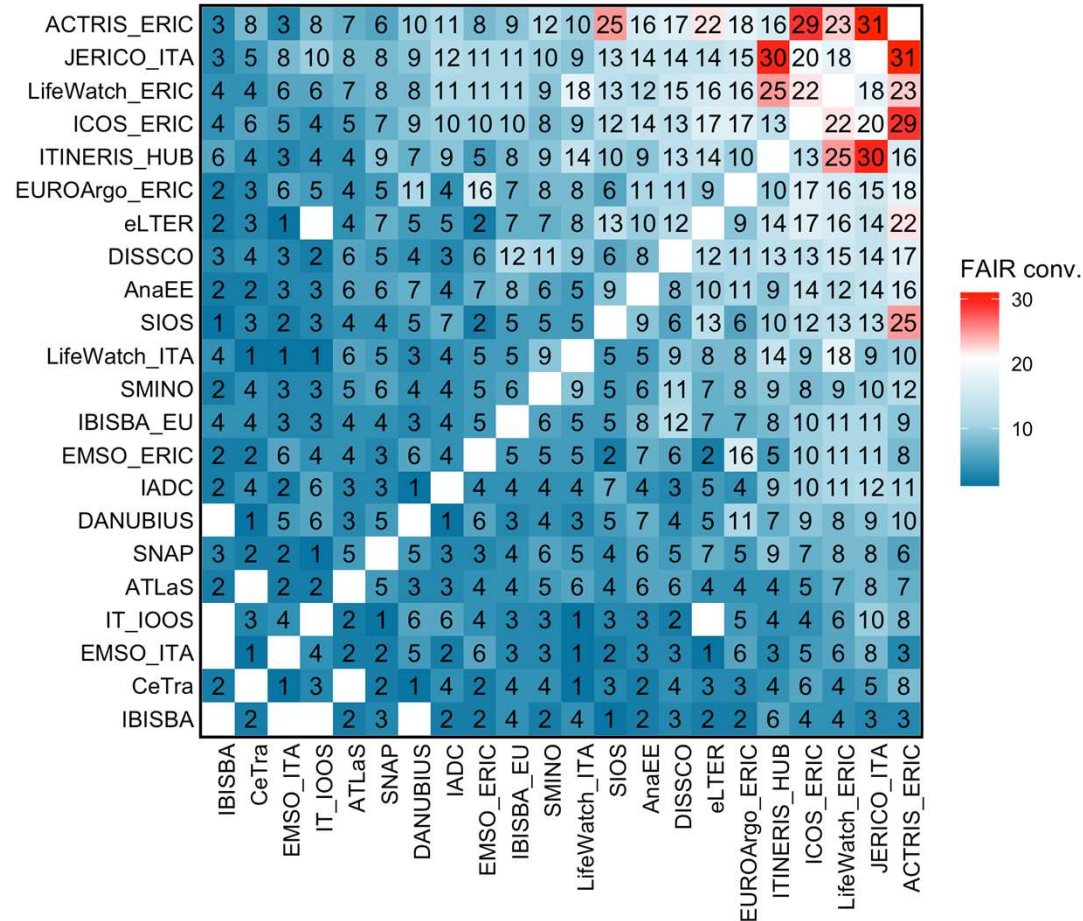
March 2024



June 2024

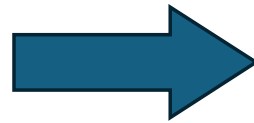
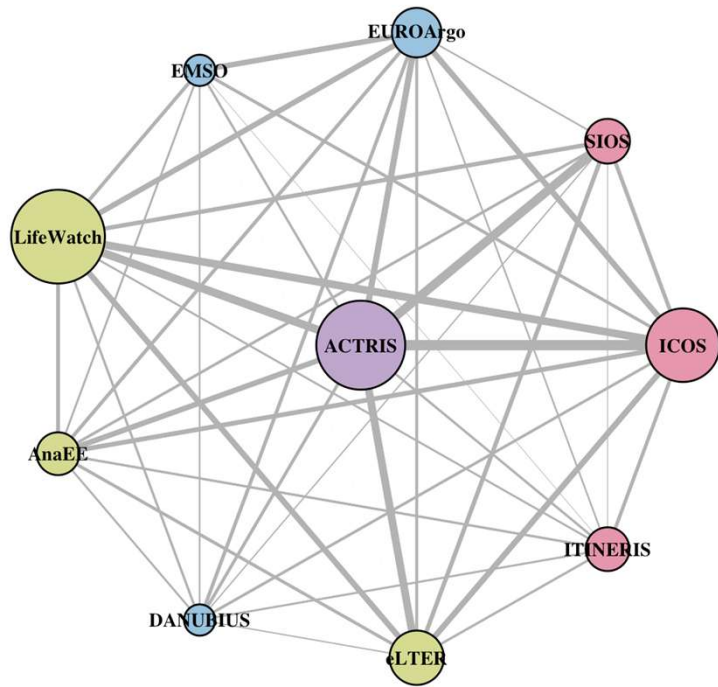


September 2025

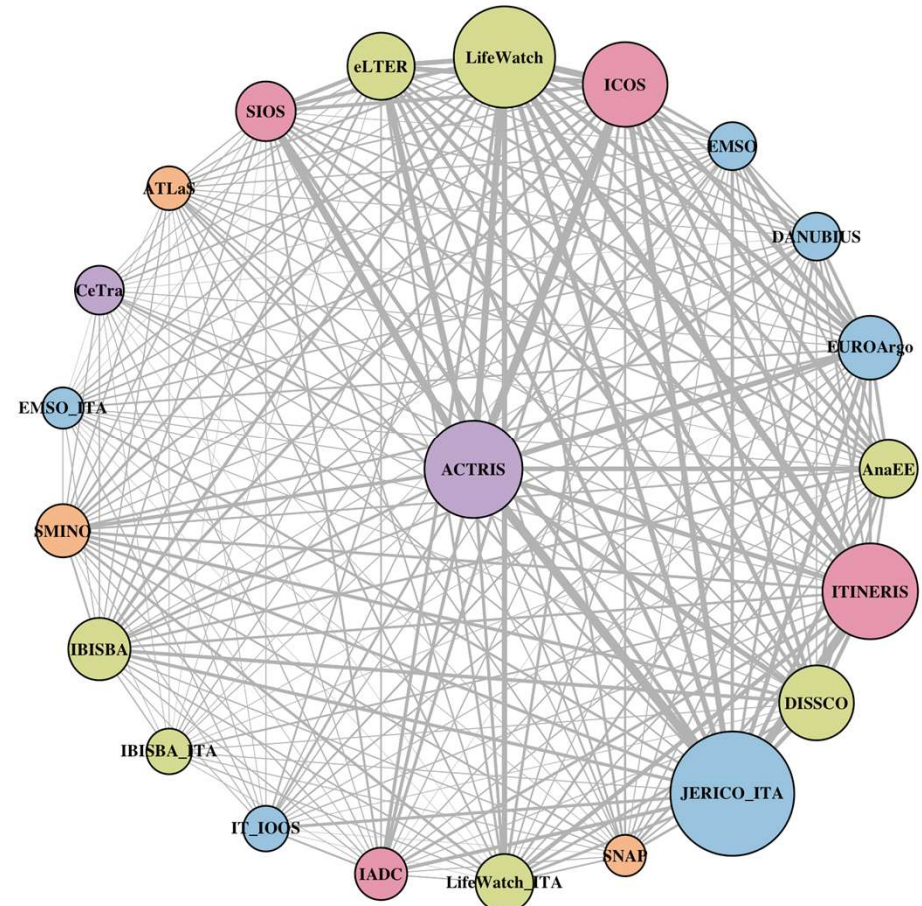


Results: FAIR Implementation Profiles potential connectivity network

June 2024



September 2025



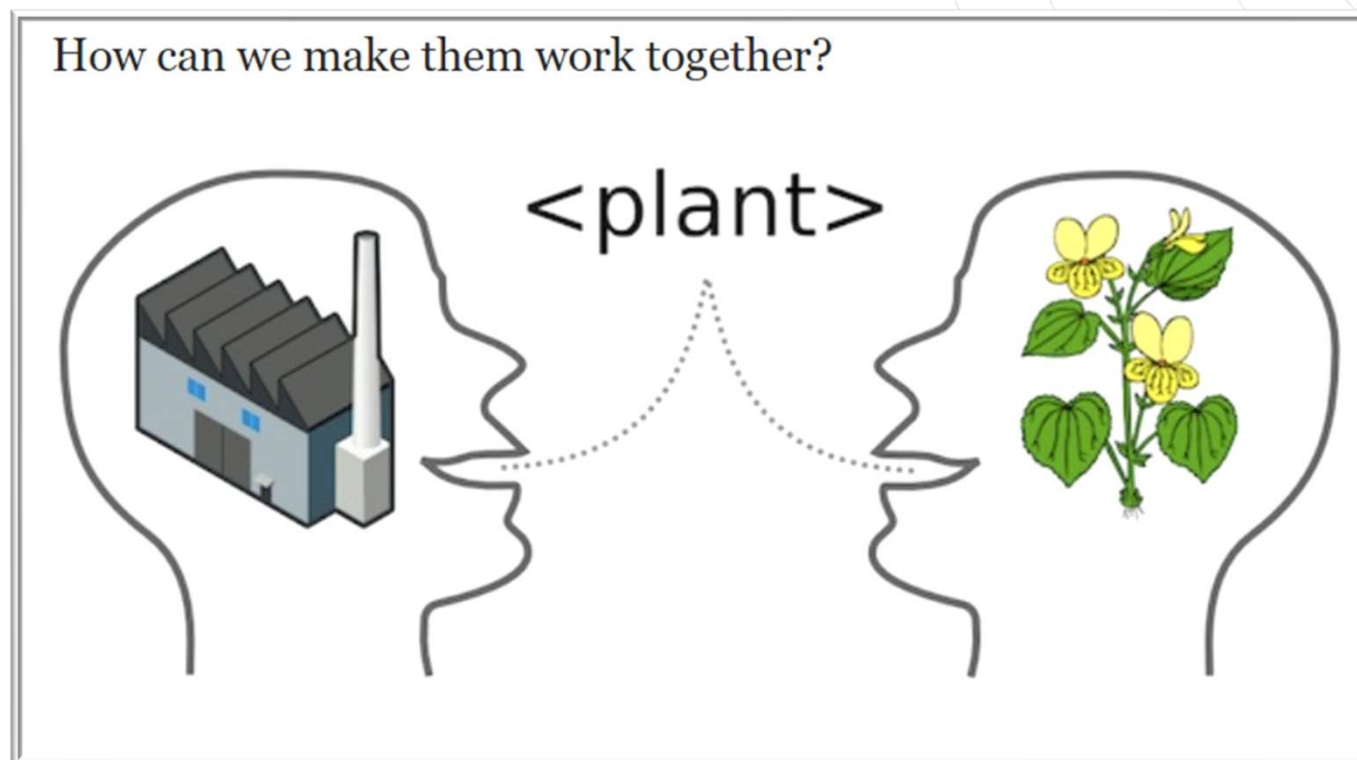
- Atmosphere
- Biosphere
- Geosph. land.
- Marine
- Multidomain

*short oral presentation for details:
Ingrosso et al.*

ITINERIS Semantic Interoperability

Enhance semantic interoperability within and among ITINERIS Research Infrastructure

Semantic interoperability is essential for efficient data discovery, integration and reuse!





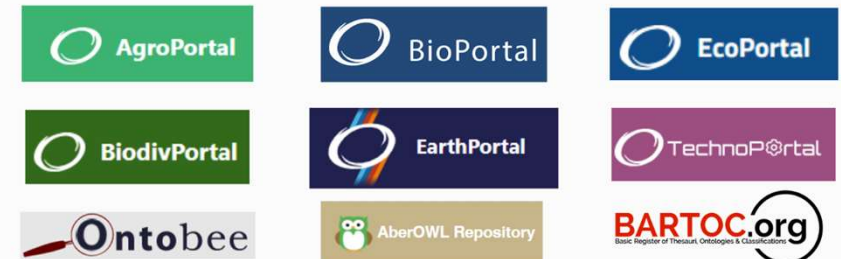
- 🌐 A unique access point to **500+ semantic artefacts** within the environmental domain
- 🌐 Search, access and use semantic artefacts distributed **over 20+ catalogues**
- 🌐 Discover and create mappings

Three Use Cases:

- 🌐 LifeWatch Italy Data Portal
- 🌐 ITINERIS Hub – Catalogue (CKAN)
- 🌐 ITINERIS Hub – Data (GeoNetwork)



Semantic catalogues included in the terminology service





FAIR Semantic Artefacts

Novel Semantic Artefacts

EcoPortal Browse Mappings Recommender Annotator Landscape VocBench Search alexandra.muresan Support

Italian Integrated Environmental Research Infrastructures System

Edit Project

Description: 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 need to be urgently addressed, providing quantitative knowledge to be transformed into actionable strategies. Given the complexity of such challenges, a multi-disciplinary approach to the Earth System is deemed crucial. This approach involves combining field and laboratory measurements, analyses, experiments, data analysis, and modeling tools across the various interlinked environmental domains. Italy is actively involved in all major pan-European Environmental Research Infrastructures (RIs) and also hosts other nationally relevant RIs, all essential for providing the systematic and coherent information needed for high-level research. Given the large number and heterogeneity of these infrastructures, coordinated actions are essential to integrate and interlink them, as well as to harmonize their activities. To achieve an integrated approach to the Earth system and its changes, the 22 participating RIs agreed to jointly prepare and build the thematic network called ITINERIS. The primary objective of ITINERIS is to establish the Italian integrated system of the Research Infrastructures in the environmental scientific domain, facilitating observation and study of processes in the atmosphere, marine domain, terrestrial biosphere, and geosphere. Such a broad-scale and long-term vision of environmental research, sustained by the main Italian scientists currently involved in European RIs, is truly innovative and it will support Italy in taking a leading role in European environmental research activities, designing the framework for the next decades.

Institution: National Research Council of Italy

Contacts: ilaria.rossat@cnr.it

Home Page: <https://itineris.cnr.it>

EcoPortal Browse Mappings Recommender Annotator Landscape VocBench Search Login Support

semantic resources > ERITHES

Environmental Research Infrastructures Thesaurus (ERITHES)

Last submission date July 21, 2023

Summary Concepts Properties Schemes Collections Notes Mappings Widgets Spard

General Information

The Environmental Research Infrastructures Thesaurus (ERITHES) was created within the task supporting semantic interoperability of the ITINERIS project (<https://itineris.cnr.it>). The Thesaurus was generated to provide controlled terms describing actors, ESFR domains, facilities, services, research products and project management activities performed by Research Infrastructures.

Initial created on **September 18, 2023**. For additional information, contact **Baria Rossi** (baria.rossat@cnr.it).

Languages:

Identifiers

URI: <https://ecos.lifewatch.eu/thesaur/erithes/>

EcoPortal URI: <http://ecoportal.lifewatch.eu/ontologies/ERITHES/>

DOI: <https://doi.org/10.48373/fae2-r561>

semantic resources > ICOS_INSTR

ICOS Instruments Vocabulary (ICOS_INSTR)

Last submission date April 7, 2023

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Jump to Filter

Instrument type

- barometer
- data logger
- desiccators
- gas analyzers
- humidity sensor
- multi sensor
- precipitation sensor
- radiometer
- Rain Disgates
- soil heat flux sensor
- soil moisture sensor
- sonic anemometer
- temperature sensor
- water pressure sensor_2

Details

URI: https://vocabulary.actris.nl/actris_vocab/instrumenttype/

Preferred name: instrument type

Definitions: Terms used to classify groups of sensors, instruments, or samplers collectors of water, PM, or air.

InSchemes: [icos_instruments >](#)

Type: <http://www3.org/2004/02/rdfs/core#Concept>

Raw data

dc:contributor: <https://orcid.org/0000-0002-3380-3470>

dc:date: 2023-06-30T12:33:29

dc:creator: <https://orcid.org/0000-0002-3380-3470>

skos:definition: Terms used to classify groups of sensors, instruments, or samplers collectors of water, PM, or air.

skos:relatedMatch: <http://vocabulary.nrc.ac.uk/collection/L5/kurmet/>

363 concepts shared by environmental RIs

<https://ecoportal.lifewatch.eu/ontology/es/ERITHES>



528 concepts describing instrument models and types

29 semantic artefacts used/managed by ITINERIS RIs were published in EcoPortal to:

1. Make them available through a repository of semantic artefacts
2. Enhance metadata description and reuse
3. Allow integration with the ITINERIS Terminology Service

Semantic resources Used

- ACTRIS Controlled Lists
- ACTRIS Vocabulary
- Annex I habitats For Natura 2000
- Biogeographical regions
- Chemical Functional Ontology
- CODATA Research Data Management Terminology
- Environmental Research Infrastructures Thesaurus
- EURIS habitats
- FAIR Implementation Profile (FIP) Ontology
- FAIR Vocabulary
- FRBR-aligned Bibliographic Ontology
- FuRRES Ontology of Vertebrate Traits
- Geologic Structures
- Geologic Units
- Invasion Biology Ontology
- Lithology
- MarineFLO Ontology
- Ontology of Integrated Carbon Observation System (ICOS)
- SnowTerm Thesaurus
- Soil Food Web Ontology
- The Archive Type Ontology
- The DMP Common Standard Ontology
- The Interpretation Ontology
- The Linked Earth Core Ontology
- The Linked Earth Instrument Ontology
- The Paleo Proxy Ontology
- The Paleo Units Ontology
- The Paleo Variables Ontology
- WISE Classification system

Strengthening interdomain semantic interoperability



Mapping Activities

VocBench Data Metadata SPARQL Tools

Alignment Validation

Source: Remote Alignment System

Remote Alignment System GENOMA REST API [1 0]

Tasks

Left project	Right project	Status	Start time	End time
GEMET_-_INSPIRE_themes	AnaEE_Thesaurus	completed	Fri Apr 11 09:31:31 +0000 2025	Fri Apr 11 09:31:41 +0000 2025

Alignments:

Left entry	Right entry	Relation	Mapping Property	Action	Status
Geology (en)	ecology (en)	=		Accept Reject	
Geology (en)	biology (en)	=		Accept Reject	
Soil (en)	soil (en)	=		Accept Reject	
Soil (en)	soil type (en)	=		Accept Reject	
Soil (en)	soil pH (en)	=		Accept Reject	



3972 mappings found

787 mappings validated



- Traits Thesaurus ↔ Environmental Thesaurus
- Environmental Thesaurus ↔ ACTRIS Vocabulary
- AnaEE Thesaurus ↔ ACTRIS Vocabulary
- GEMET ↔ AnaEE Thesaurus
- Environmental Thesaurus ↔ GEMET
- Environmental Thesaurus ↔ Earth Science
- Environmental Thesaurus ↔ Theia/OZCAR Thesaurus



short oral presentation for details:
Muresan et al.

FIRST OUTCOMES & FUTURE PROSPECTIVES



First Positive Outcome

- Central HUB
- Greater visibility & attractiveness
- More engagement from non-academic users
- Progress on harmonized access process
- Unique catalogue → interoperability
- Stronger training and Knowledge Transfer on FAIR and Access principles
- Several capacity building initiatives

Remaining Challenges

- Continuous effort in standardization
- Support in standardizations beyond ITINERIS project end
- Easy and harmonized access process
- Engaging underrepresented user groups



Carmela Cornacchia, Ilaria Rosati, Ermann Ripepi, Giuseppe Gargano, Canio Colangelo, Claudio Dema, Francesco Izzi, Giuseppe La Scaleia, Lucia Mona, Quinzia Palazzo, Lucia Saganeiti, Vito Salvia, Michele Volini, Pilar Guma, Rosa Petracca, Simone Gagliardi, Francesca Ricciardi, Simona Loperte, Corrado Russo, Enrica Nestola, Gregorio Sgrigna, Andrea Tarallo, Gianmarco Ingrosso, Cristina Di Muri, Alexandra N. Muresan, Davide Raho.

THANKS!

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