

H2IOSC: Strengthening Research Infrastructures, Consolidating the Federation

Session 1: Results and opportunities in Resource Alignment

1

Monica Monachini
monica.monachini@cnr.it



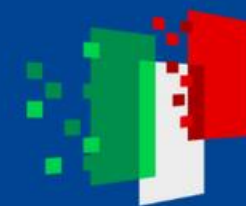
H2IOSC Project - Humanities and cultural
Heritage Italian Open Science Cloud funded by
the European Union – NextGenerationEU –
NRRP M4C2 - Project code IR0000029 - CUP
B63C22000730005.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Heterogeneity as a starting point

From different infrastructures

to an integrated ecosystem

CLARIN

Disciplinary Diversity

towards a shared vision

DARIAH

Different maturity levels

towards common readiness

E-RIHS

Heterogeneous data and
models

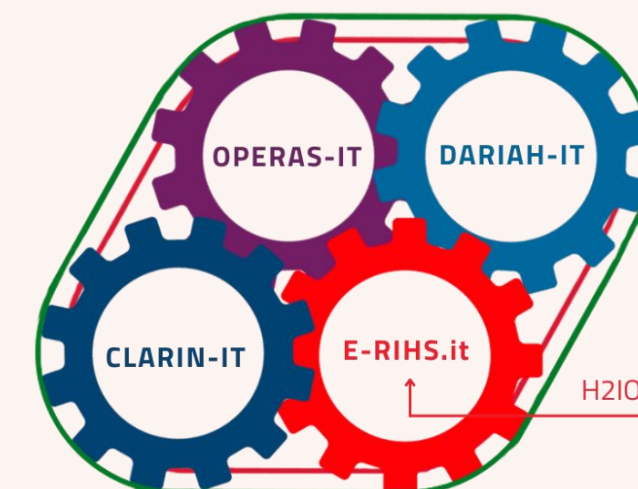
towards semantic alignment

OPERAS

Fragmented infrastructures

towards interoperability

H²IOSC



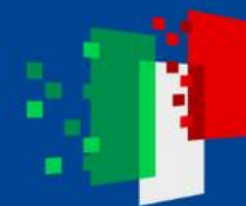
Leading
H²IOSC cluster



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca

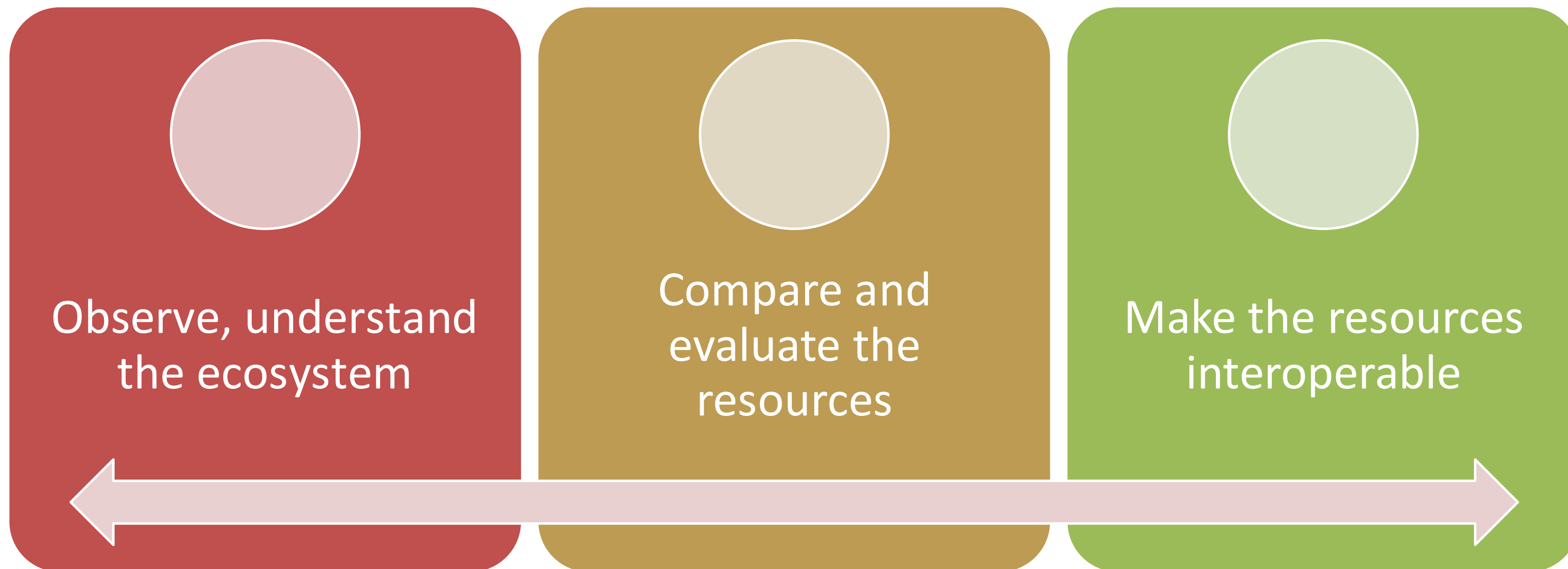


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



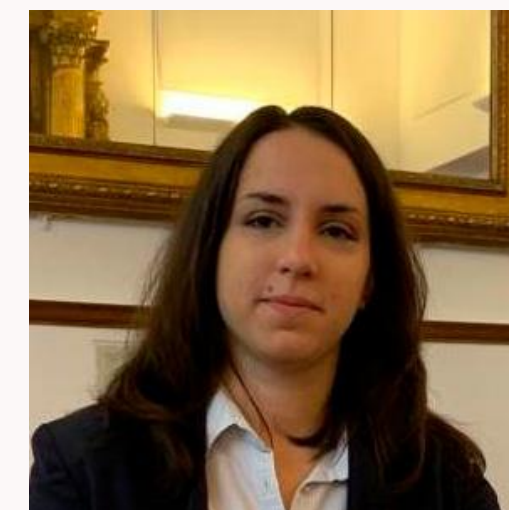
Consiglio Nazionale
delle Ricerche

Alignment process



Discussants

- **Alignment:** three complementary perspectives on a shared process:
- Making the ecosystem
 - Observable: *Observatory , surveys, focus groups, landscaping:* Valeria Quochi (ILC) and Giacomo Mancuso (ISPC)
 - Comparable: *maturity and readiness levels:* Andrea Pandurino (ISPC)
 - Interoperable: *Common Semantic Framework:* Alessia Spadi (OVI)





Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Guiding Questions

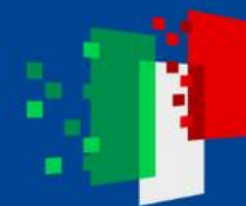
- In what ways does your work make resources **observable**, **comparable**, and **interoperable**, and how does this **alignment** support the **transition towards the H2IOSC federation**?
- Recommendation for discussants: Focus on the **process followed**, the **transformation enabled** and the **impact**.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Guiding Questions

- In what ways does your work make resources **observable**, **comparable**, and **interoperable**, and how does this **alignment** support the **transition towards the H2IOSC federation**?

Observability

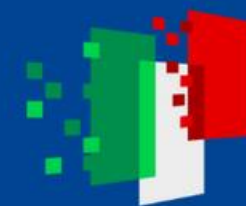
- What kind of **heterogeneity** emerged from the initial landscape, and how did your **approach** help build a **systematic understanding** of it?
- How does the **Observatory** make the ecosystem **observable** and **monitorable** for the community?



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Guiding Questions

- In what ways does your work make resources **observable**, **comparable**, and **interoperable**, and how does this **alignment** support the **transition towards the H2IOSC federation**?

Comparability

- What key **discontinuities** emerged across infrastructures, and how did the **maturity model** enable **comparability** of resources and services?
- How did it support **operational alignment**?



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Guiding Questions

- In what ways does your work make resources **observable**, **comparable**, and **interoperable**, and how does this **alignment** support the **transition towards the H2IOSC federation**?

👉 **Interoperability**

- What **challenge** does the **Common Semantic Framework** address, and how does it enable **semantic integration** across **heterogeneous data**?
- How does it support **interoperability** and **reuse**?



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



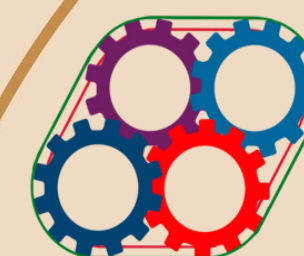
Consiglio Nazionale
delle Ricerche

H2IOSC: Strengthening Research Infrastructures, Consolidating the Federation

Session 1: Results and Opportunities in
Resources Alignment

Making the Ecosystem Observable:
Monitoring the SSH Landscape

Valeria Quochi
valeria.quochi@ilc.cnr.it



H²IOSC

Humanities and cultural Heritage Italian Open Science Cloud

H2IOSC Project - Humanities and cultural
Heritage Italian Open Science Cloud funded by
the European Union – NextGenerationEU –
NRRP M4C2 - Project code IR0000029 - CUP
B63C22000730005.

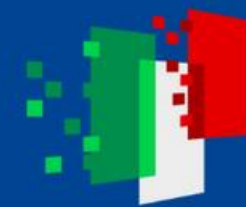
9



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA







Consiglio Nazionale
delle Ricerche

OBSERVE & UNDERSTAND THE ECOSYSTEM. LANDSCAPING GOALS

- ❖ Like geographers → start mapping current RIs “territories”
- ❖ Devise tools to launch periodic mapping campaigns
- ❖ Make maps available to RI managers, developers and resource and tech providers
- ❖ Make maps available to reference communities at large

OBSERVABILITY: LANDSCAPING BY INVOLVING COMMUNITIES

Making the ecosystem observable means:

-  understanding who the communities/users & providers are
-  understanding what kinds of resources they produce and use
-  understanding how mature, FAIR, and connected these resources are
-  understanding usage, expectations, needs, and gaps

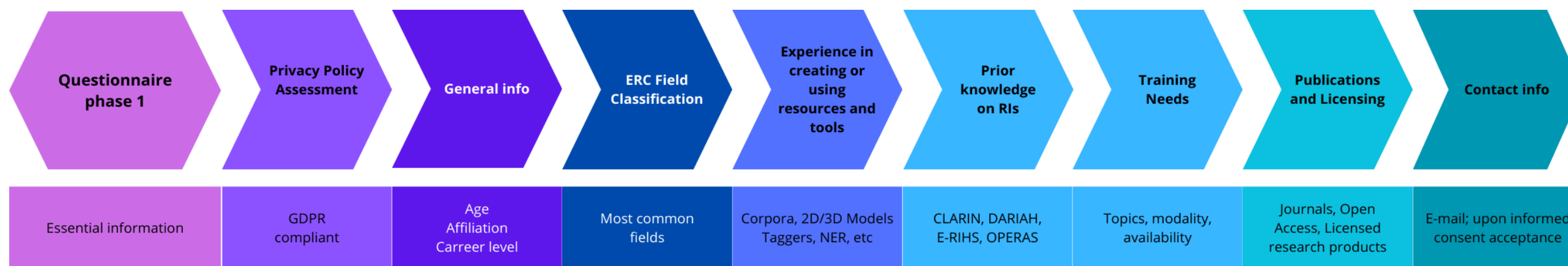
HOW OBSERVABLE

MIXED METHODS METHODOLOGY

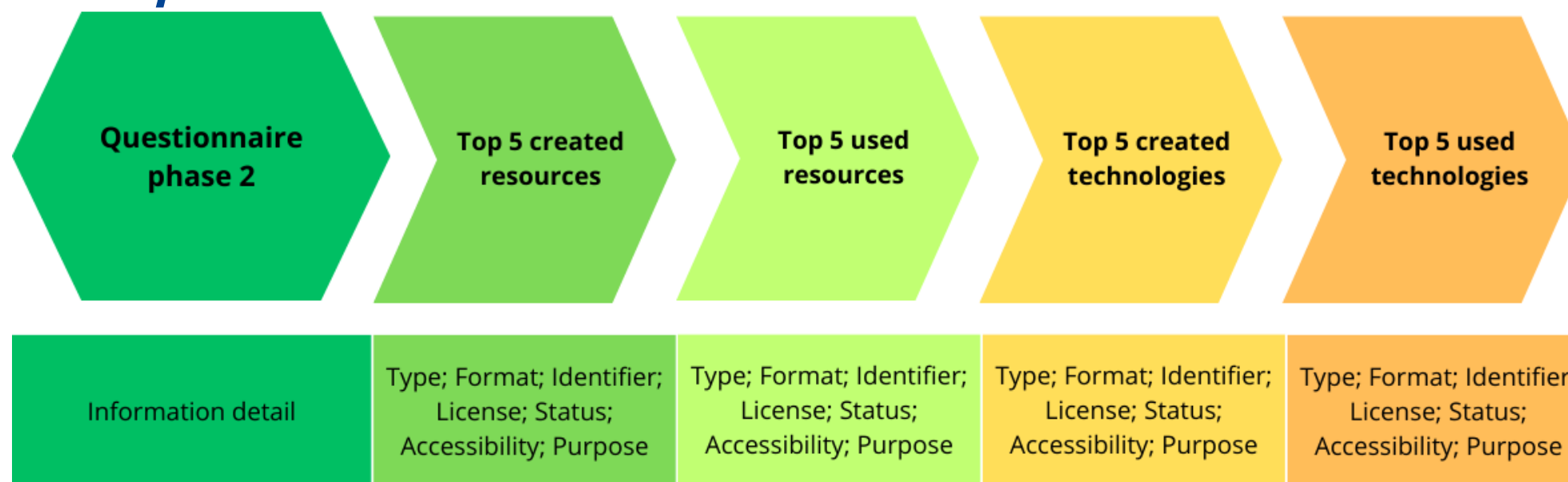


QUESTIONNAIRE-BASED SURVEY

September – October 2023



July 2024 – June 2025



Dissemination/Engagement

Each RI is identified

- Associations
- Mailing lists
- Consortia
- User communities
- Websites
- Social network

of interest to share the questionnaire, with the help of the H2IOSC Editorial Board.

FOCUS GROUPS

Preparation

1. Elaborate stimuli for discussion based on previous insights
2. Share stimuli with other RI actors to collect internal needs
3. Choose location for
4. Prepare materials to be shared for discussion

01

Recruitment

1. Select candidate participants based on defined criteria for representativity
2. Invite participants
3. Define final participant lists
4. Share informed consent to be signed for recording and reuse of outcomes

02

Meeting conduction

1. 1 moderator + 1 collaborator e.g
2. Participants together: balanced per career-stage, discipline and gender
3. Stimuli and materials used to elicit discussion

03

Resulting material

1. Audio files with recording of the discussion
2. Textual transcription
3. Visual materials to be discussed

04

Data analysis

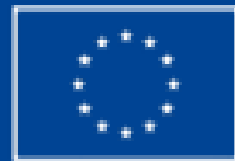
1. Encoding and analysis of conversations
2. Integration analysis with outcomes from questionnaire survey

05

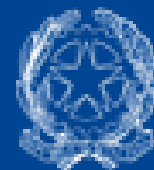
Report

Shareable reports both for internal and external use

06



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

OTHER LANDSCAPING ACTIVITIES

F2F Interviews

- Questionnaire-based one to one meetings
- reaching out to less active / involved communities
- Collect additional information on used needs and perceptions

Surveying for Pilots

- Collect information both on existing and needed resources for project-internal needs

Surveying external sources

- Collect information from journals, proceedings, other scientific sources
- Depending of RI needs



Shared information (metadata) structure

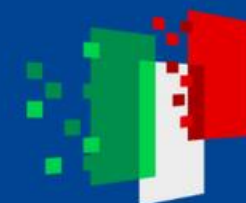
<https://dhelo.cnr.it>



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



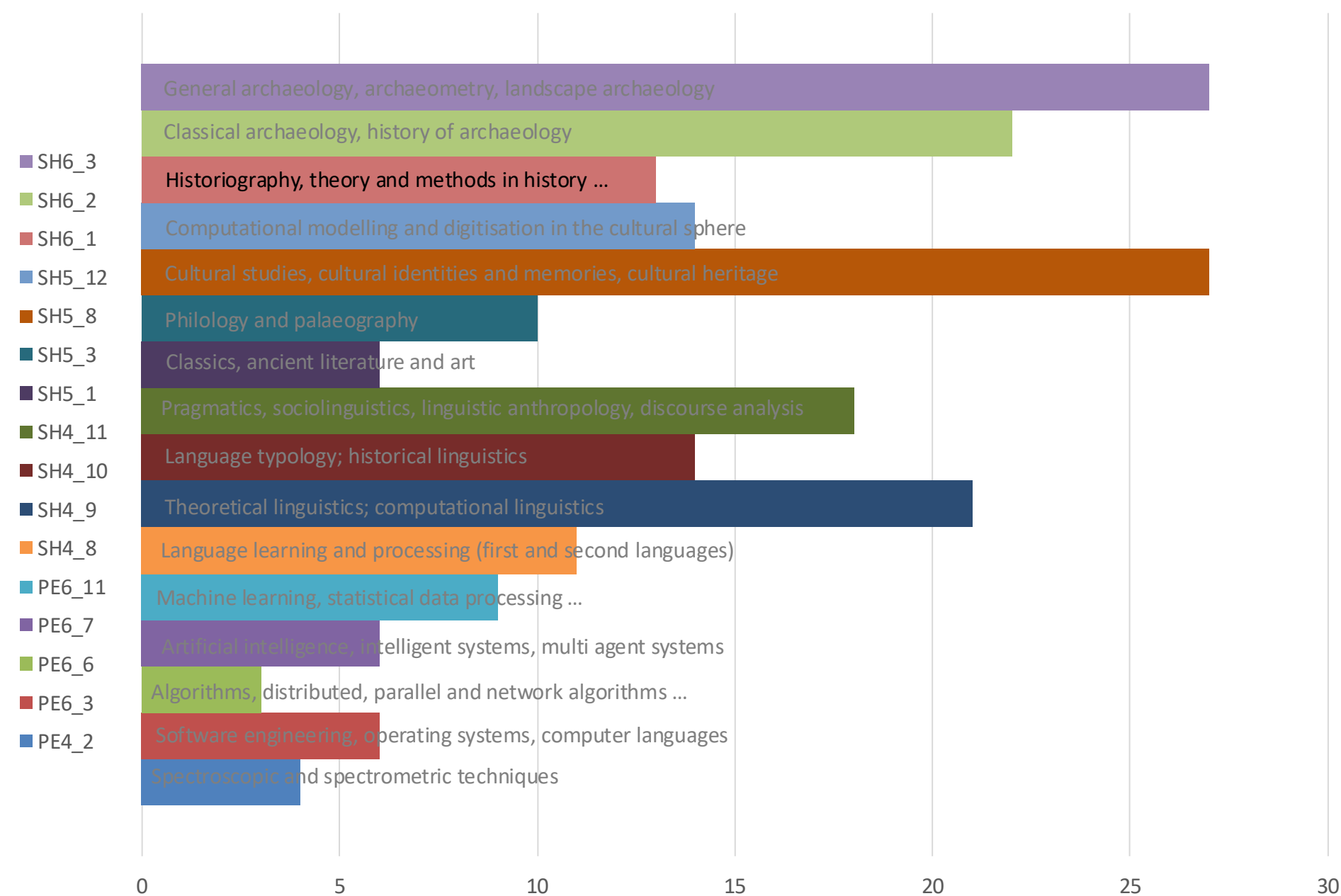
Consiglio Nazionale
delle Ricerche

EMERGING HETEROGENEITY FROM LANDSCAPING RESULTS

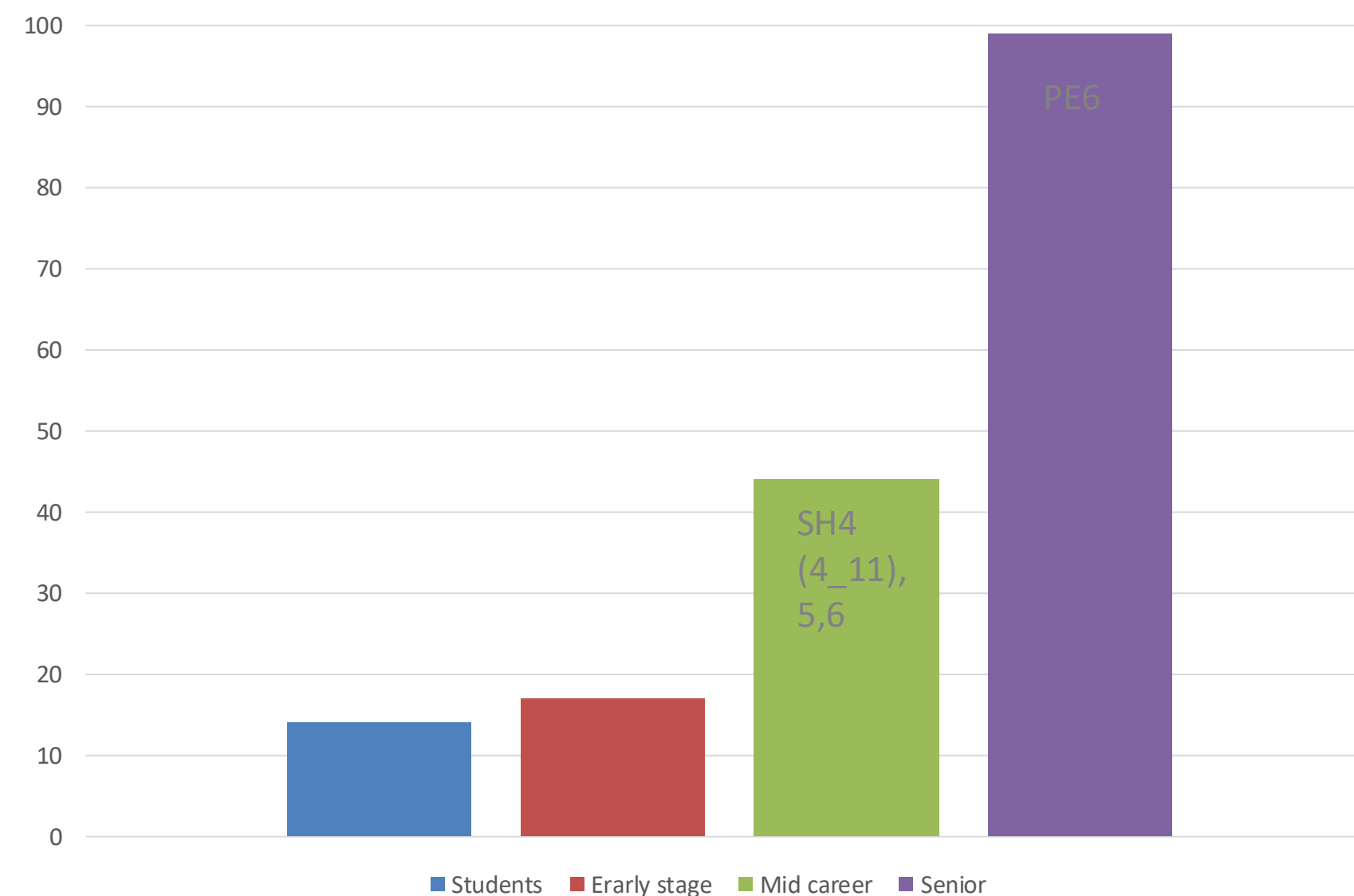
- ❖ Disciplinary sub-communities participation /involvement
- ❖ Types of resources used & created
- ❖ Licensing & Open science practices
- ❖ Training needs

RESULTS: COMMUNITY PARTICIPATION

ERC sector



Career level



RESULTS: RESOURCE TYPES

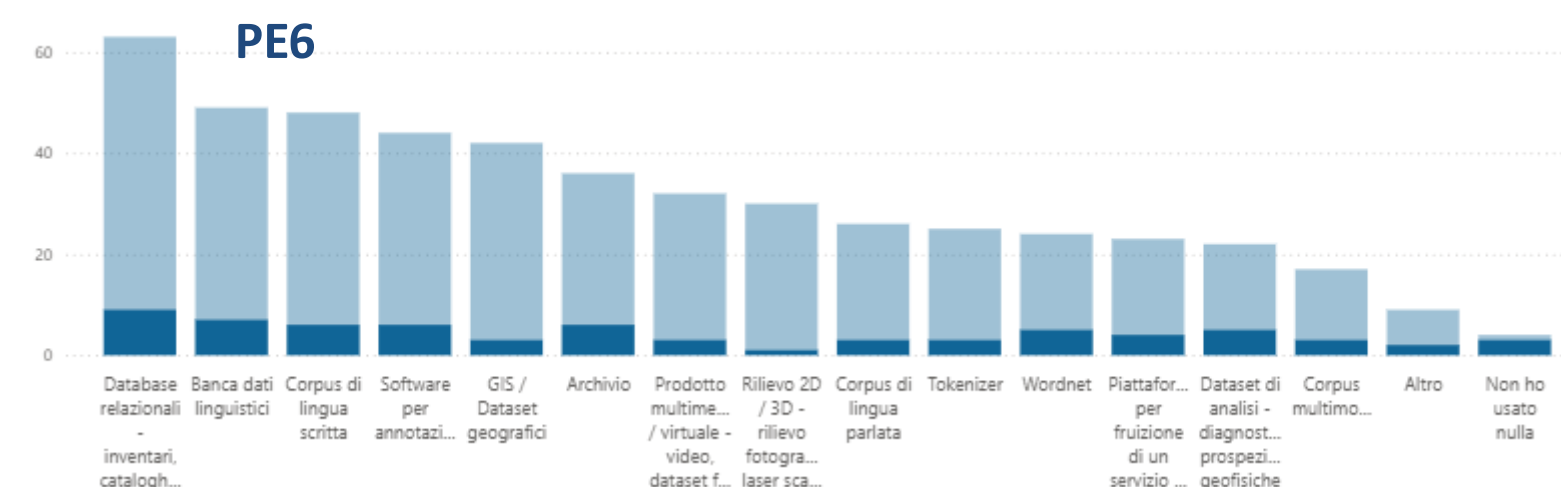
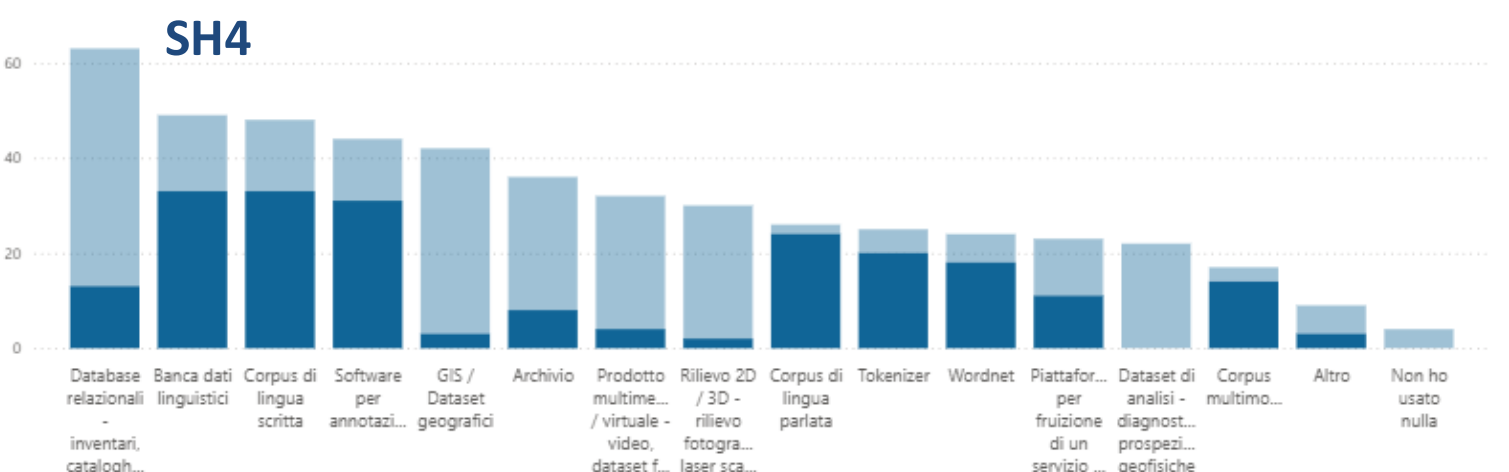
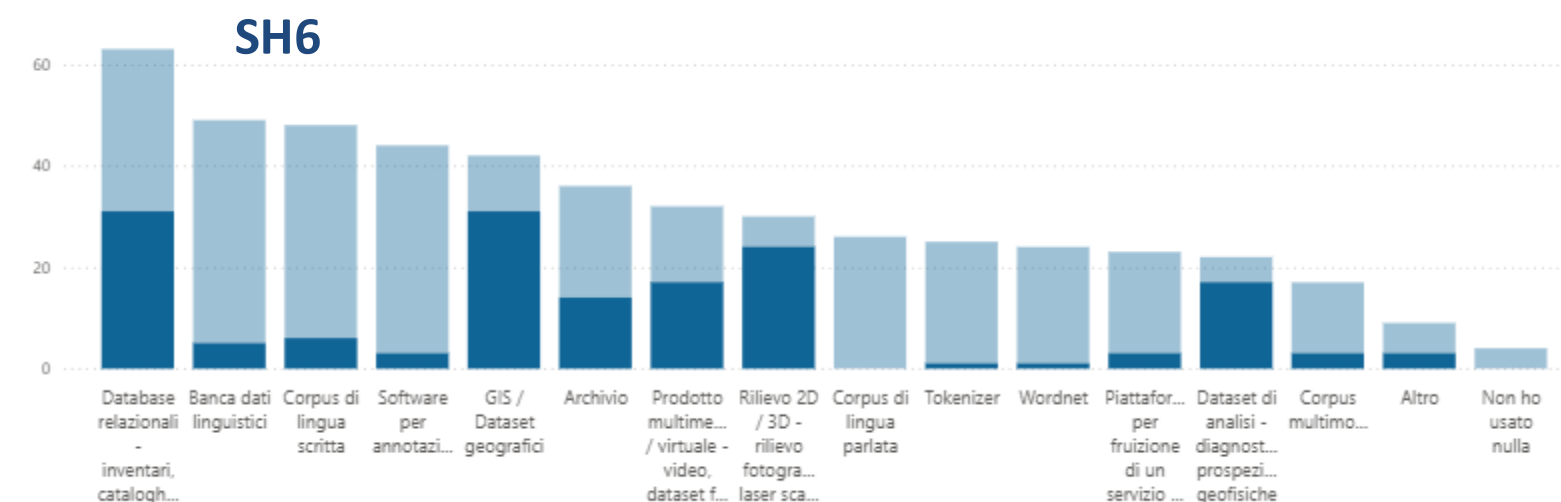
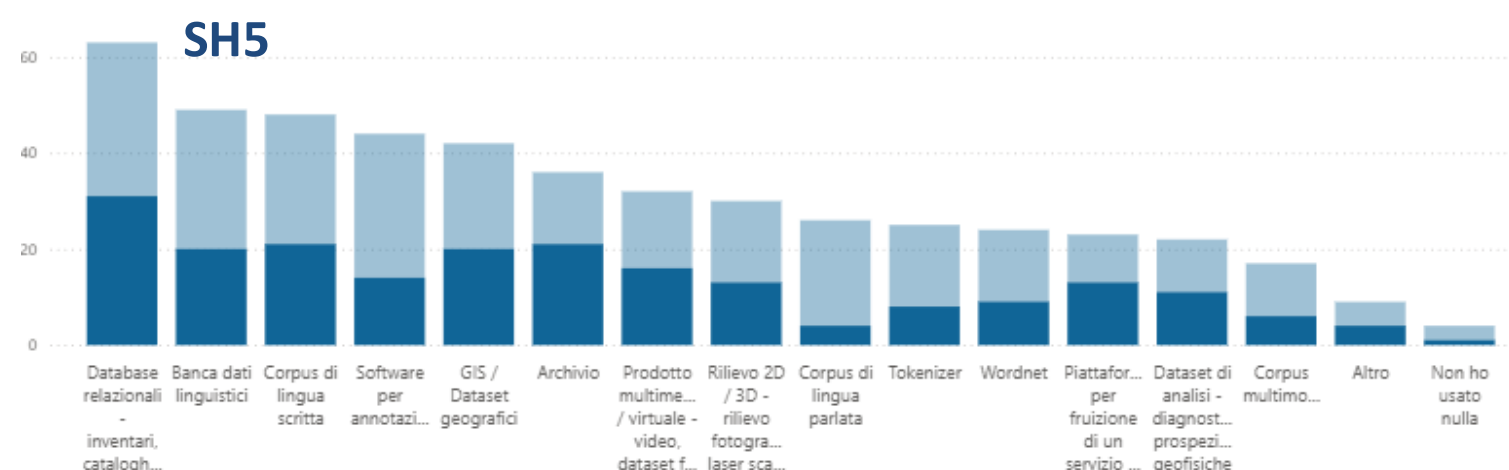
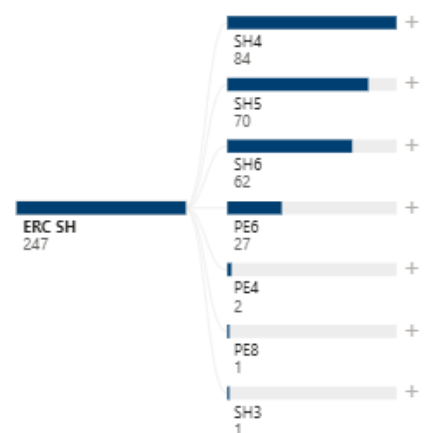
Resource Usage per User

This chart shows the average use of resources per individual respondent.

ERC Sectors

filter the dashboard by respondents ERC sectors

ERC Panel x

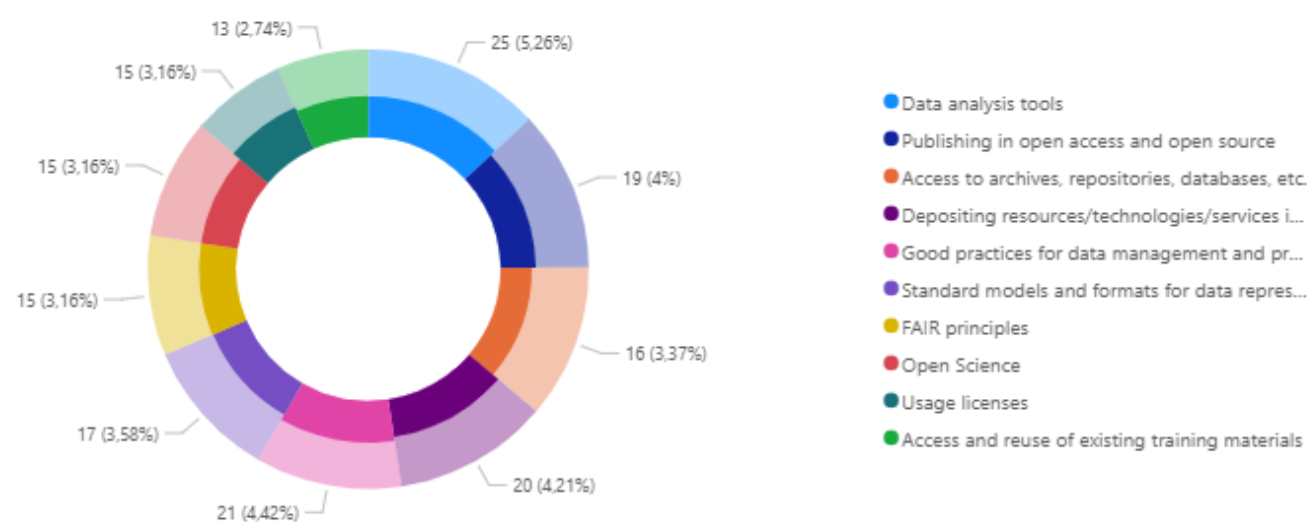


RESULTS: TRAINING NEEDS

Training Needs by Topic

This chart shows the different types of publications produced in Open Access, providing an overview of their distribution across categories.

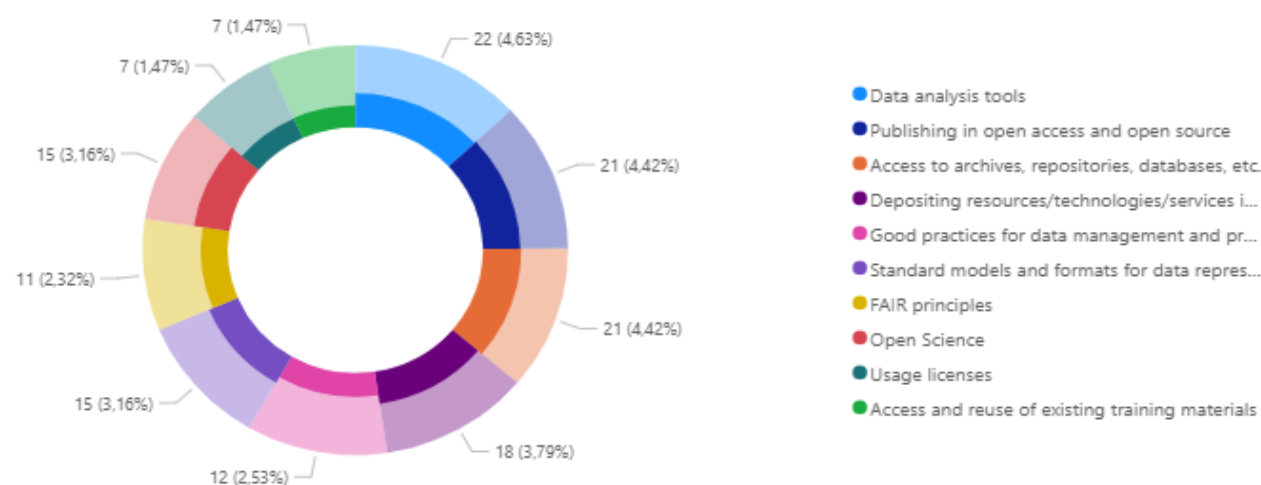
SH4



Training Needs by Topic

This chart shows the different types of publications produced in Open Access, providing an overview of their distribution across categories.

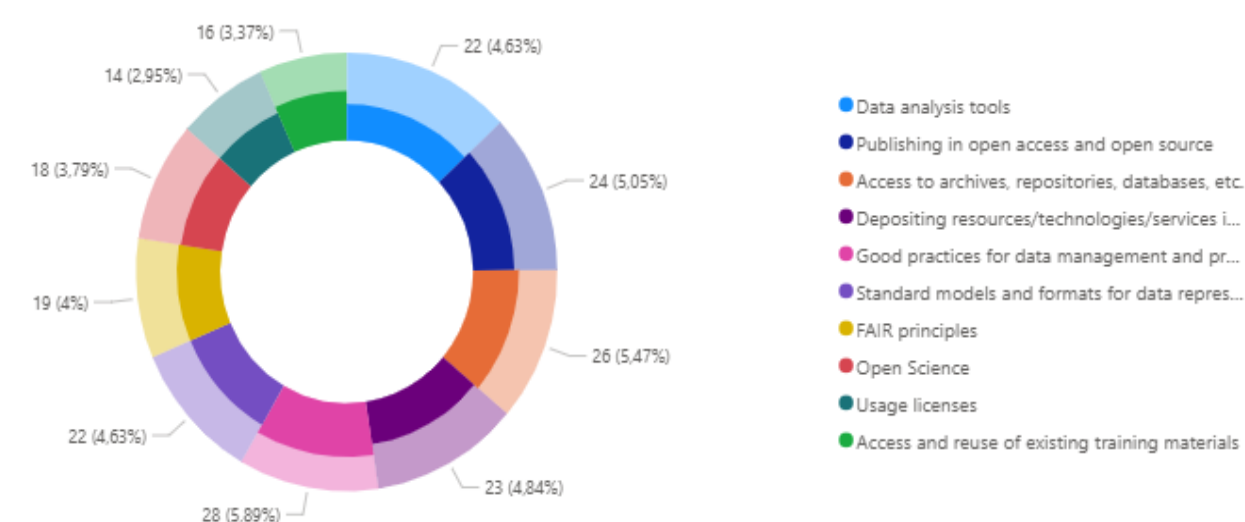
SH6



Training Needs by Topic

This chart shows the different types of publications produced in Open Access, providing an overview of their distribution across categories.

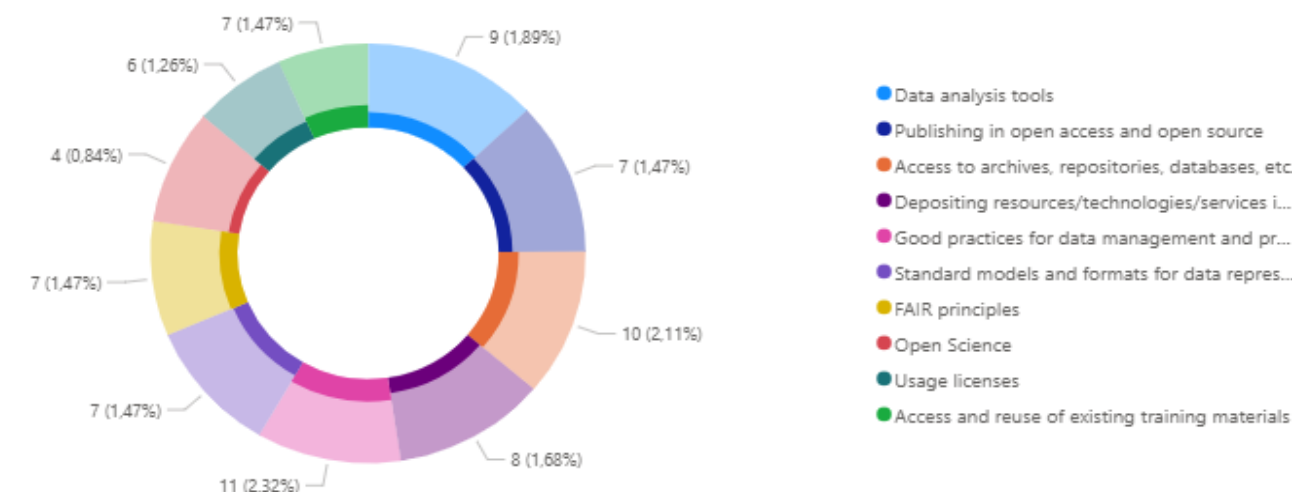
SH5



Training Needs by Topic

This chart shows the different types of publications produced in Open Access, providing an overview of their distribution across categories.

PE6

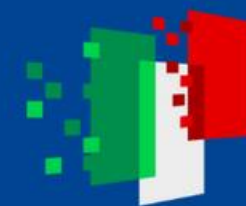




Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

RESULTS: FOCUS GROUPS

Archeologists

They expect a single environment where they can find everything they need to conduct research in a single platform

Philosophers



They expect to have open access publication tools and management of all sources used in one platform

Philologists

They need for more digitized material available even from small archives

Linguists

They need for more data (to perform and train LLMs)

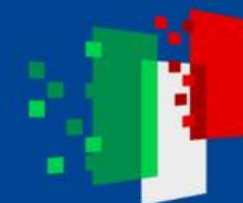
➤ Expectation: free services (individual scholar's view)



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



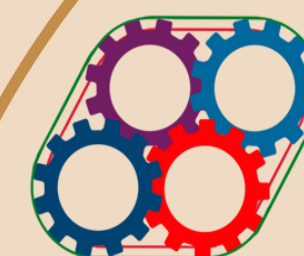
Consiglio Nazionale
delle Ricerche

H2IOSC: Strengthening Research Infrastructures, Consolidating the Federation

Session 1: Results and Opportunities in
Resources Alignment

Making the Ecosystem Observable:
Monitoring the SSH Landscape

Giacomo Mancuso
giacomo.mancuso@cnr.it



H²IOSC

Humanities and cultural Heritage Italian Open Science Cloud

H2IOSC Project - Humanities and cultural
Heritage Italian Open Science Cloud funded by
the European Union – NextGenerationEU –
NRRP M4C2 - Project code IR0000029 - CUP
B63C22000730005.

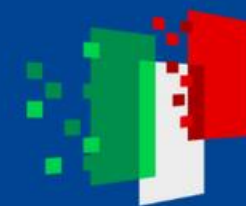
28



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche



Engagement with the scientific
community

Questionnaire

Interviews



Eterogeneous data production and dissemination

Data Centric Prospective

Dissemination of knowledge through
structured, findable, accessible,
interoperable, and reusable (FAIR) data



<https://dhelo.cnr.it>

Biblio Centric Prospective

Dissemination of knowledge primarily
through open access scientific literature



[https://bidiar.cnr.i
t](https://bidiar.cnr.it)



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca

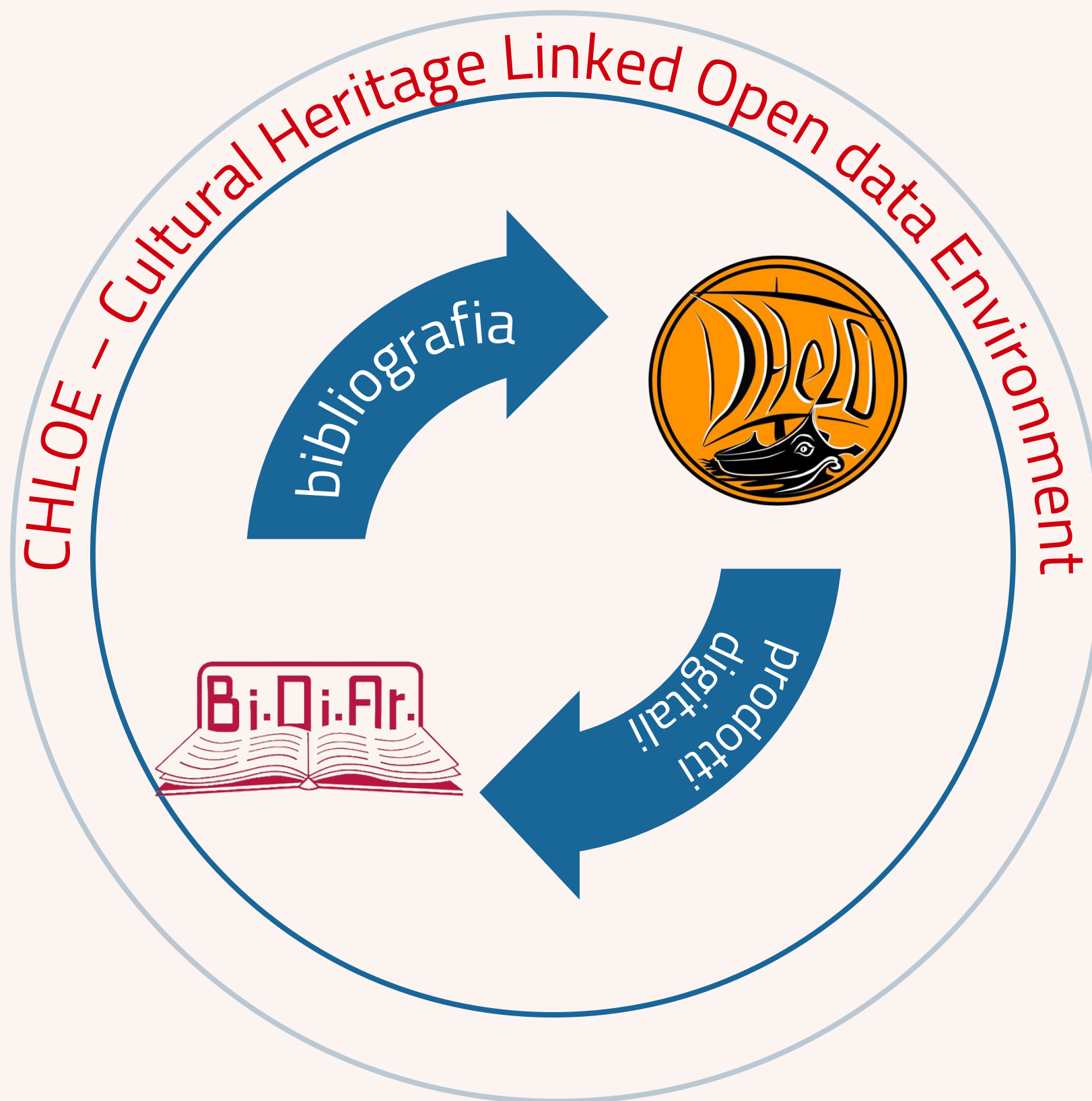


Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche



MAIN GOALS

Analysis

Better understanding of the research community through the outputs it produces and consumes

Accessibility

Connecting open-access digital resources through a single access point

Interoperability

Export and aggregation of metadata into research infrastructures or metacatalogues



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



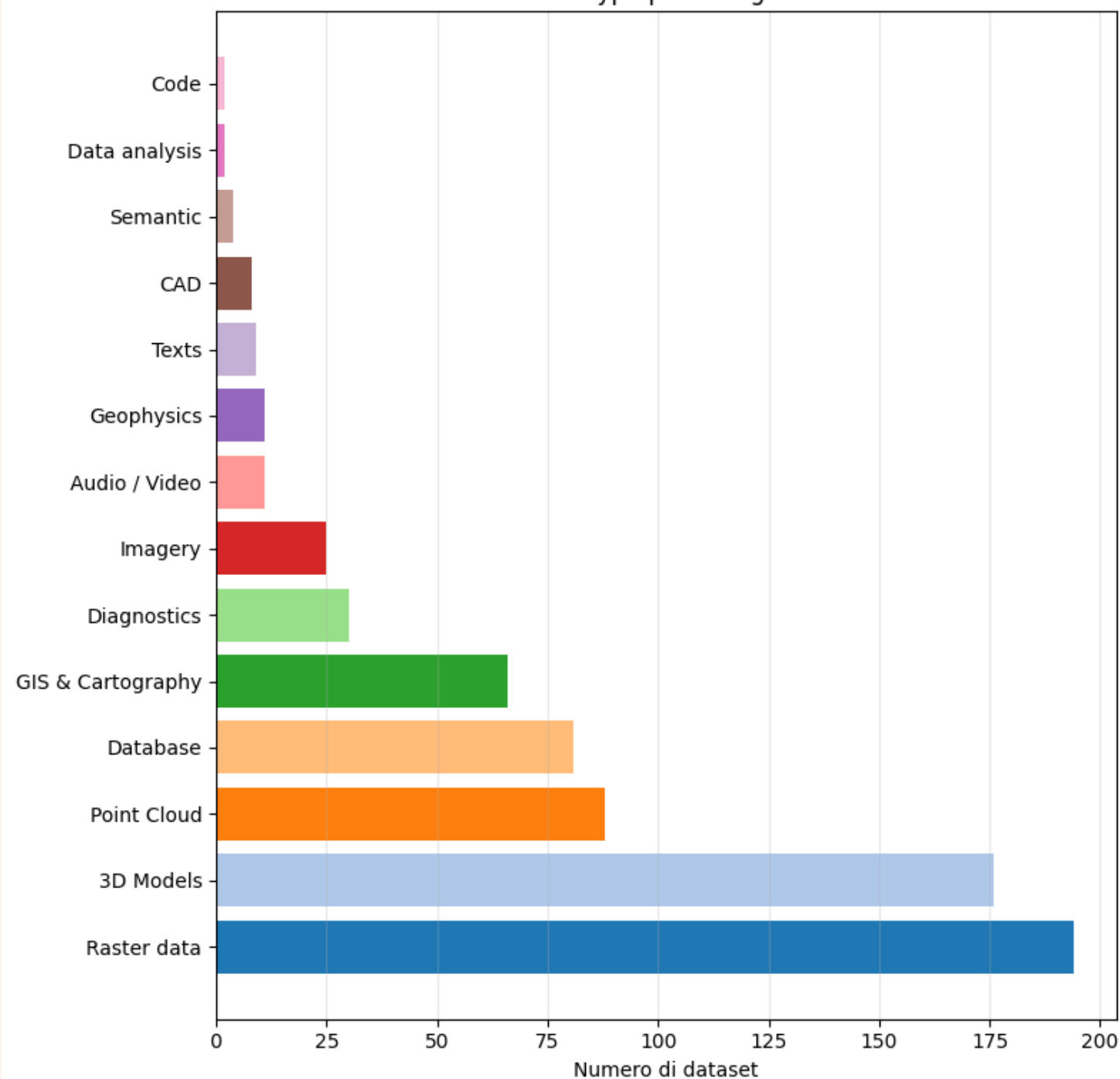
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



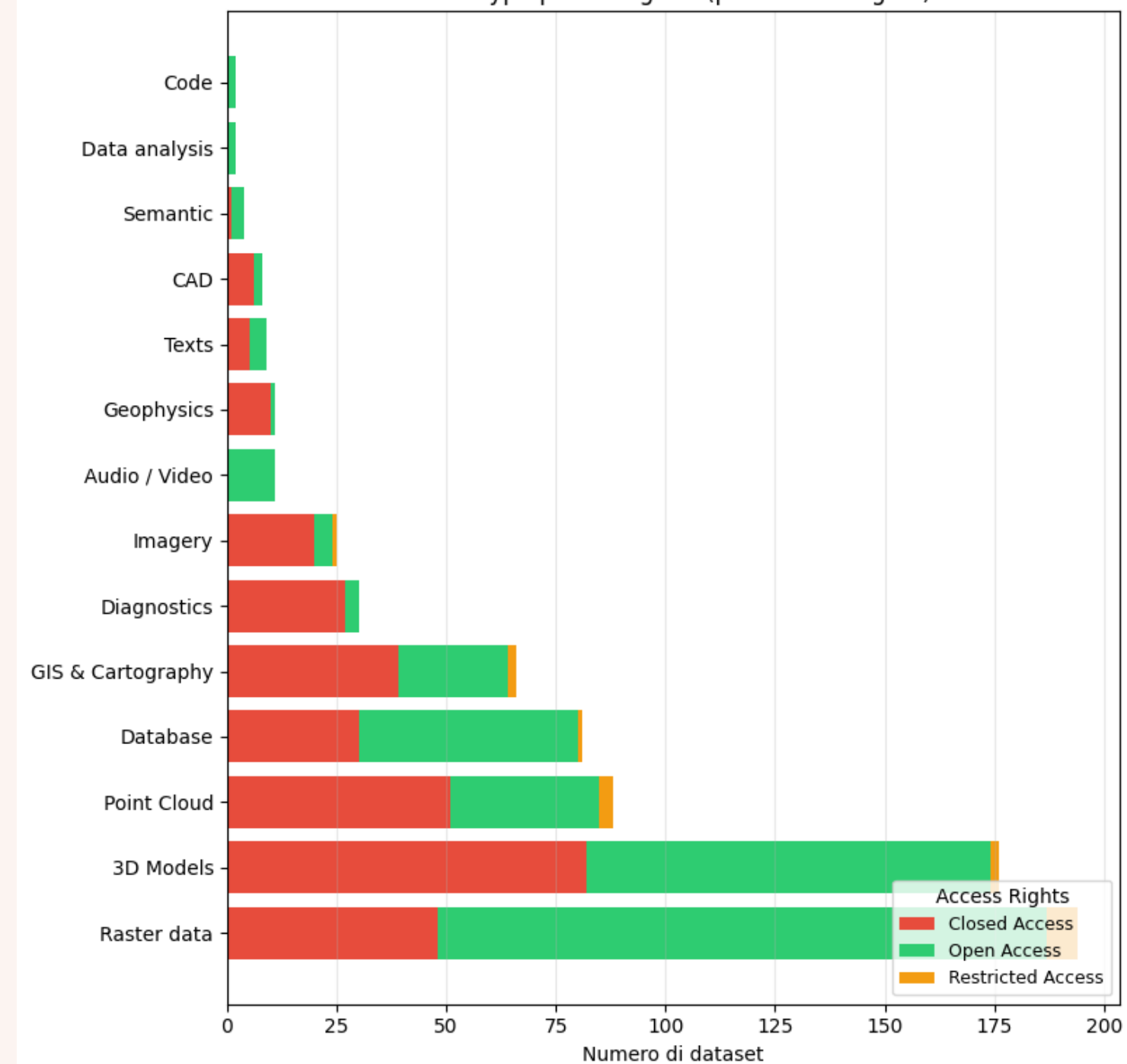
Consiglio Nazionale
delle Ricerche

Analysis

Data Type per Categoria



Data Type per Categoria (per Access Rights)





Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



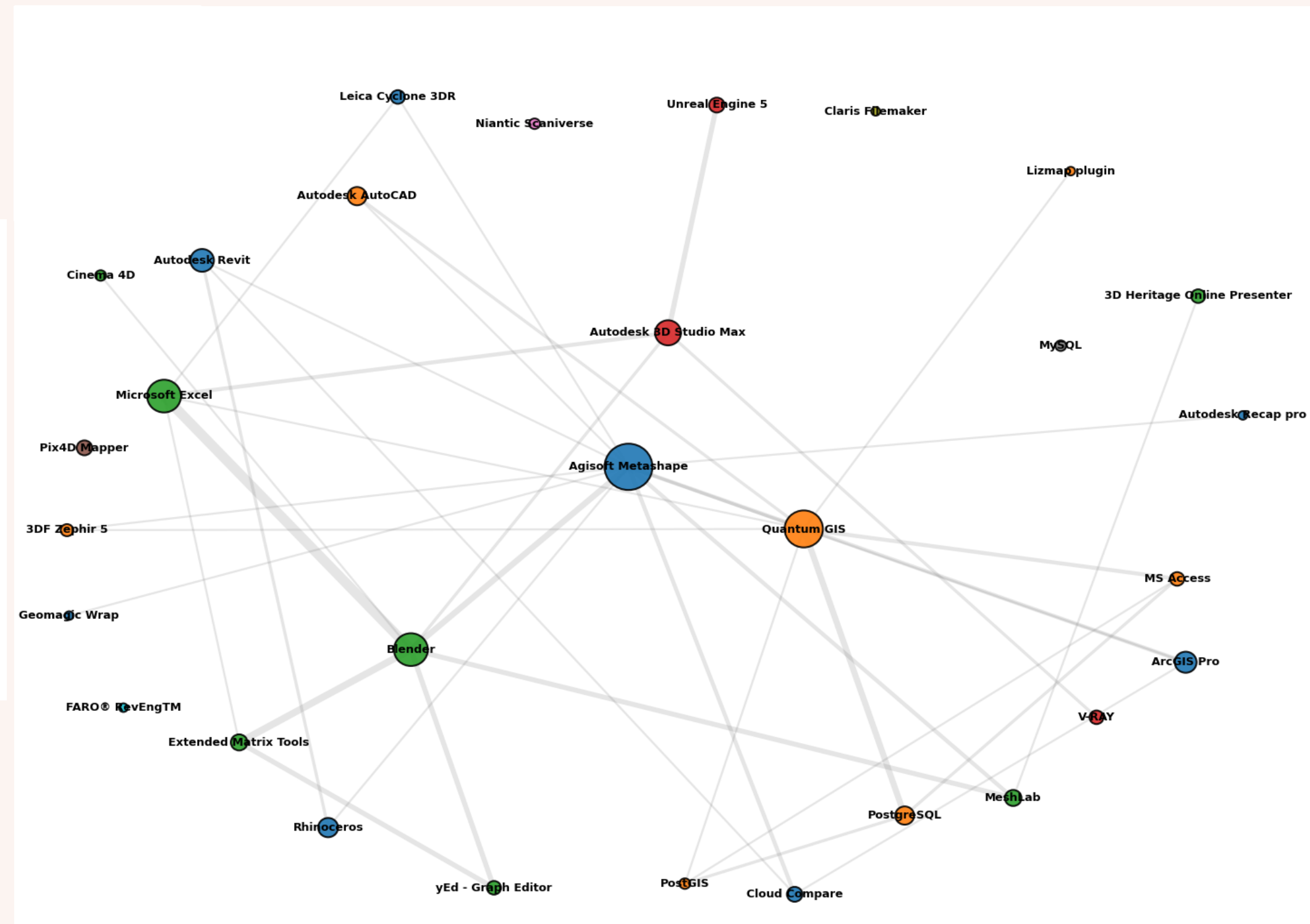
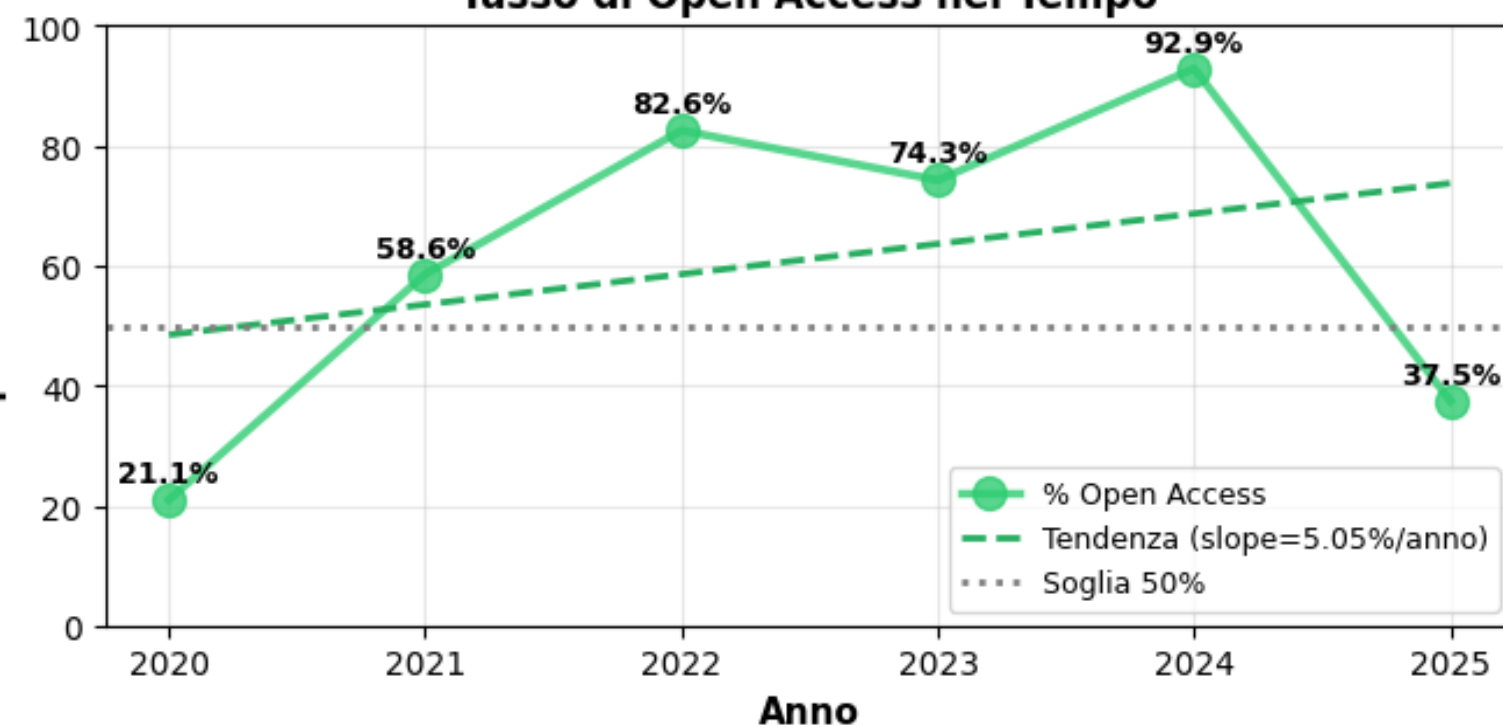
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Analysis

Tasso di Open Access nel Tempo

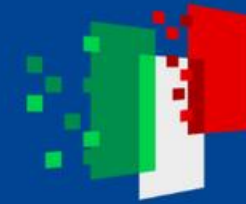




Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche



DHeLO — Digital Heritage Landscaping Platform

ADVANCED SEARCH

Search

Q

HOMEEXPLOREPROJECTSPRODUCTSTOOLSENTENTSABOUT

DHeLO

Digital Heritage Landscaping platfOrm

Welcome to DHeLO: a Digital Platform for Cultural Heritage Research

DHeLO is a web platform designed to map and connect the diverse digital resources that contribute to Cultural Heritage and Heritage Science research. Developed as part of the [H2IOSC Project](#), it serves as a structured repository for metadata on research projects, datasets, digital tools, and interactive resources.

In a rapidly evolving digital landscape, valuable resources are often scattered across different platforms, making them difficult to track, access, and reuse. DHeLO addresses this challenge by acting as an **observatory**, aggregating and organizing metadata from multiple sources. By structuring this information in a way that supports advanced querying, indexing, visualization, and retrieval, the platform enhances **findability**, a key principle of the [FAIR data framework](#).

By improving the **discoverability and accessibility** of research outputs, DHeLO fosters new connections between research efforts and promotes **interoperability and reuse** through a **linked open data approach**. This commitment to FAIR principles ensures that digital heritage knowledge is not only preserved but also effectively leveraged for future studies and innovations.

What can you find on DHeLO?

DHeLO serves as a centralized platform for discovering and exploring digital outputs from research projects and activities in the fields of cultural heritage and heritage science. The platform collects and organizes metadata on a variety of resources, making them easier to find, access, and connect.

Visitors can explore:

- **Research Projects:** Metadata and descriptions of research initiatives focused on cultural heritage, highlighting their objectives, methodologies, and digital outcomes.
- **Datasets:** Structured data collections that provide valuable insights into different aspects of heritage science and cultural heritage studies.
- **Interactive Resources:** Digital tools, applications, and web-based platforms that offer interactive ways to engage with cultural heritage data.
- **Software & Tools:** A selection of digital tools, including analysis software and preservation solutions, supporting research and heritage management.
- **Places:** Resources enriched with geographical metadata, linking research data to specific cultural and historical sites.
- **Periods of Time:** Temporal metadata describing the historical or chronological context of cultural heritage resources, helping to frame research within specific time periods.

Accessibility



BiDiAr — Bibliography of Digital Archaeology

ADVANCED SEARCH

Search

Q

WELCOMEXPLORESEARCH

Bibliography of Digital Archaeology

What is BiDiAr

BiDiAr (Bibliography of Digital Archaeology) is an open-access bibliographic database that collects, organises, and enriches references related to digital methods and tools in archaeology. Developed using Zotero and integrated into the DHeLO infrastructure, BiDiAr indexes scientific literature with structured metadata, linking bibliographic entries to associated datasets, projects, and software. It serves as both a research tool and a knowledge base, tracing the development of digital archaeology over time. With over 10,000 records, BiDiAr provides a critical resource for scholars seeking to understand how digital practices have shaped archaeological research and heritage documentation across various contexts.

BiDiAr on Zotero

BiDiAr provides a dedicated [Zotero Library](#), where all bibliographic records included in the platform are collected and openly accessible. Each entry on the BiDiAr website includes a direct link to the corresponding Zotero record. Bibliographic resources can be explored both on this site and via Zotero, to accommodate different consultation needs and usage contexts.

The library is regularly updated and structured to support browsing, search, and interoperability with other digital tools, thus facilitating the reuse of data in scholarly contexts.

[Zotero](#) is a free and open-source reference management software developed by the *Roy Rosenzweig Center for History and New Media* at *George Mason University* (Virginia, USA). It allows users to collect, organize, cite, and share bibliographic data and research materials collaboratively, making it a valuable tool for managing digital scholarship.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca

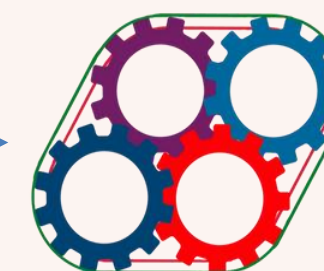
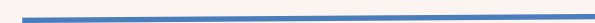
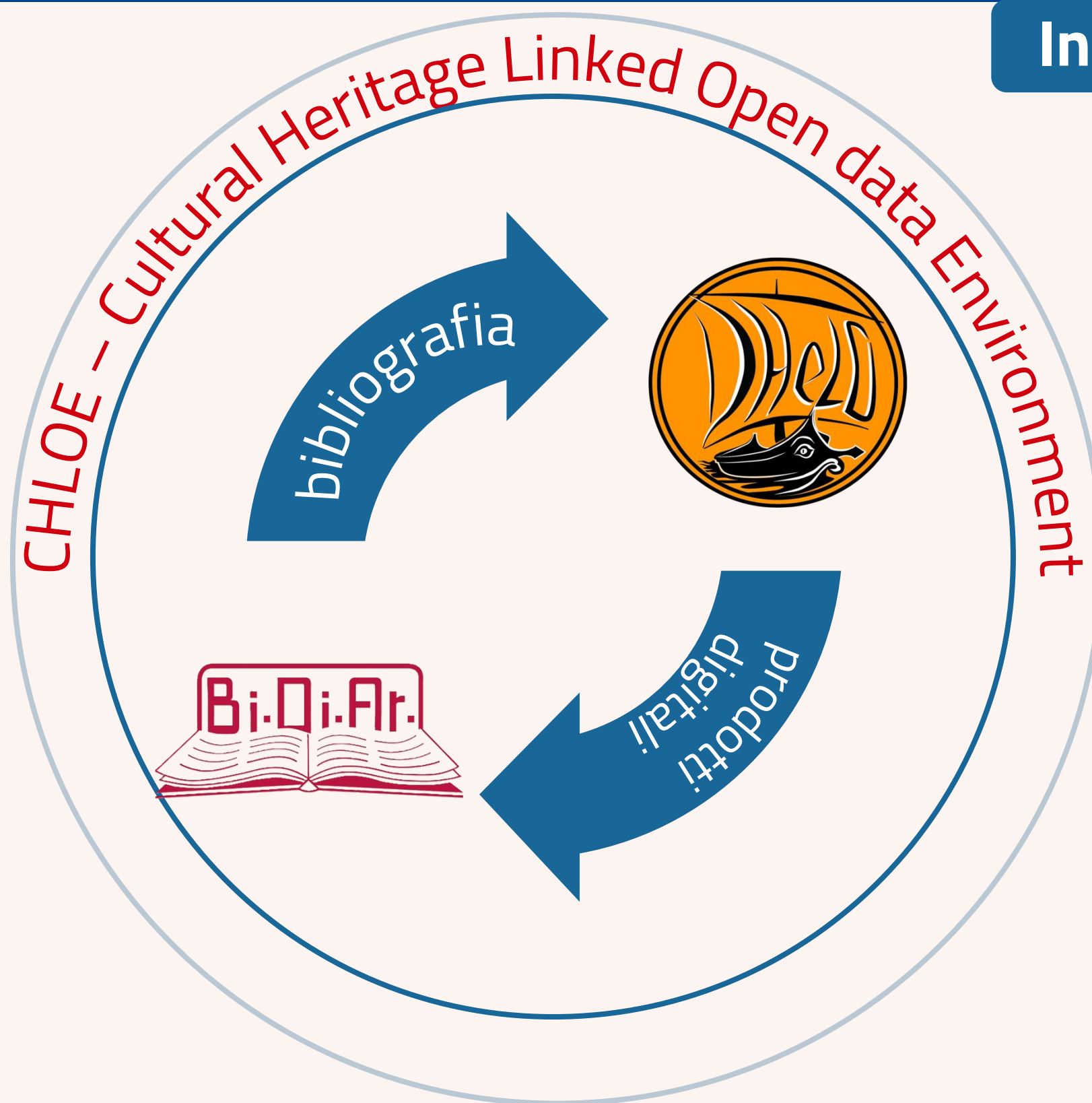


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Interoperability

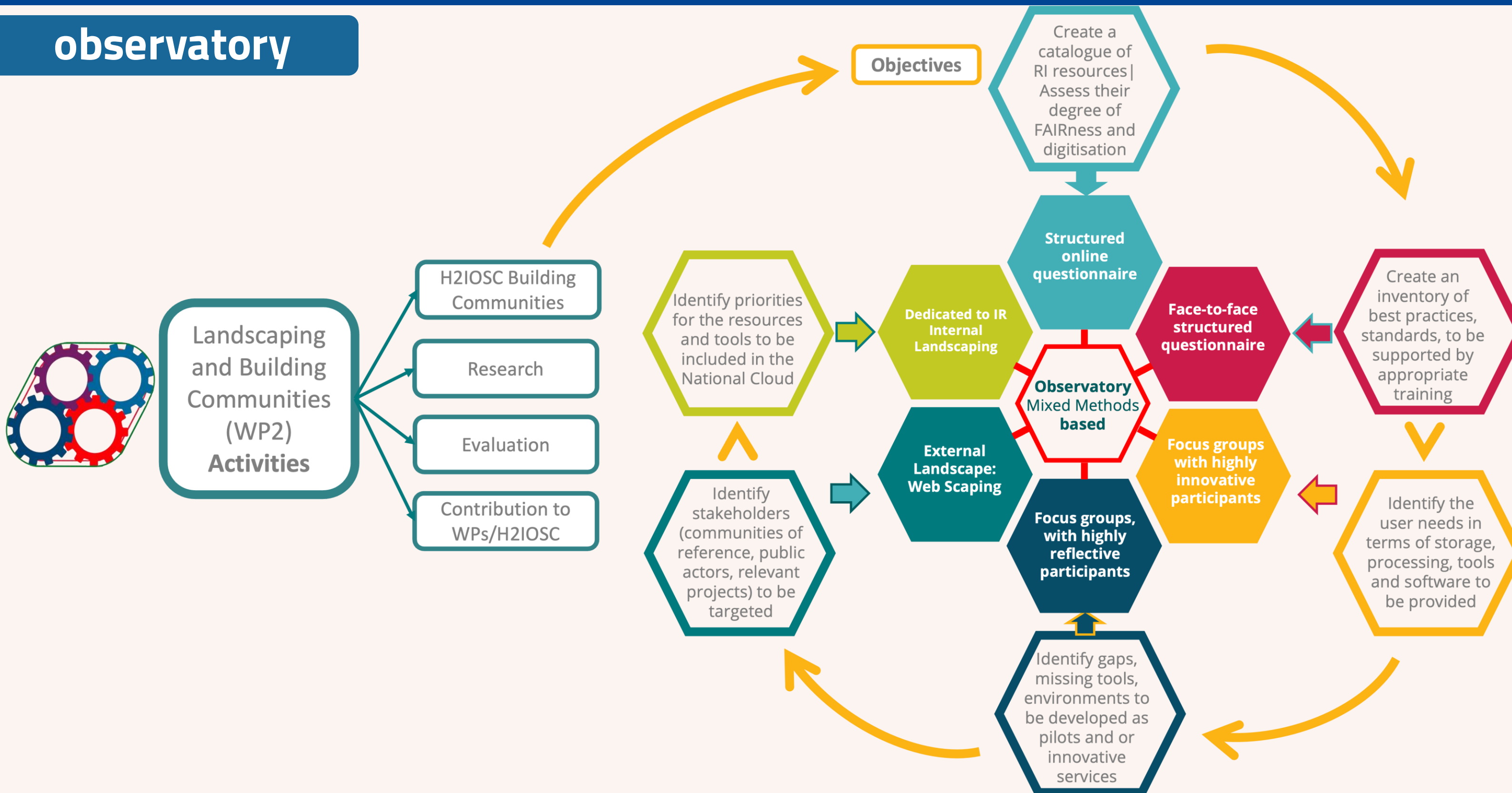


marketplace

observatory

pilots



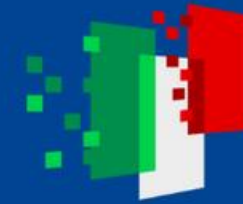




Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Italiano ▼

Italiano ▼



L'Osservatorio H2IOSC

Focus group

Questionari

Progetti

Notizie

Grafico

Statistiche Marketplace

Contatti

Osservatorio H2IOSC: monitorare l'evoluzione delle infrastrutture di ricerca

Analisi mirate per comprendere il ruolo, l'efficacia e l'impatto delle infrastrutture di ricerca nella comunità scientifica, nel tessuto istituzionale e nello sviluppo socio-economico.

Scopri di più sull'osservatorio →



Un punto di osservazione sulla ricerca

L'Osservatorio H2IOSC analizza l'evoluzione delle infrastrutture di ricerca e il loro impatto, combinando dati quantitativi e qualitativi. Il suo raggio d'azione si amplia alle scienze sociali e umanistiche e ad altri settori emergenti.



Questionari

Presentazione dei dati raccolti attraverso indagini strutturate, con analisi delle risposte, identificazione di tendenze significative e implicazioni per le politiche di supporto alla ricerca.

Scopri di più



Focus Group

Sintesi delle discussioni tematiche che coinvolgono diverse comunità scientifiche, evidenziando esigenze comuni e proposte per migliorare l'efficacia delle infrastrutture di ricerca.

Scopri di più



Progetti

Esplorazione delle iniziative sperimentali sviluppate nell'ambito del progetto H2IOSC, con dettagli su obiettivi, metodologie adottate e risultati ottenuti, per promuovere l'innovazione nelle pratiche di ricerca.

Scopri di più



L'Osservatorio H2IOSC

Focus group

Questionari

Progetti

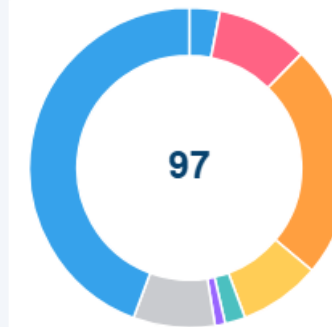
Notizie

Statistiche Marketplace

Contatti

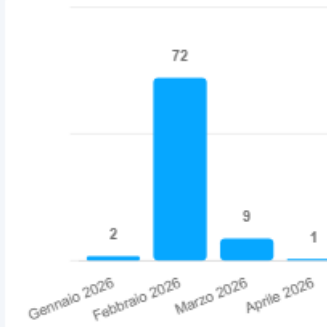
Statistiche Marketplace

Mesi ▼



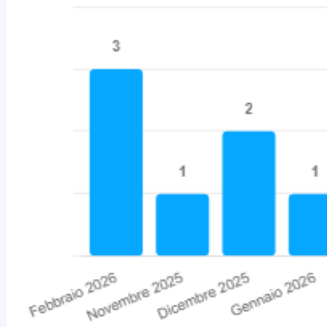
Risorse (items)

Risorse presenti in Marketplace suddivise per tipologia



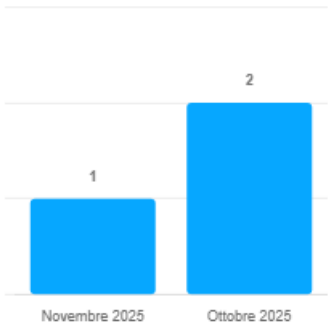
Risorse (items)

Risorse presenti in Marketplace distribuite nel tempo



Utenti

Utenti registrati in Marketplace distribuiti nel tempo

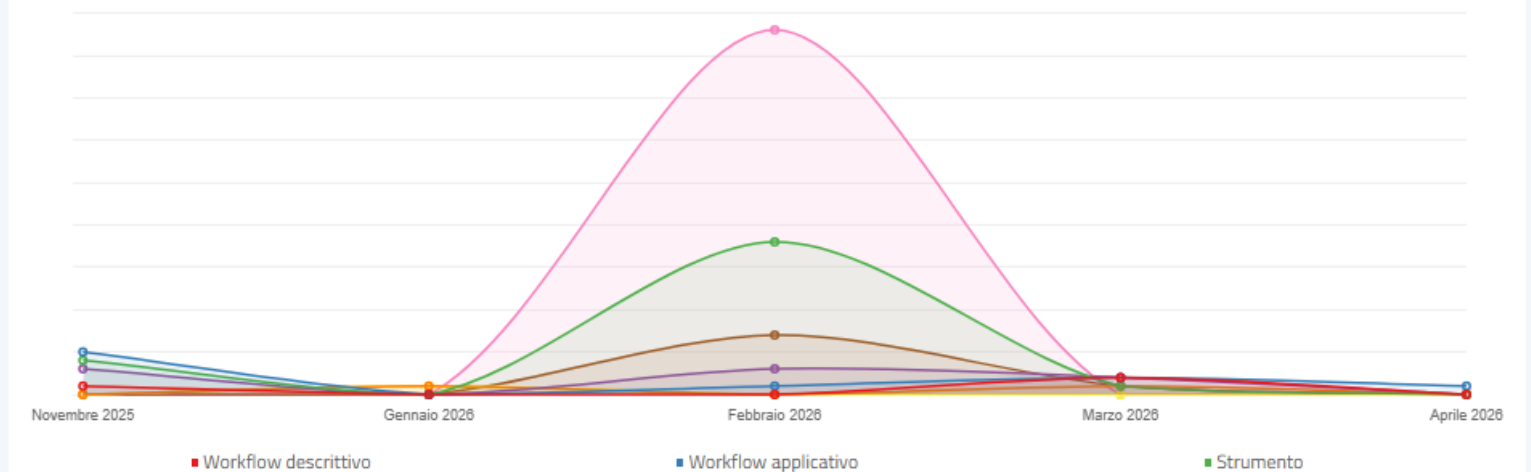


Ricerche

Ricerche salvate dagli utenti distribuite nel tempo

Risorse pubblicate in Marketplace

Andamento temporale e confronto per tipologia di risorsa



H2IOSC: Strengthening Research Infrastructures, Consolidating the Federation

Session 1: Results and Opportunities in Resources Alignment

Making Resources Comparable: Assessing Maturity Across Infrastructures

Andrea Pandurino
andrea.pandurino@cnr.it



H2IOSC Project - Humanities and cultural
Heritage Italian Open Science Cloud funded by
the European Union – NextGenerationEU –
NRRP M4C2 - Project code IR0000029 - CUP
B63C22000730005.

Heterogeneity as the starting point, convergence as the goal

From distinct infrastructures

to integrated ecosystem

Disciplinary specializations

to be integrated into a common vision

Maturity levels

To be aligned toward a shared maturity
threshold

Heterogeneous data types

To be made interoperable through shared
data standards

Semantic data models

To be mapped to a federated semantic
model

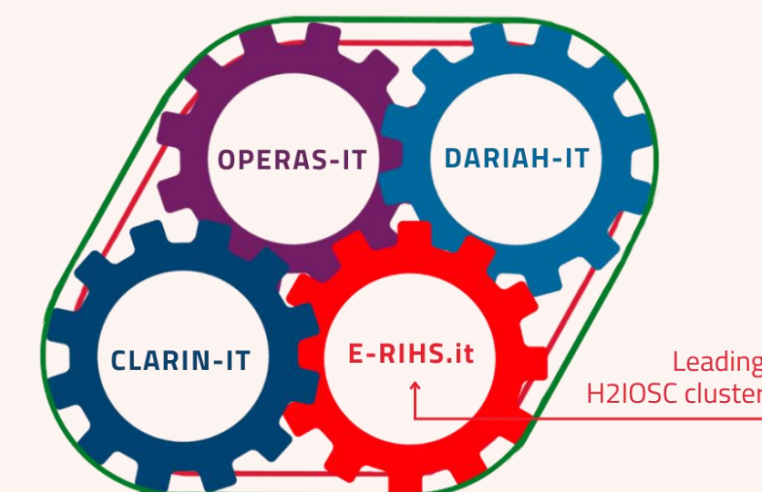
Data lifecycle management

To be harmonized around shared policies
and protocols

Pre-existing technological
environment

to be made interoperable

H²IOSC





Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Building the cluster: the dimensions of complexity

- **Complexity in information management:**
 - several semantic models
 - heterogeneous digital objects
- **Interoperability policies and standards:**
 - asymmetric maturity of the research infrastructures
 - different lifecycle logics
- **Technological and architectural complexity:**
 - consolidated technological ecosystems that must be aligned with the common layer
 - legacy systems and servitization of pre-existing tools
 - data security and management of federated identities
 - orchestration and governance of cross-cutting processes





H2IOSC Maturity model

- **TRL - Technology Readiness Level:** the degree of development and technological maturity of a system
- **SRL - Societal Readiness Level:** the degree of acceptance and social integration of the proposed solution
- **ORL - Organizational Readiness Level:** The organization's internal preparation to adopt and support the system over time
- **LRL - Legal Readiness Level:** the degree of compliance of the system with applicable regulatory, legal and ethical requirements

TRL - Technology Readiness Level

- **TRL 1-3:** initial stages of the project, where the first PoCs conceptualized and progressively developed.
- **TRL 4-6:** validation and demonstration phase
- **TRL 7:** marks the end of prototyping phase
- **TRL 8-9: Market phase:** denotes a fully qualified, stable system proven in real operational conditions with continuous maintenance and updates

ORL - Organizational Readiness Level

- **ORL 1-3: Analysis and awareness-** identification of organizational need
- **ORL 4-6: validation and acquisition** the solution is tested in simulated environments
- **ORL 7-9: Consolidation and Production Phase -** Process refinement, organizational embedding plan completion

SRL - Societal Readiness Level

- **SRL 1-3: Initial** - definition of the proposed solutions and first test
- **SRL 4-6: Validation** - Real-Context Solution Testing with Stakeholders
- **SRL 7-9: Final** : -Refinement, Solution Implementation

LRL - Legal Readiness Level

- **LRL 1-3: Awareness** - increasing recognition of the existence of a legal and ethical compliance issue, up to the first regulatory considerations
- **LRL 4-7: Validation and Compliance** -progressive integration of the regulatory framework
- **LRL 8-9: Operational Compliance** - full, certified regulatory compliance

H2IOSC Maturity Model — Adoption and Monitoring

Starting from July 2024, all the infrastructures in the cluster adopted the maturity model as a shared governance tool for development. For each infrastructure, this meant:

- agreeing on the target TRL level to be reached for publication on the Marketplace
- establishing a TRL development roadmap with verifiable intermediate milestones
- committing to simultaneously advance the SRL, ORL and LRL dimensions within their own organizations

To monitor progress and ensure a harmonious and aligned development across the cluster's systems, four assessment sessions were carried out over the course of the project:

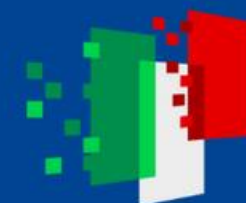
- 1st assessment: 7 October 2024
- 2nd assessment: 12 March 2025
- 3rd assessment: 16 June 2025
- 4th assessment: 31 October 2025



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca

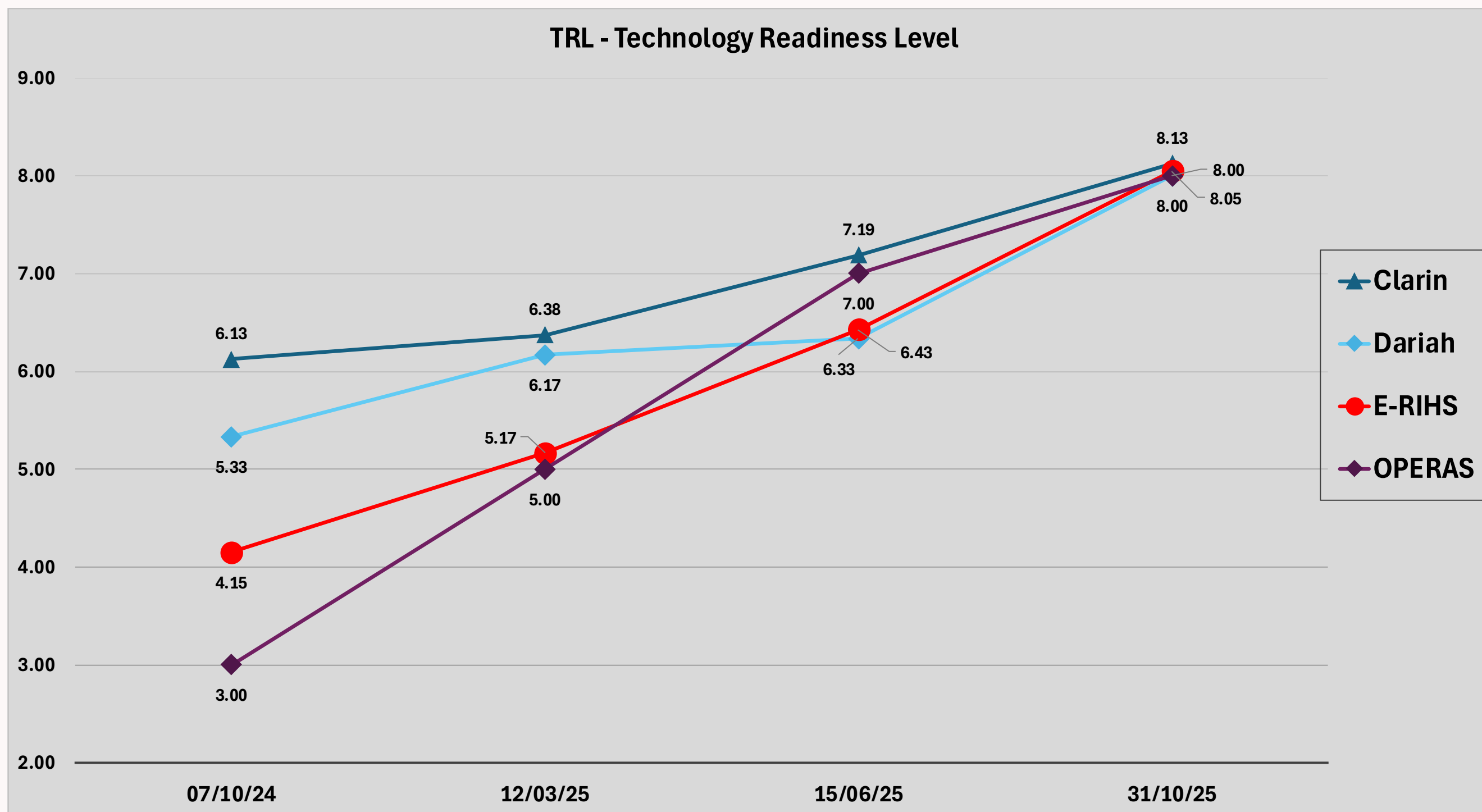


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

H2IOSC Maturity Model — TRL - Technology Readiness Level

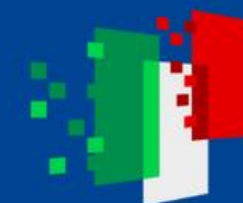




Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca

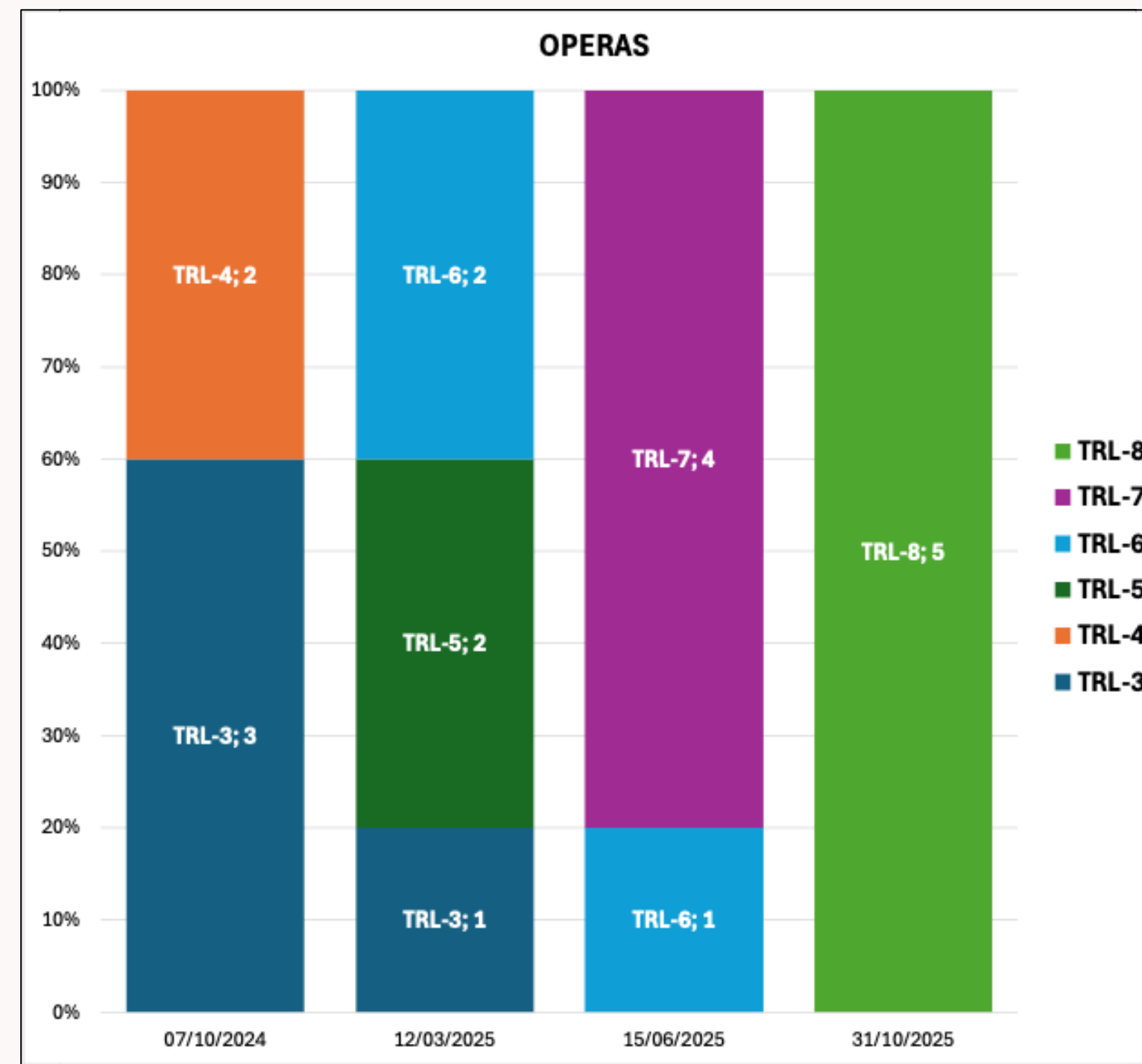
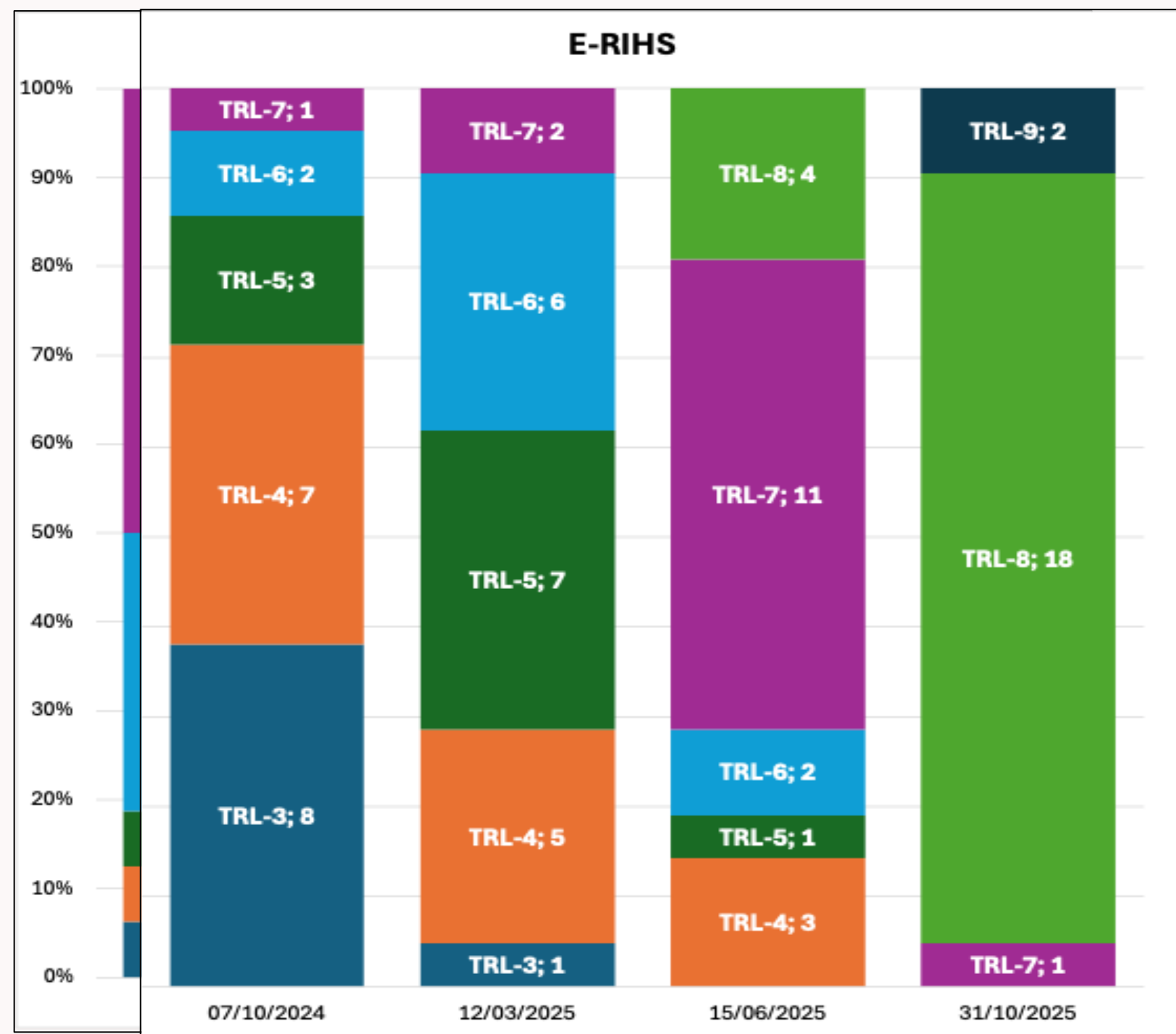


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

H2IOSC Maturity Model — TRL - Technology Readiness Level

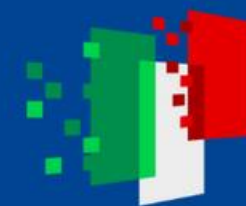




Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



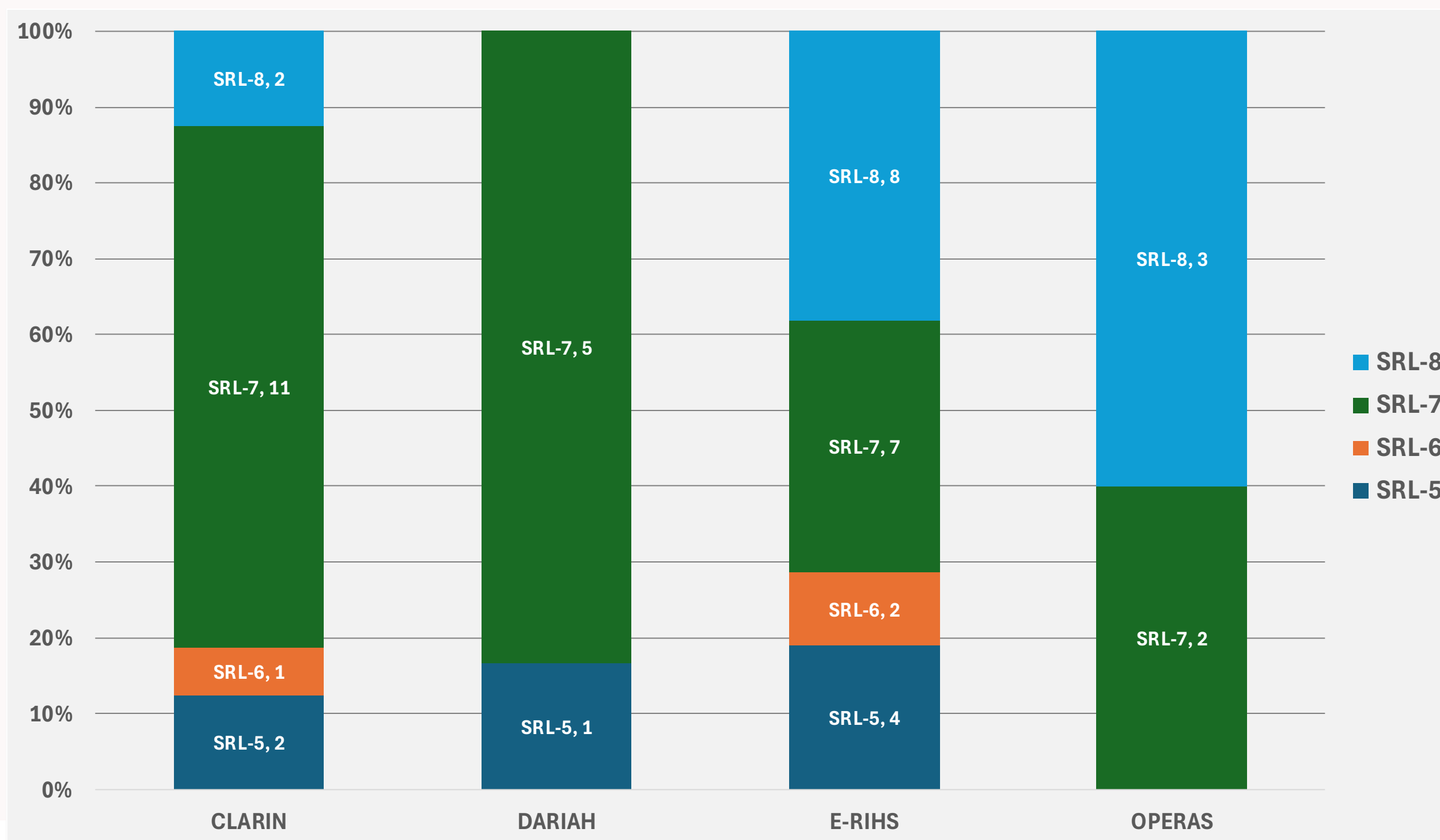
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

H2IOSC Maturity Model — SRL - Societal Readiness Level

(4th assessment: 31 October 2025)





Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



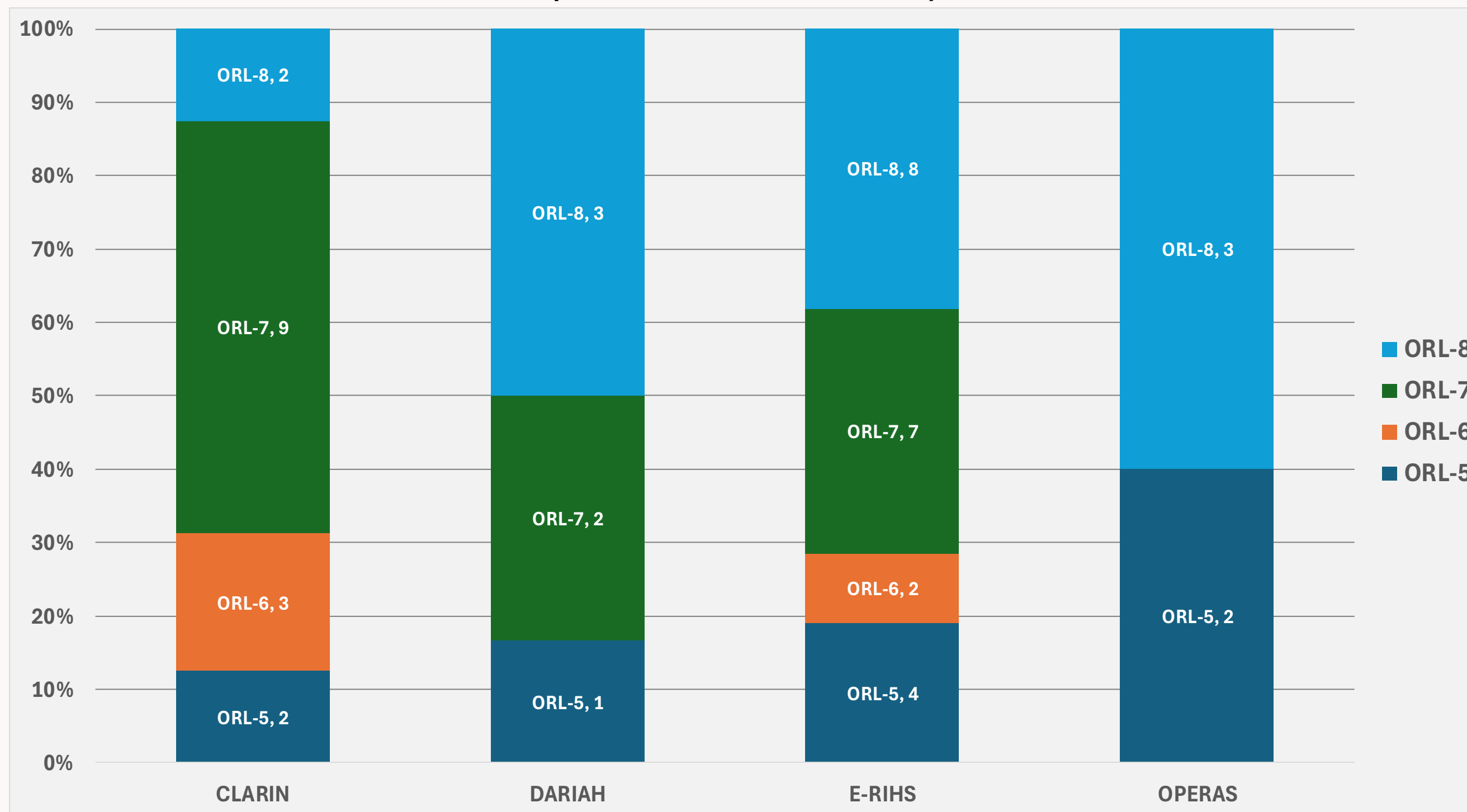
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

H2IOSC Maturity Model — ORL - Organizational Readiness Level

(4th assessment: 31 October 2025)





Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

H2IOSC Maturity Model — Results

Immediate visibility of asymmetries

- It made it possible to clearly detect the different maturity levels of the RIs.

Common language

- The TRL, SRL, ORL and LRL indicators provided a single, neutral metric applicable to the various specializations and domains of the RIs.

Shared objective

- Setting TRL 8 as the threshold for Marketplace publication turned the integration of the RIs into a clear and verifiable operational goal.

Timely corrections

- The periodic assessments enabled the identification and prevention of delays, allowing interventions before they propagated across the Work Packages.

Comparability among heterogeneous systems

- The periodic assessments made it possible to compare very different outputs.

Sustainability beyond technology

- Integrating the SRL, ORL and LRL indicators enabled broad-spectrum considerations regarding service delivery, not just technological readiness.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



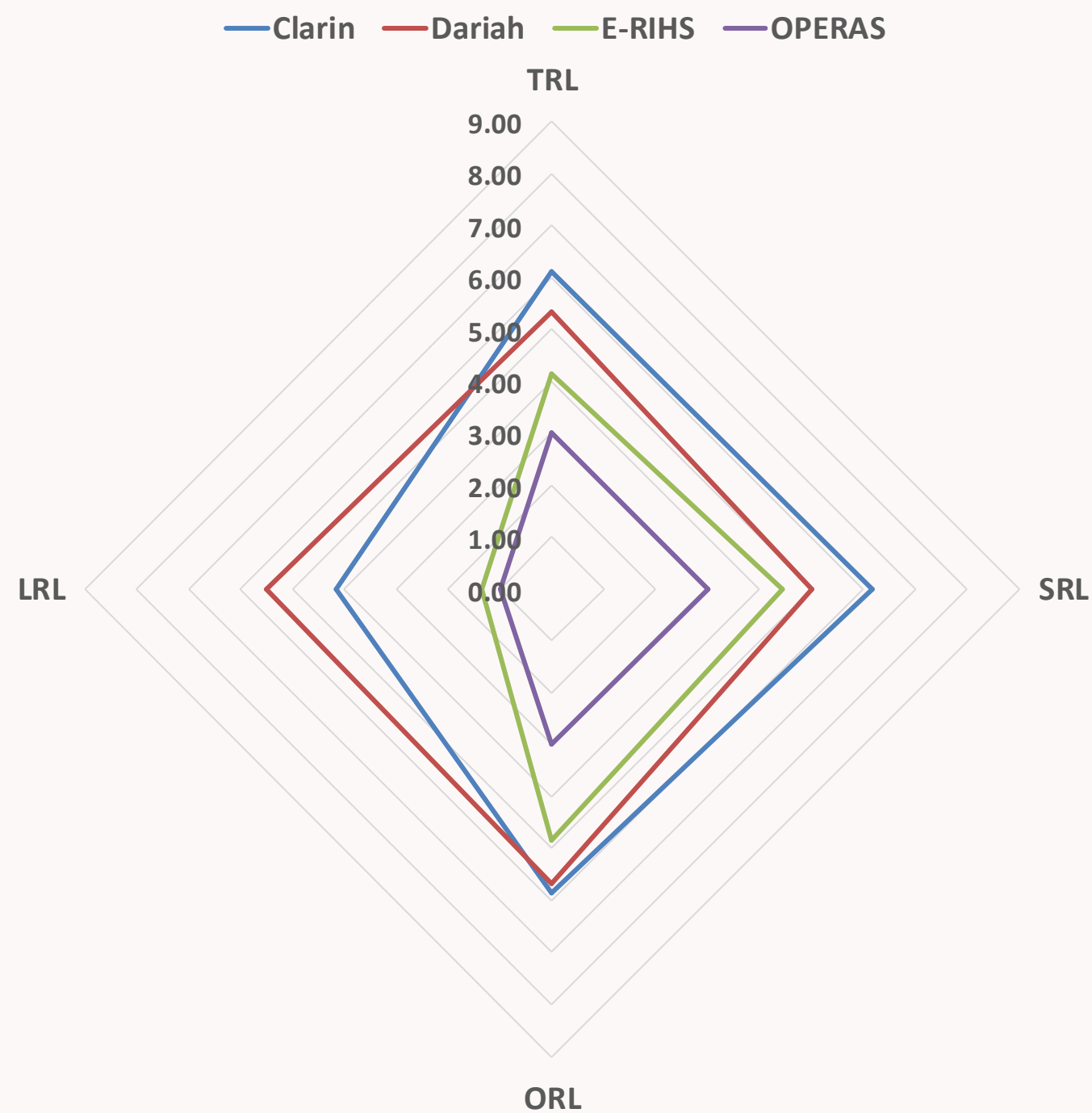
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



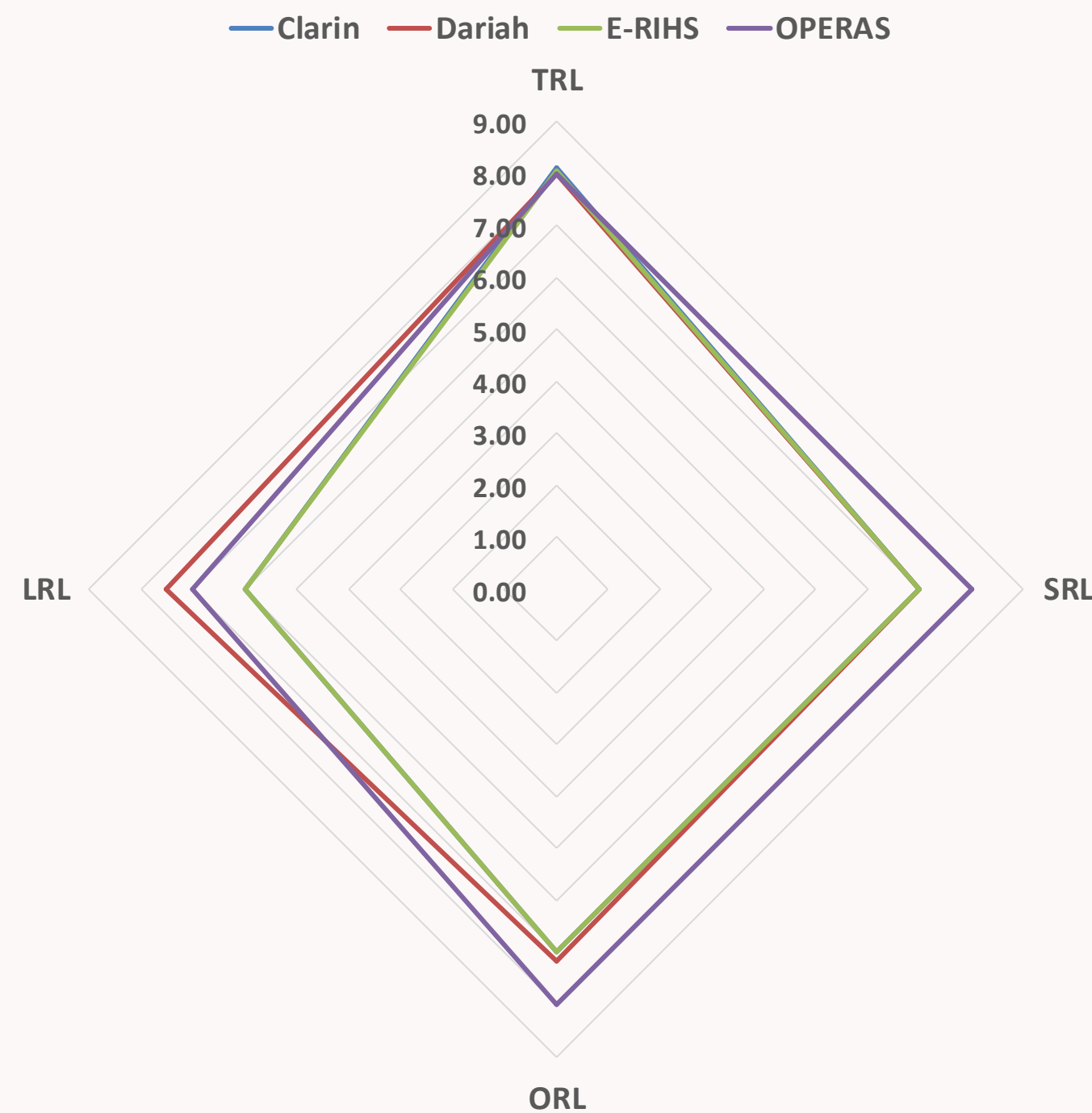
Consiglio Nazionale
delle Ricerche

H2IOSC Maturity Model — Current Assessment

1° Assessment - 7 October 2024



Current Assessment



H2IOSC: Strengthening Research Infrastructures, Consolidating the Federation

Session 1: Results and opportunities in
Resource Alignment

Making Resources Interoperable: Building
a Common Semantic Framework

Alessia Spadi
alessia.spadi@cnr.it



H2IOSC Project - Humanities and cultural
Heritage Italian Open Science Cloud funded by
the European Union – NextGenerationEU –
NRRP M4C2 - Project code IR0000029 - CUP
B63C22000730005.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche



RIs Nodes and Resources Interoperability

H2IOSC aimed to create a level of interoperability between the repositories of the RIs by offering an information model that allows the integration of records from highly diversified single RIs into a common vision

The common semantic framework provides:

- a pipeline of validated actions and guidelines on the assessment and semantization of data
- a practical method for the homogenization of data, their transformation (triplification) and their validation, allowing the exploitation of resources with tools and services.

*Text adapted from Annex C of the H2IOSC Proposal (RIs Nodes and Resources Interoperability section).
Image generated using OpenAI's DALL·E image generation model.*



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Translating the state of knowledge

Data preparation & management

- Management of thesauri and vocabularies
- Adoption of a common ontology to map heterogeneous data
- Context preservation (legacy)

Technical & Semantic Interoperability

- Common Mapping Schema
- Extensible and Scalable Architecture
- Reusable schemas for resources sharing the same standards.

Support for the H2IOSC Federation

- Integrated framework: merging diverse RI data into a unified system
- Cross-RI reuse: enabling resource sharing across infrastructures
- Scalable integration: supporting continuous expansion of resources and RIs
- Long-term sustainability: ensuring reuse beyond original systems



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

From fragmentation to integration

Common Semantic Framework: a collection of domain ontologies with comprehensive mapping and validation tools covering the areas of interest of the involved RIs

The fundamental elements to build a solid common semantic framework are:

- an Ontology capable of describing all collected data through a unified language
- standardized vocabularies supporting the ontology
- a practical Data integration workflow, to convert input data to the shared ontology, store them, and make them accessible



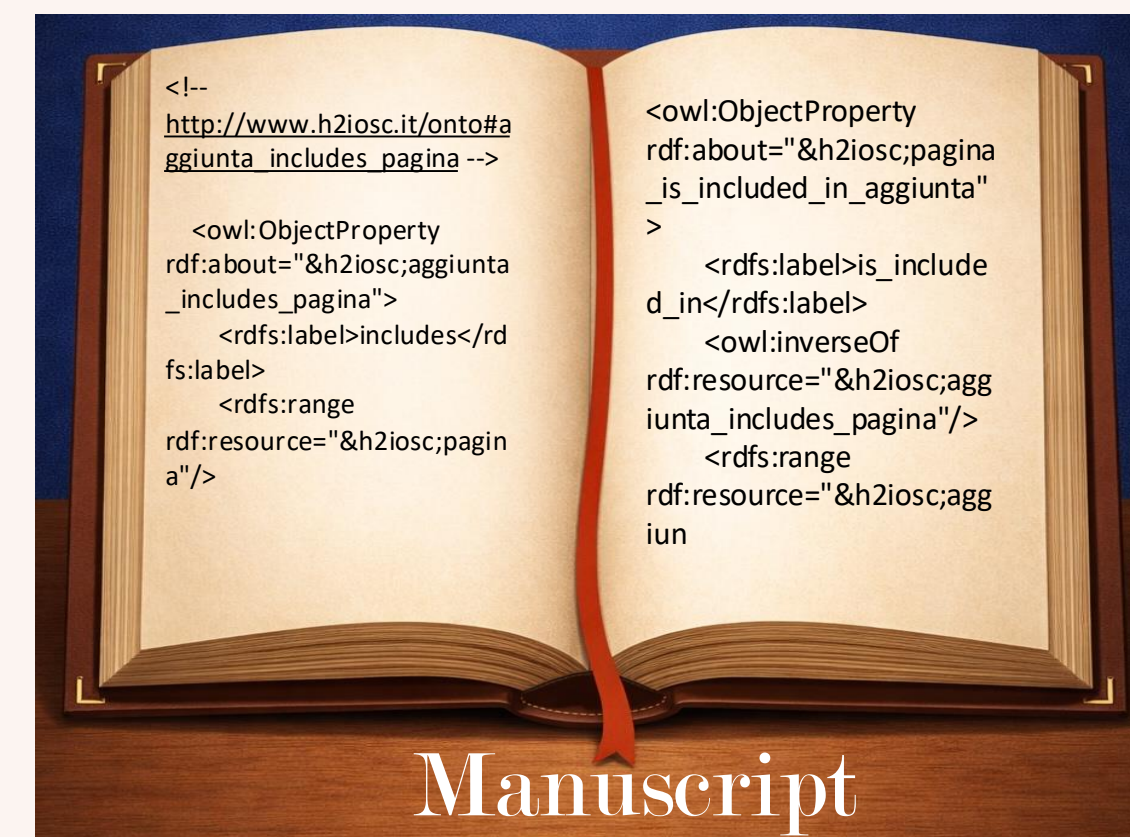
The CSF transforms heterogeneity into interoperability and fragmentation into a system

The Manuscript use case

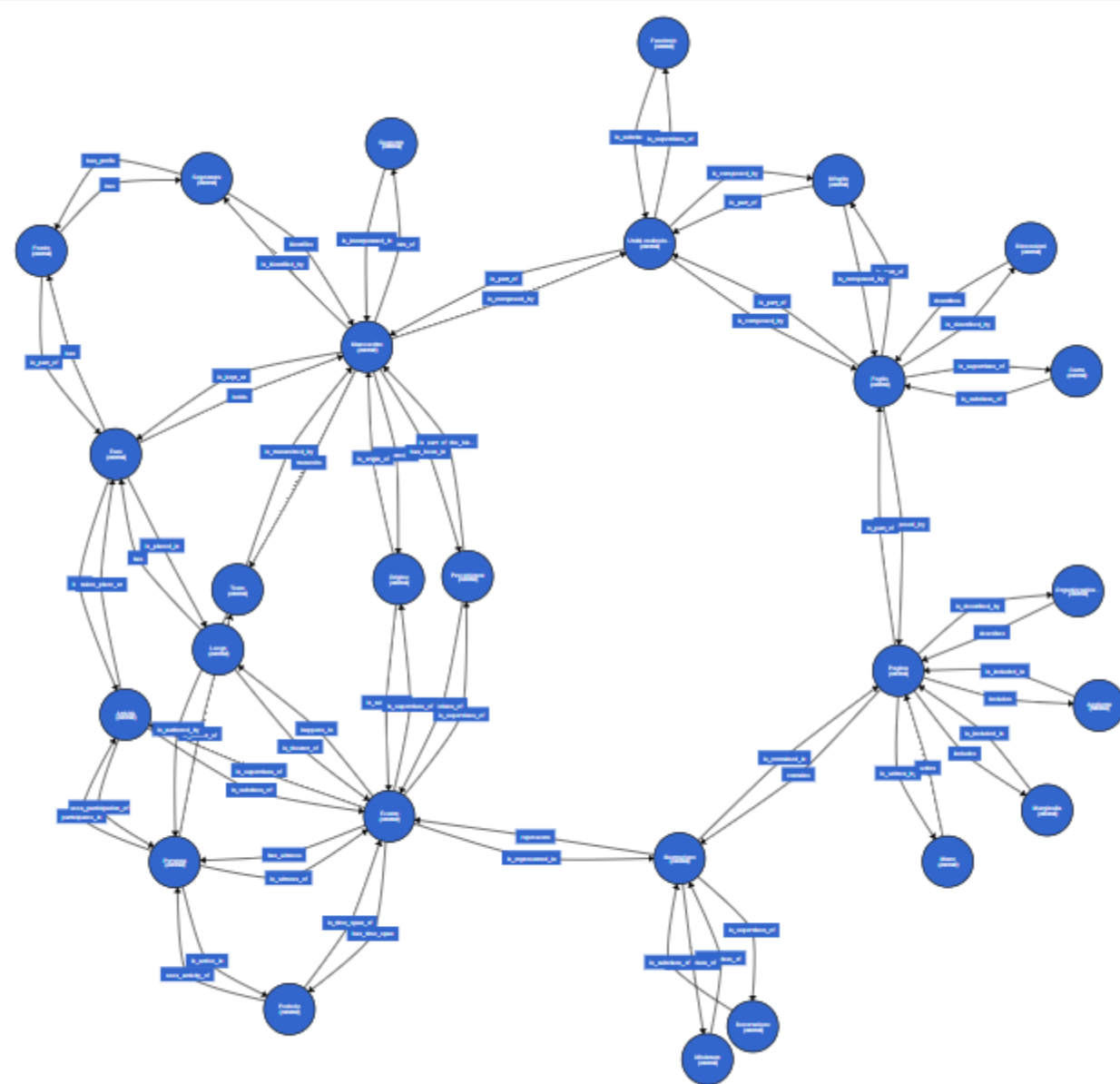
The Manuscript use case was used as a pilot case in the H2IOSC project to bring together the 4 Research Infrastructures (RI) perspectives around one research object.

Objective: to develop interoperability among multidisciplinary resources both at a physical level, creating a National Cloud infrastructure, and at a semantic level, translating the state of knowledge with respect to the resources of each RI into a common semantic interdisciplinary and interoperable representation

Concetto	CIDOC		
	Soggetto	Proprietà	Oggetto
Manoscritto	ex:Manoscritto	rdf:type	crm:E22_Human-Made_Object
	ex:Manoscritto	crm:P128_carries	ex:Manoscritto_INF
Segnatura	ex:Manoscritto	crm:P1_is_identified_by	ex:Segnatura
	ex:Segnatura	rdf:type	crm:E42_Identifier
	ex:Segnatura	crm:P46_is_composed_of	ex:Fondo
	ex:Segnatura	crm:P46_is_composed_of	ex:Ente
	ex:Segnatura	crm:P46_is_composed_of	ex:Manoscritto
	ex:Segnatura	crm:P2_has_type	ex:Tipo=Segnatura
Fondo	ex:Manoscritto	crm:P55_has_current_location	ex:Fondo
	ex:Fondo	rdf:type	crm:E53_Place
	ex:Fondo	crm:P2_has_type	ex:Tipo=Fondo
	ex:Fondo	crm:P89_falls_within	ex:Ente
	ex:Fondo	crm:P89_falls_within	ex:Luogo



Interoperability and Reuse



Creating a layer of interoperability between RIs allows the integration of records from highly diverse individual RIs into a common vision that will:

- 1) allow for the exploitation of resources across the participating member RIs
- 2) create an environment for a expandible integration of these resources

Portal Entity Builder (PEB):

guided OWL ontology editor for contextual entities, linked to catalogue records and digital objects

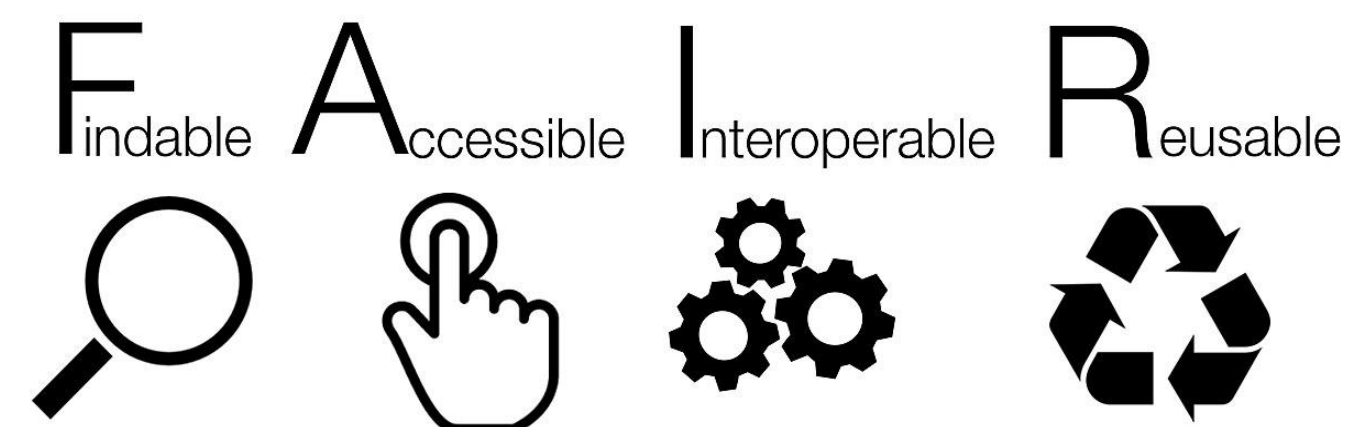
Interoperability and Reuse

Supporting interoperability

- Establishes a common semantic layer shared by all RIs
- Uses FAIR-compliant ontologies and vocabularies
- Aligns data through mapping schemas and shared models
- Includes qualified links between datasets

Enabling reuse

- Ensures resources are richly described and easily discoverable
- Provides clear, standardised metadata and documentation
- Includes licensing and provenance information
- Supports reuse across research contexts and workflows



Interoperability transforms isolated resources into a connected ecosystem



Reuse maximises the value of resources across communities



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Use case: MetaFAIR Ecosystem

Descrizione
Esterna

Segnatura: ITALIA, Toscana, Firenze, Biblioteca Nazionale
Centrale, Nazionale 12/01

Ultima modifica: 01/12/2025 16:09:06 Stato della scheda: ● In lavorazione DPH

GERARCHIA

Identificazione

Descrizione generica

Composizione materiale

Palinsesto

Datazione

M < >

[DE] Firenze, Biblioteca Nazionale Central...

[UC] Firenze, Biblioteca Nazionale Centr...

SEGNATURA

Ente di conservazioneBiblioteca Nazionale Centrale (Firenze) x v

FondoNazionale x v

Identificativo12/01

Collocazione fisica

Alias

MetaFAIR Ecosystem is designed to support the management of the full data lifecycle in alignment with FAIR principles.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani

PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Use case: Digital Heritage and Memory HUB

Digital Heritage and Memory Hub

Fondi e Archivi

Tutte le tipologie ▼ Cerca in Digital Heritage and Memory Hub 🔍 Cerca 178124 risultati

Ordina per rilevanza ▼

Affina la ricerca

Dominio ^

- ☐ Archivistico (174897 risultati)
- ☐ Carteggio (3012 risultati)
- ☐ Manoscritto (74 risultati)
- ☐ Storico-artistico (68 risultati)

Tipologia di scheda ^

- ☐ Unità documentaria (149911 risultati)
- ☐ Unità archivistica (22979 risultati)
- ☐ sottoserie (1640 risultati)
- ☐ Carteggio di Milano (838 risultati)

"ricolte" di grano, uva, biada e altri generi

👁 6 📁 Archivi Sottoserie

Fa parte di Ospedale della Misericordia e Dolce

🔗 66 Scheda →

01. libri grandi

👁 4 📁 Archivi Sottoserie

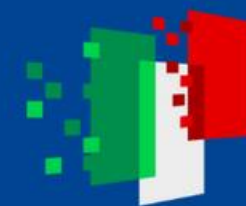
Digital Heritage and Memory Hub (DHMH), is a discovery portal for public access and cross-domain search, providing a unified and integrated discovery interface for heterogeneous SSH resources.



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca

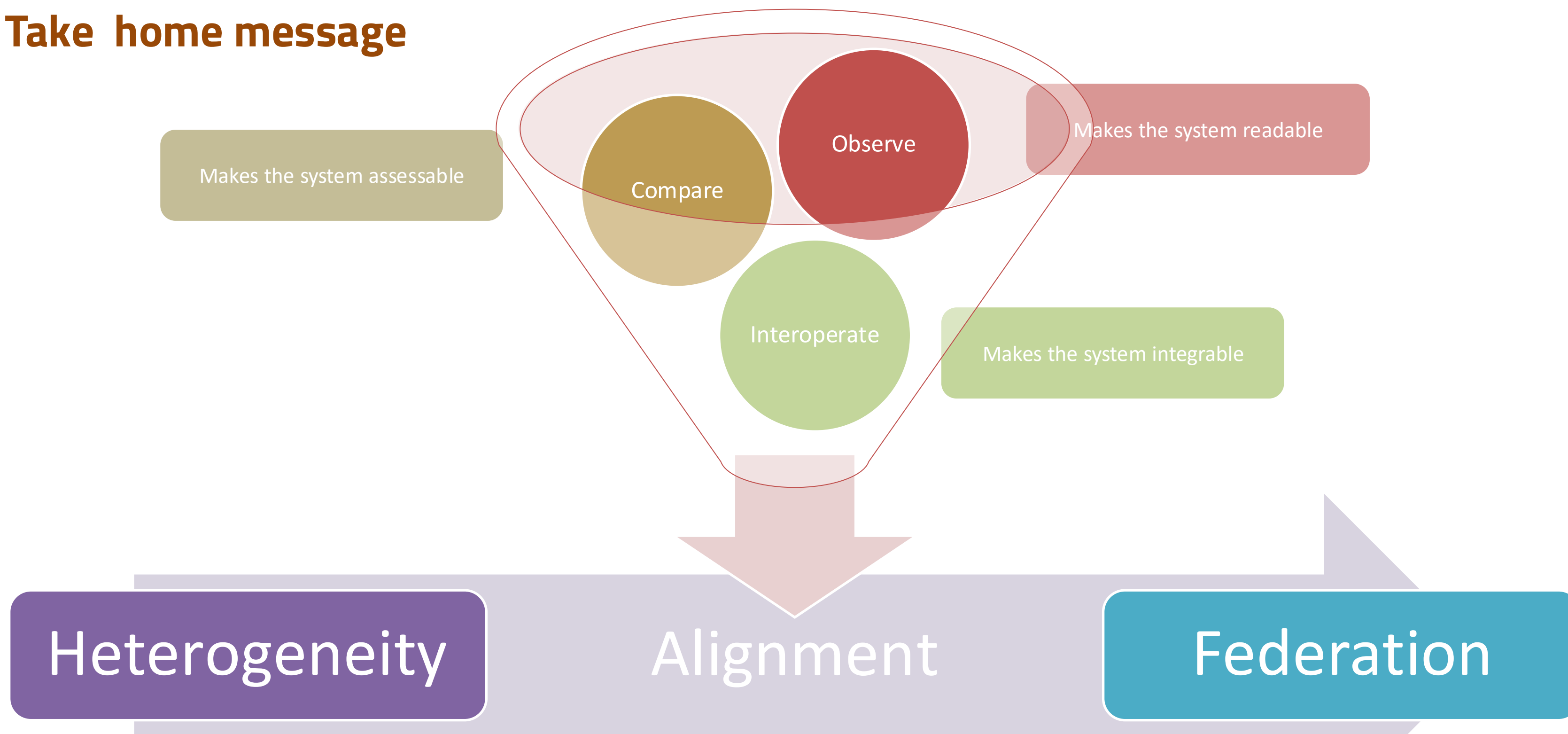


Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



Consiglio Nazionale
delle Ricerche

Take home message

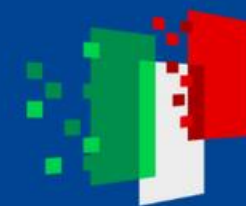




Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



**Consiglio Nazionale
delle Ricerche**

Thank you for your attention