



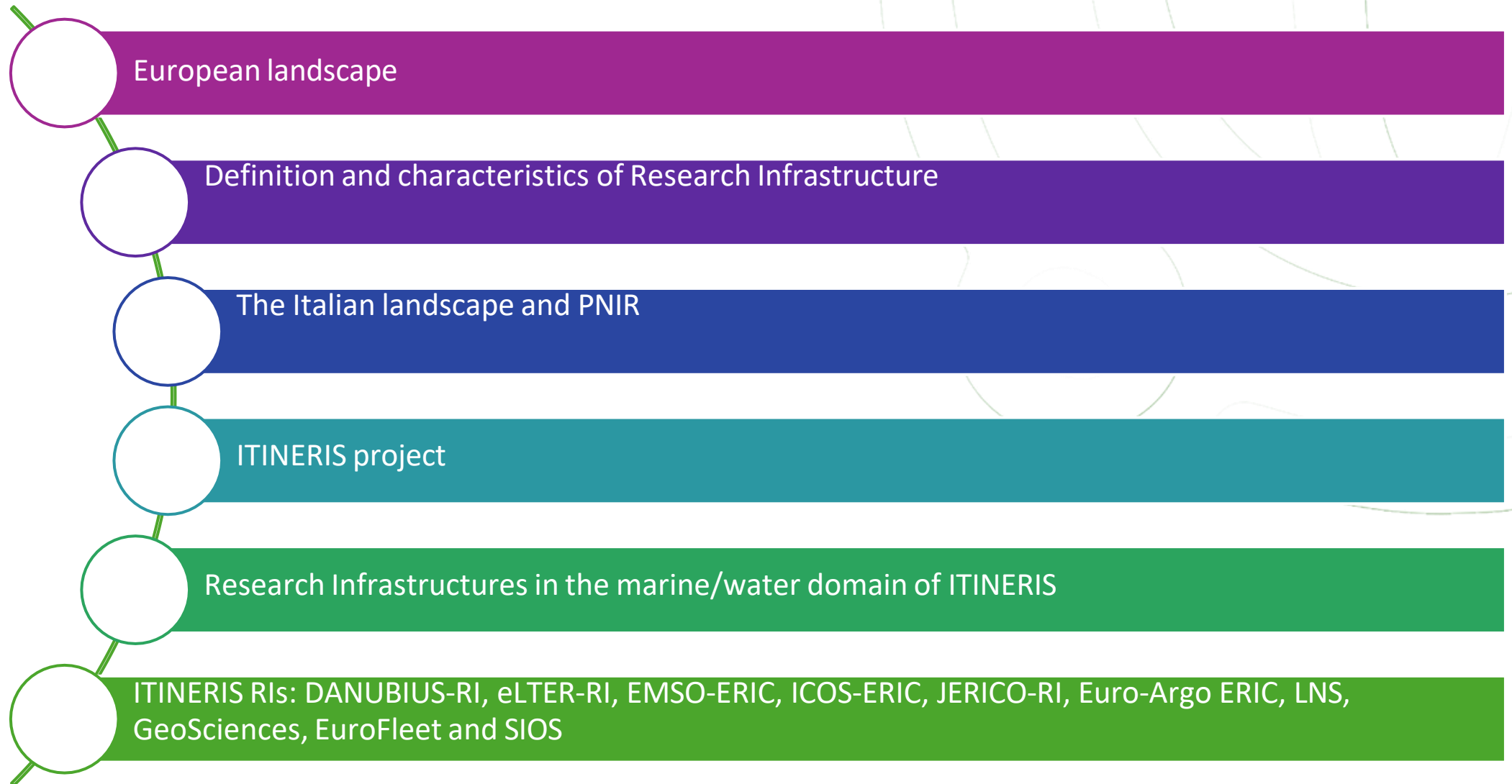
# Introduction to RIs

Francesca De Pascalis, Laura Beranzoli

**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”



# Introduction to RIs





# Italian Landscape of RIs

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## Programma Quadro di Ricerca e Innovazione 2014-2020



Basato sul contributo dei sistemi di ricerca e d'innovazione dei Paesi Membri e degli Stati Associati per la costruzione di quella 'Unione dell'innovazione', componente della Strategia Europa 2020 volta a potenziare la competitività globale del Sistema Europa.

# HIT 2020 - Horizon Italy 2020



Nel 2013 per la prima volta l'Italia adotta un quadro strategico di riferimento coerente con quello europeo per durata e impostazione

## **Motivazione:**

evidenza di criticità importanti per il posizionamento del sistema europeo della ricerca e dell'innovazione e, al suo interno, in maniera più accentuata, di quello italiano.

## **Punto di partenza:**

Consultazione Pubblica sulle direttrici del Programma Quadro per il sistema della ricerca in Italia, Horizon 2020 Italia



## Approccio

- definizione delle **priorità nazionali** e territoriali;
- stimolo alla caratterizzazione delle istituzioni di ricerca e alta formazione del Paese;
- valutazione dei programmi e dei progetti.

## Scopo:

- razionalizzare gli interventi di finanziamento della ricerca pubblica e privata,
- garantire la certezza delle erogazioni in tempi rapidi, prevedere meccanismi di monitoraggio e di valutazione degli interventi
- ridurre il divario Nord-Sud

# HIT 2020 - Horizon Italy 2020



Sintonizzare la programmazione nazionale con quella europea

**Un sistema della ricerca sano ed efficiente, non frammentato e privo di duplicazioni, forte, coeso e strategicamente orientato genera benessere economico e coesione sociale: questo è il grande obiettivo di HIT 2020.**

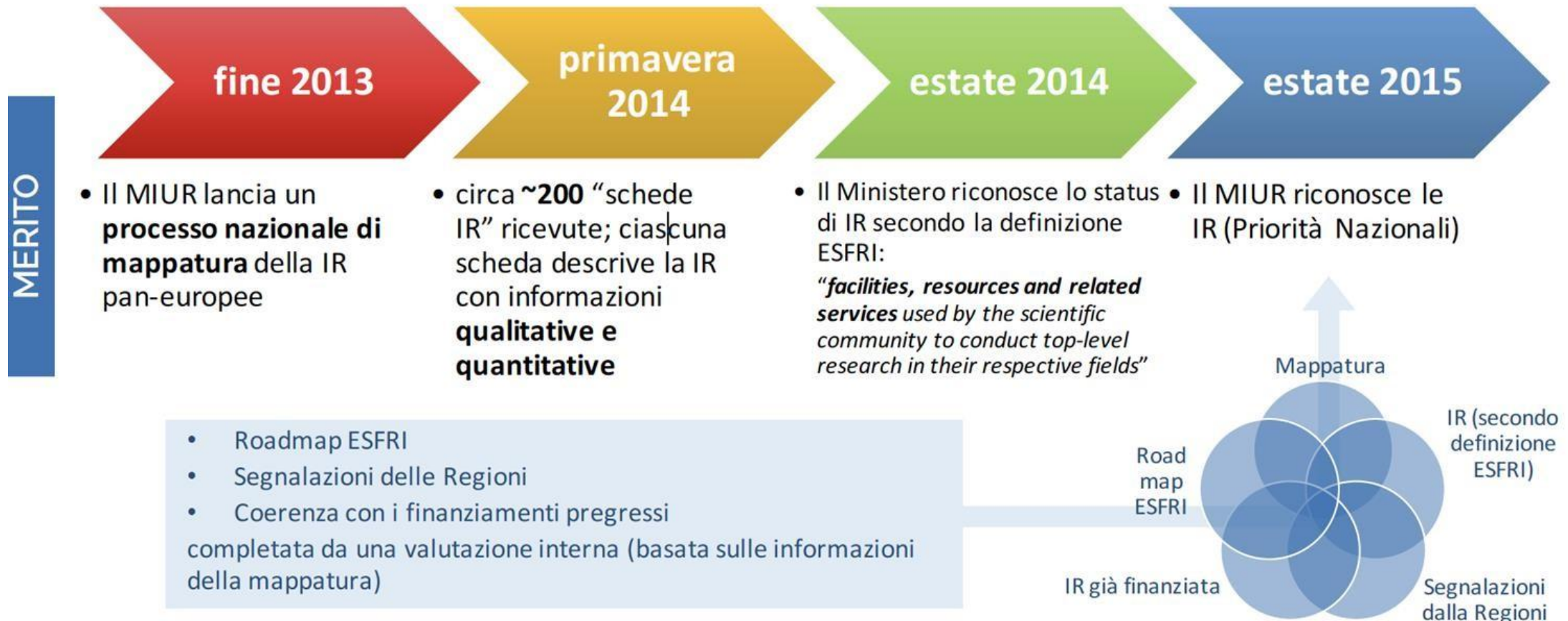


La ricerca scientifica di frontiera e la capacità d'innovazione richiedono Infrastrutture di Ricerca (IR) di alta qualità ed adeguata dimensione, aperta al sistema delle imprese, e la possibilità per i ricercatori dei sistemi privato e pubblico di accedere alle risorse e ai servizi che queste IR rendono disponibili. Questa necessità è avvertita come priorità dalla comunità scientifica e dal sistema produttivo, tanto che da entrambi gli stakeholders il potenziamento delle IR è avvertito come priorità

# How PNIR was developed

## Priorità Nazionali

Courtesy of Catani MUR 2016



# How PNIR was developed

## Selezione e prioritizzazione

Courtesy of Catani MUR 2016



- 2013 mappatura delle IR di interesse pan-Europeo sul territorio nazionale (processo bottom-up)
- scheda per la profilazione della IR con informazioni qualitative e quantitative, per le IR già realizzate, e stime per le IR in fase di realizzazione
- applicazione definizione IR secondo ESFRI
- presenza nella Roadmap ESFRI
- segnalata da una o più Regioni
- già finanziata a valere sui FOE precedenti.
- Integrazione con le Specializzazioni (S3) Nazionali e Regionali

# Da HIT 2020 al Piano Nazionale per le IR

Piano Nazionale per le IR (PNIR), per la prima volta messo a punto nell'ambito di HIT 2020, ha previsto strutture che possano associare nello stesso 'perimetro' anche fisico, oltre che relazionale, attività di ricerca *knowledge driven* ed attività *technology driven*, promuovendo così la collaborazione e la sinergia fra ricercatori di estrazione universitaria (o comunque pubblica) e ricercatori operanti nel settore privato (in particolare PMI).

# Alignment of ESFRI and PNIR

As a Member of the European Union, **Italy aligns its National Research Plan to the European Union R&I framework programs** and commits itself in contributing, developing and enhancing the European Research Area.

**Italy participates with experts to the European Strategy Forum on Research Infrastructures (ESFRI)**, a structured European community of experts from all the scientific and technology disciplines supporting the Research and Innovation Directorate General of the European Commission.

# Alignment of ESFRI and PNIR

Italy adopts the definitions on 'Research Infrastructure' (RI) agreed in EU Framework Programs and ESFRI Roadmaps:

- RIs are facilities that provide resources and services for the research communities to conduct research and foster innovation in their fields:
- RIs are open to users outside the research institutions that host the RI facility;
- A RI is based on 3 essential components:
  - complex facilities (either single-site or geographically distributed)
  - highly skilled and specialised staff
  - operation of services to meet/respond-to the needs of various stakeholders, and external scientists and operated under a unique coordination/governance.

# Alignment of ESFRI and PNIR

A RI's life spans typically 2-3 decades. MUR monitors RIs periodically against criteria which encompass ESFRI monitoring criteria and Country-specific criteria.

Example of the criteria adopted

- the sustainability (political and financial commitment of the participating Countries)
- the capacity to catalyse investments (regional, national, european level, including 'structural funds' and extra-european level
- scientific excellence;
- socio-economic impact;
- user strategy and access policy;
- governance, management and human resources management;
- Risk identification and management.

# PNIR and the RIs of the Marine Domain or having marine components

- **Pan-European fully Marine RIs**
- **Pan-European environmental RIs including a marine component**
- **National Research Vessels**
- **National Research Infrastructures with marine components**

- **EMSO-ERIC**: a network of deep sea fixed-point observatories across European seas for studying oceanographic processes, climate change, and marine ecosystems. ([www.emso.eu](http://www.emso.eu)) . I
- **EuroArgo-ERIC**: Europe's contribution to international Argo programme consisting in a global array of autonomous instruments ([www.euro-argo.eu](http://www.euro-argo.eu))
- **JERICO-RI project**: a network of pan-European multidisciplinary and multi-platform research infrastructure dedicated to a holistic appraisal of coastal marine system ([www.jerico-ri.eu](http://www.jerico-ri.eu))
- **EuroFleet project**: aiming to facilitate open access to an integrated and advanced research vessel fleet, ([www.eurofleets.eu](http://www.eurofleets.eu))

# PNIR - Pan-European environmental RIs including a marine component

- **DANUBIUS**, aims to facilitate and contribute excellent science on the continuum from river source to sea ([www,danubius-ri.eu](http://www.danubius-ri.eu))
- **ECORD**, The European Consortium for Ocean Research Drilling ([www.ecord.org](http://www.ecord.org))
- **E-LTER**, pan-European in-situ research infrastructure whose mission is to study long-term ecological changes [www,elter-ri.eu/](http://www,elter-ri.eu/)
- **EMBRC-ERIC**: pan-European research infrastructure for marine biology and ecology research. It includes a marine component, and it also supports long-term observations with focus on marine biodiversity using omics. ( [www.embrc.eu/](http://www.embrc.eu/) )
- **ICOS-ERIC**, Ecosystem component the green-house gases exchanges between ecosystems and atmosphere, ([www.icos-cp.eu/](http://www.icos-cp.eu/) )
- **SIOS**, a regional observational system for long-term measurements in and around Svalbard ([www.sios-svalbard.org/](http://www.sios-svalbard.org/) )

# PNIR and National RIs in the Marine Domain/with Marine Components

## National Research Vessels:

- **Laura Bassi R/V** (Istituto Nazionale di Oceanografia e Geofisica Sperimentale)
- **Gaia Blu R/V** (CNR)

## National Research Infrastructures with marine components:

- **Laboratori Nazionali del Sud (INFN)**: a national RI based in Sicily, hosting unique facilities for astroparticle, nuclear and applied physics and marine science.
- **Geoscience (ISPRA)** : a network of Italian Regions and Regional Environmental Agencies providing access to data, service

# PNIR 2021-2027 - classification of the RIs in the Marine Domain or having marine components

- Level A: **High Priority** RIs:  
DANUBIUS, ECORD, e-LTER, EMBRC, EMSO, EuroArgo, ICOS, SIOS
- Level B: **Medium Priority** RIs (35 RIs):  
JERICO, Laura Bassi, EuroFleet
- Level C: **Non-priority** RIs (22 RIs not fully compliant to RI definition)

# of RIs classified in Level A = 8

# of RIs classified in Level B = 3

## How RIs are maintained on the long-term

There isn't any specific program addressing the long-term maintenance of RIs, MUR supports financially the high priority RIs on a yearly basis for the period of validity of the RI National Plan.

**RIs can obtain funds mainly for their enhancement, by means of national competitive calls that are also funded by Ministries other than MUR (e.g., Economic Development Ministry), joint Ministry and EC funds devoted to the regional development, Cohesion Funds (FESR - Fondo Europeo per lo Sviluppo Regionale, FSE - Fondo Sociale Europeo), and recently Next Generation EU Funds.**

## PNIR 2021-2027 - RIs of High Priority (Level A)

The high priority RIs are financially sustained and receive founding yearly from MUR.

**SIOS as an exception:** funded by Consiglio Nazionale delle Ricerche through its ordinary funds.

## PNIR 2021-2027 - RIs of Medium and No- Priority (Level B, C)

The RIs with a lower priority are founded by research programs on competitive base (call for proposals), and their sustainability is not regularly guaranteed by national funds.

**The Italian RVs are sustained by the owner institutions** (national funds) also through additional financial resources made available respectively on the basis of a management model and an annual planning.

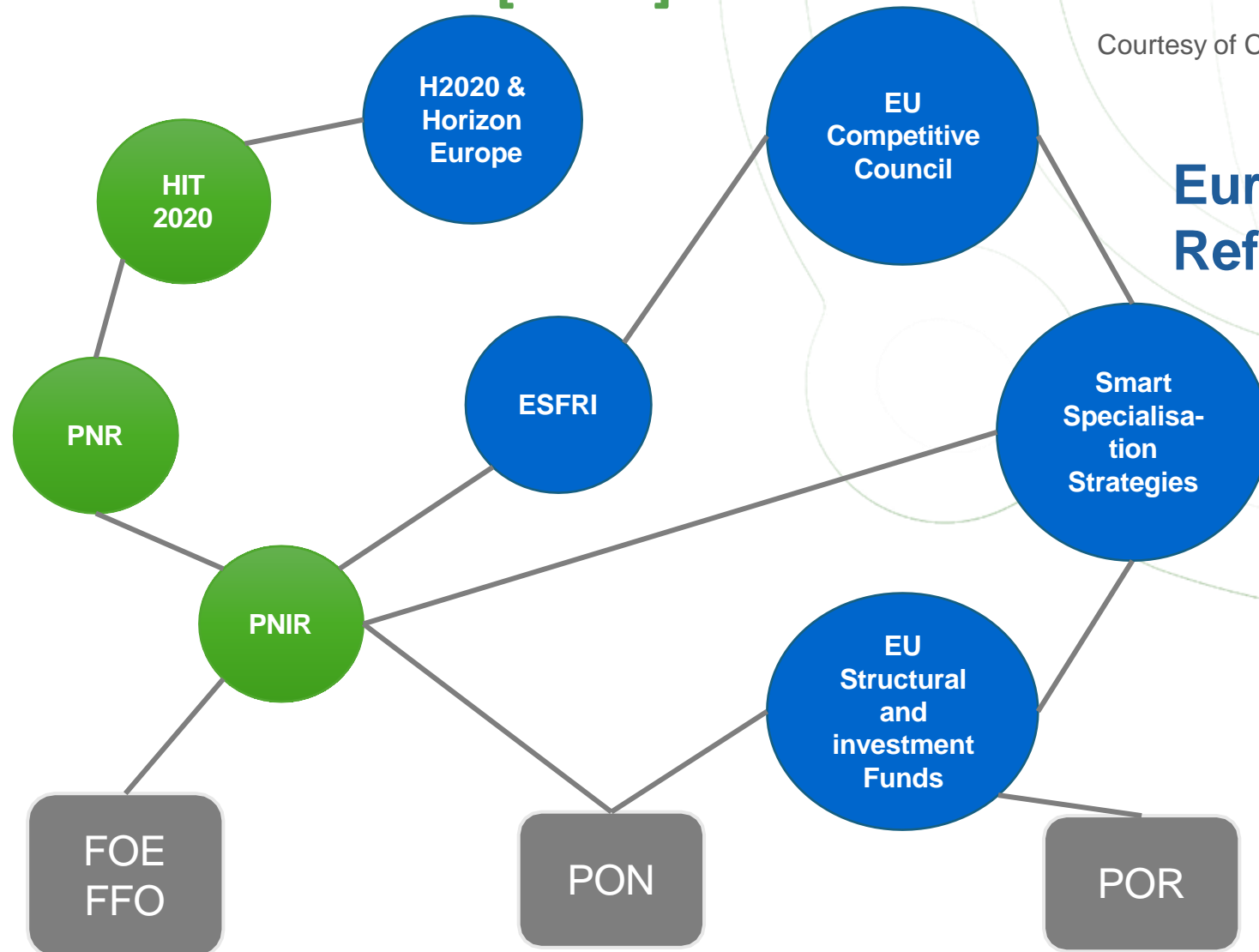
# Da HIT 2020 al Piano Nazionale della Ricerca [PNR] e al Piano Nazionale delle Infrastrutture [PNIR]

Courtesy of Catani MUR 2016

Italian  
References and  
Programmes

European  
References

Fundings  
Instruments





## ITINERIS project

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## Italian INtegrated Environmental Research Infrastructures System

Funded by EU - **Next Generation EU PNRR**

Mission 4 “Education and Research”

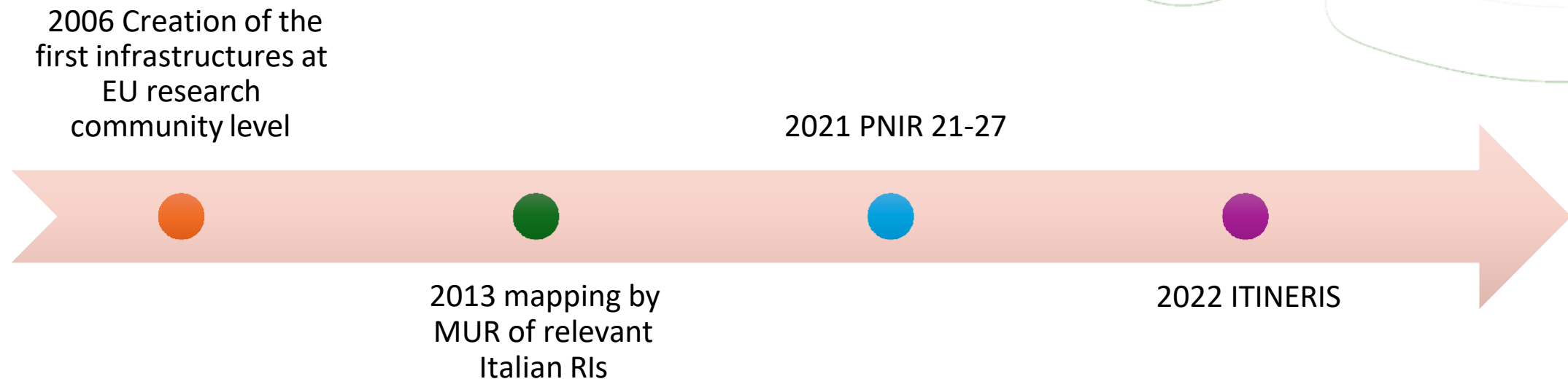
Component 2: “From research to business”

Investment 3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”

# From PNIR to ITINERIS

- PNIR incorporates a new strategy for Research Infrastructures
- integral part of the national strategy (PNR)
- integrated with the National and Regional Smart Specialization Strategies
- satisfies the Ex-ante Conditionality for the use of EU Structural Funds
- creates the conditions for the use of Structural Funds in synergy with other national financing instruments

## ITINERIS includes RIs of High and Medium priority in the PNIR



# ITINERIS project in numbers



**Partners: 7**



**RIs: 22**

**ESFRI Landmarks** ACTRIS, EMSO, Euro-Argo, ICOS and LIFEWATCH, from the ENV domain and ANAEE from the H&F domain and closely linked to the ENV domain;

Italian nodes of the **ESFRI projects** DANUBIUS, DISSCO, e-LTER, from the ENV domain, and EMPHASIS and EU-IBISBA from the H&F domain and also relevant for ENV;

the **EU RIs** ECORD, EUFAR, Eurofleets, JERICO and SIOS, all from the ENV domain;

the national RIs ATLaS, CeTrA, N/V Laura Bassi, and SMINO, from the ENV domain, and Geosciences and LNS, both from the PSE domain, that in ITINERIS support services in the marine domain.

**1 November 2022 – 31 October 2025 + at least 10 years operation**

## Project at a glance



€ 155M INVESTMENT



7 PARTNERS

39 OPERATING UNITS



75 INTERMEDIATE OBJECTIVES

208 DELIVERABLE



8 WORK PACKAGES

89 ACTIVITIES

# ITINERIS Project - Vision, Goal and Objectives

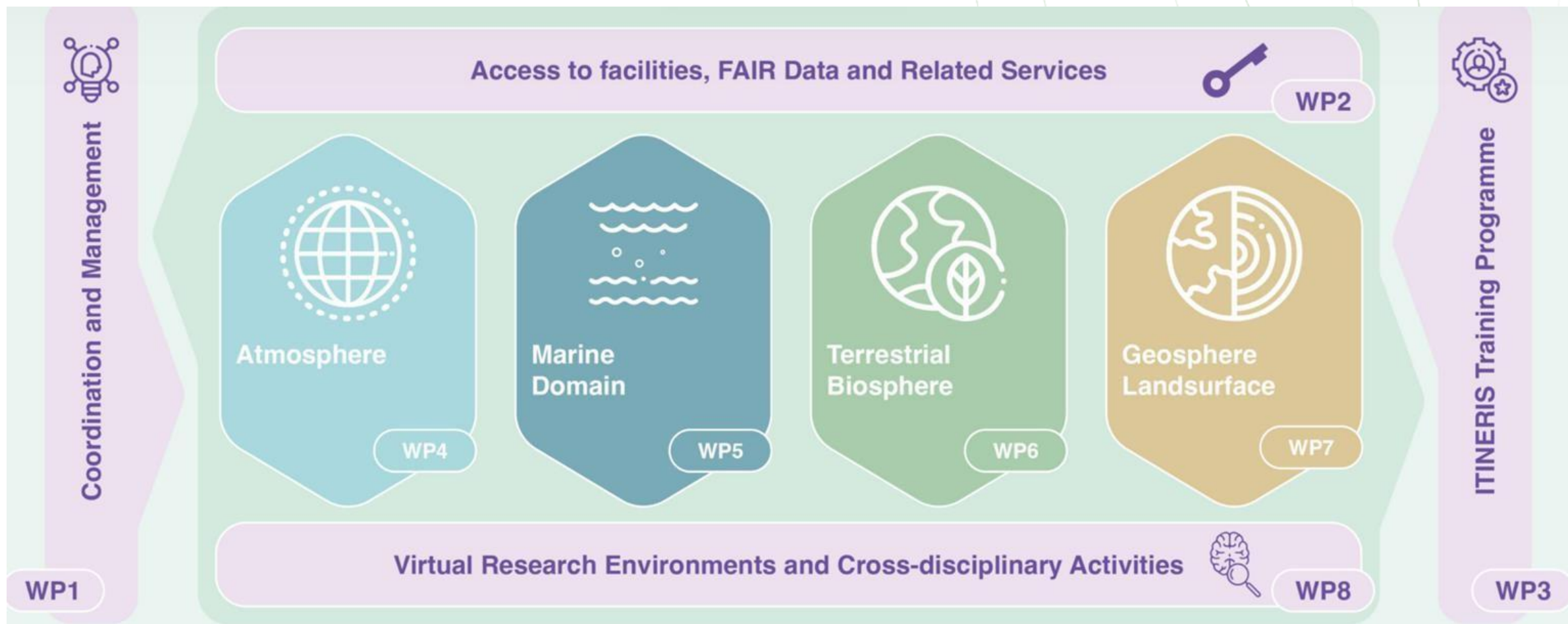


**Support our Country in taking a key role in European environmental research, leveraging the potential of pan-EU and national RIs and designing the framework for the next decades.**

**Develop cross-disciplinary research in environmental sciences through the use and re-use of existing (or pre-operational) data and services and new observations, to address scientifically and socially relevant issues** such as sustainable use of natural resources, implementation of Nature-Based Solutions, Green and Blue Economy, pollution reduction, critical zone and ecosystem management and restoration, carbon cycle, mitigation of the downstream effects of climate and environmental change.

**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 and supporting the Country to address current and expected environmental challenges.

# ITINERIS Project - Main Activities



# ITINERIS project expected impact



## ITINERIS

will establish the **Italian national system of Research Infrastructures in the environmental domain**, creating a coherent and harmonized flow of data, information and knowledge across all the participating RIs.

will produce new knowledge on environmental processes across domains, adopting a whole-system view and considering in particular the interactions and links among the different components, something that is often overlooked in individual RIs.

will favour the link with other domains to promote cross disciplinarity

will induce scientific, economic, and societal effects: (a) promotion of scientific excellence and creation of knowledge and innovation; (b) attraction of new researchers from other territories; (c) attraction of capital and investments in the territory; (d) impact on the competitiveness of enterprises, and more generally in terms of spin-off effect on the territory.



- to **harmonize and integrate** the Italian nodes of marine RIs to guarantee **access to Italian facilities, services and marine data and to ensure long term monitoring of Essential Variables** (Ocean, bio-geo-chemical, climate).
- Implementation of the **Italian Marine Data Store** to provide single point of access to all Italian marine data & services



- **to establish IOOS, the “Italian Integrated Ocean Observing System” able to contribute to European and International effort on ocean observations (GOOS & EOOS)**
- **Upgrade the RIs by installing new instrumentations responding to the digital requirements and to fill data gaps -> focus on bio EOVs & and EBVs observations**



## IT-IOOS key numbers

# RIs

11

# Marine Data Store

1

# Marine data Portal

1

# Components:

32

# PUs:

51

# Internal Interfaces:

5

# External Interfaces: 6

# ITINERIS project - Marine Domain specific objectives



**OBJ1 - Integration and harmonization of Marine Domain RIs towards **IOOS- Italian Integrated Ocean Observing System****

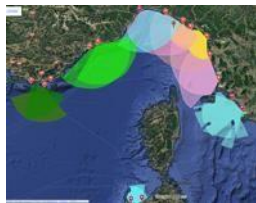
**OBJ2 – Fill the gaps in biological and ecosystem observations**

**OBJ3 -Expand capability of NRT ship-based ocean observations**

**OBJ4 - Develop Pilot services to tackle overarching marine issues**



- CNR-ISMAR-Venezia
- CNR-ISMAR-Bologna
- CNR-ISMAR-Lerici
- CNR-ISMAR-Roma
- CNR-ISMAR-Napoli
- CNR-IAS-Genova
- CNR-IRSA-Taranto
- CNR-ISP-Messina
- OGS\_OCE-Trieste
- OGS\_CGN-Trieste
- IRSA
- INGV-BO -Bologna
- INGV-WIS - Catania
- INFN-LNS -Catania
- ISPRA - Roma



# ITINERIS project - Marine Domain specific objectives



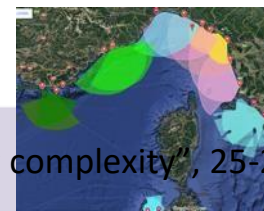
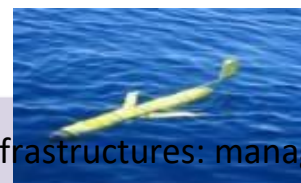
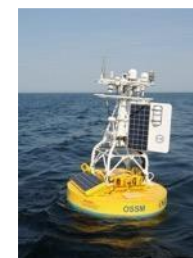
## OBJ1 - Integration and harmonization of Marine Domain RIs towards IOOS- Italian Integrated Ocean Observing System

### Contributing RIs: all

The aim is to **harmonize data and products** from the different RIs and **build up an integrated system of systems** able to ensure continuity of data and services and to respond to user requirements and contribute international effort

#### How:

- **Integration and harmonization** of Marine Domain RIs
- **Design and implementation of IOOS**
- Implementation of the **ITINERIS Marine Data Store**
- Upgrade the RIs by installing **new instrumentations responding to the digital requirements**
- Enounce capability of the **RI marine facilities to transfer data from offshore to inshore**



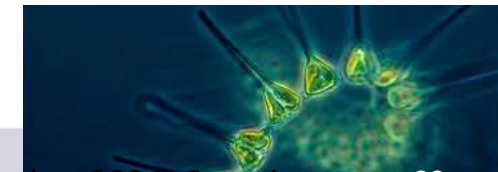
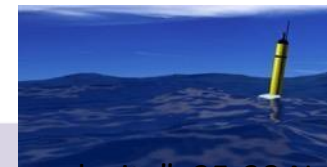
# ITINERIS project - Marine Domain specific objectives

## OBJ2 – Fill the gaps in biological and ecosystem observations Contributing RIs: Euro-Argo, DANUBIUS, JERICO, eLTER, SIOS

The aim is to fill the crucial data gaps in EOVs and EBVs observations in order to ensure monitoring of biochemistry, biological and ecosystem EOVs measurements as national contributions to EOOS, GOOS and GEO BON.

### How:

- Exploiting **new automated technologies** to acquire biological data
- Acquire **new technologically advanced sensors** and **install on autonomous platforms, marine observational sites** and **systems** and remote sites to address the digital revolution (e.g., **smart observatories, Argo floats, gliders, drifters** )
- Reduces the existing gap of EOVs data from instruments moored **in deep waters**
- made available **NRT biological data** through the IOOS Marine Data Store interfaced with the ITINERIS HUB.



## OBJ3 -Expand capability of NRT ship-based ocean observations.

### Contributing RIs: EUROFLEETS, Laura Bassi

The aim is to expand the Italian capacity to acquire and make available in near real time (NRT) physical, biogeochemical and geological ocean variables providing highest accuracy measurements obtainable only with research ships.

#### How:

- **design the Italian contribution to the international research fleets effort on full-depth, coast-to-coast NRT measurements**
- **Acquisition & installation of autonomous systems on board of Italian research ships (Laura Bassi & Gaia Blue);**
- **development of systems for NRT data quality control and data transmission from RV to the IOOS Marine Data Store**
- **definition of the procedures for data policy and access to fleets and observations;**
- **adaptation of the procedures in order to guarantee FAIR data release.**



## OBJ4 - Develop Pilot services to tackle overarching marine issues

### Contributing RIs: All

The aim is **to demonstrate the impact of the integration and harmonization of data and facilities from different RIs by developing five pilot services to tackle overarching marine issues and to respond to key stakeholder requirements.**

#### How:

- Evaluate the impact of improved data availability **on modelling data assimilation and evaluation of model prediction**
- develop **prototype services** for monitoring the **coastal marine environment** in support to Marine Strategy Framework Directive and Water Framework directive;
- **prototype services integrating Eulerian and Lagrangian measurements to improve the representation of open sea environments**
- identification of **new marine protected areas** for the implementation of EU Biodiversity Strategy 2030
- impact of improved data availability **on data-driven models to describe the 4D ocean state**



# Research Infrastructures in the marine/water domain of ITINERIS

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# ITINERIS Project - RIs in the Marine Domain

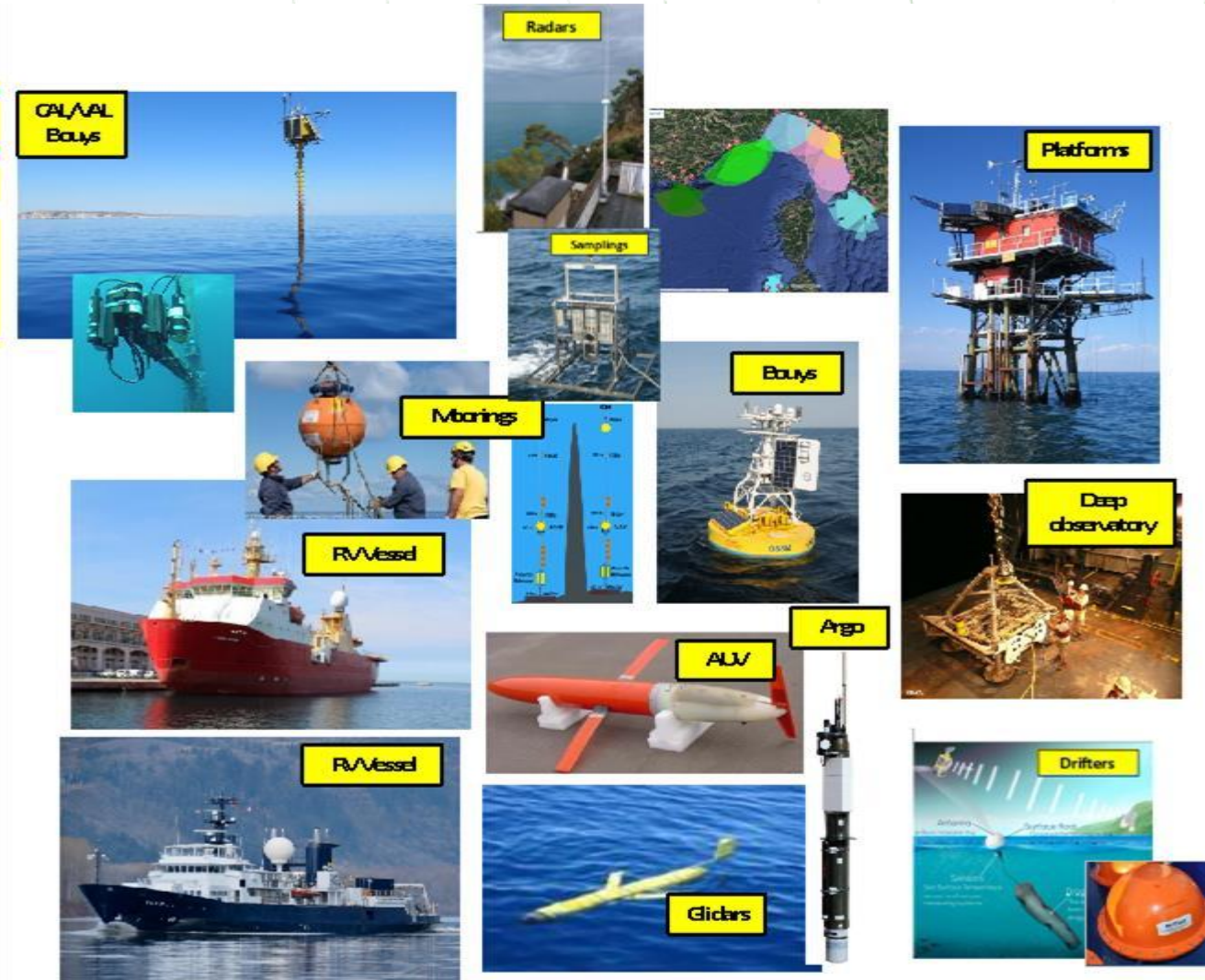
The large national facilities includes:

- RV vessels
- Deep observatories
- Off-shore Platform
- Gliders & AUVs
- observational networks of buoys, tide gages,
- specialised laboratory facilities (e.g., analytical, experimental, test benches)
- e-facilities (ICT/digital) for data management and data services operation

These facilities contribute to acquire observations as Italian contribution to GOOS

Italy considers Research Infrastructures a key element to ensure long term ocean observations

Italy contributes to the European Research Infrastructures



# ITINERIS Project - Marine Domain RIs



Euro-Argo ERIC allows active coordination and strengthening of the European contribution to the international Argo programme to explore the open ocean.

<https://www.euro-argo.eu>



EMSO aims to observe the oceans in the long term, better understand the phenomena in and under them and their interactions and roles in terrestrial systems through a multidisciplinary approach.

<https://emso.eu>



International Centre for Advanced Studies on River-Sea Systems

DANUBIUS-RI mission is to facilitate and contribute excellent science on the continuum from river source to sea; to offer state-of-the-art research infrastructure; and to provide the integrated knowledge required to sustainably manage and protect River-Sea Systems.

<https://www.danubius-ri.eu/>

## ICOS



The ICOS Marine component currently coordinates twenty-nine ocean stations from seven countries monitoring carbon uptake and fluxes. ICOS ensures high quality measurements that are independent, transparent and reliable, to quantify fluxes and to assess their variability and drivers.

[www.icos-ri.eu](http://www.icos-ri.eu)



EMBRIC aims to advance knowledge of marine biodiversity and ecosystems. It gives access to research facilities and expertise in marine biology and ecology a network of European marine stations to support the blue sustainable economy.

<https://www.embric.eu/>



JERICO-RI is an integrated pan-European multidisciplinary and multi-platform research infrastructure dedicated to a holistic appraisal of coastal marine system changes.

<https://www.jerico-ri.eu/>



eLTER-RI is a pan-European in-situ research infrastructure whose mission is to study long-term ecological changes in terrestrial, freshwater and transitional ecosystems through a holistic 'whole system' approach.

<https://www.elter-ri.eu/>



The Eurofleets+ project will facilitate open access to an integrated and advanced research vessel fleet, designed to meet the evolving and challenging needs of the user community.

<https://www.eurofleets.eu/>



SIOS is a collaborative effort to develop and maintain a regional observational system for long-term measurements in and around Svalbard, addressing Earth System Science questions related to Global Change

<https://sios-svalbard.org/>



ECORD is the European Consortium for Ocean Research Drilling as part of the International Ocean Discovery Program (IODP) "Exploring the Earth under the sea"

<http://www.iodp-itie.ucl.ac.uk/index.php/it/>

# ITINERIS Project - Facilities of the Marine Domain (locations)



- ◆ Danubius
- ◆ Danubius, JERICO, eLTER
- ◆ Danubius, JERICO, ICOS
- ◆ eLTER
- ◆ EMSO
- ◆ EMSO, ICOS
- ◆ EMSO, LNS
- ◆ EURO-ARGO
- ◆ GeoSciencesIR
- ◆ ICOS
- ◆ JERICO
- ◆ JERICO, eLTER, ICOS
- ◆ JERICO, EMSO
- ◆ LNS



# ITINERIS Project - Italian R/V

## R/V GAIA BLU



**Length overall:** 82.90 m  
**Beam, overall:** 13.00 m  
**Gross tonnage:** 2024 T  
**Cruising Speed:** 11 knots  
**Endurance:** 36 days  
**Scientific Personnel:** 26 people  
**Crew:** 18 people

**Length overall:** 80 m  
**Beam, overall:** 17.00 m  
**Gross tonnage:** 4028 T  
**Cruising Speed:** 12 knots  
**Endurance:** 60 days  
**Scientific Personnel:** 50 people  
**Crew:** 22 people



**R/V LAURA BASSI**

# ITINERIS Project - R/V for coastal/regional activities



**R/V Litus**



**R/V Leonardo**



**R/V Tecnopescas II**



**R/V Astrea**

# ITINERIS Project - IOOS

Sub-Systems -  
Research  
Infrastructures

Marine Data  
Store  
(federated)

Marine Data  
Portal  
(access point)



# IT-IOOS

## General requirements of IT-IOOS

- Provide a **single access point** for the users to access to the entire ocean database and RIs' services
- IT-IOOS data includes **all available datasets** from: 11 RIs, ITINERIS integrated marine products, able to host additional products
- Designed as a **modular system configurable** either at system and sub-system levels
- Designed to allow any **upgrade and integration of additional sub-systems** without requiring any change of the overall system architecture.



# THANKS!

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