



JERICO-DS DELIVERABLE	
Joint European Research Infrastructure of Coastal Observatories - Design Study	
DELIVERABLE #, WP# and full title	JERICO-DS D2 / D1.2 - WP1 - First elements to unify environmental RI efforts at national level
5 Key words	EU landscape, RI collaboration, nested scientific approach, synergy, framework
Lead beneficiary	Ifremer
Lead Author	Lucie Cocquempot
Co-authors	Marcello G. Magaldi, Antoine Grémare, Holger Brix, Laurent Delauney
Contributors	
Submission date (dd/mm/yyyy)	08/07/2022 (DRAFT) - 05/12/2022 (FINAL)

Nature : R

R = Report, P = Prototype, D= Demonstrator, O = Other

Dissemination level : PU

PU PP RE CO

PU = Public, PP = Restricted to other programme participants (including the Commission Services), RE = Restricted to a group specified by the consortium (including the Commission Services), CO = Confidential, only for members of the consortium (including the Commission Services)

GRANT N°: 951799

PROJECT ACRONYME : JERICO-DS

PROJECT NAME : Joint European Research Infrastructure network of Coastal Observatories - Design Study

COORDINATOR : Laurent DELAUNEY - Ifremer, France - design.jerico@ifremer.fr

DOCUMENT TECHNICAL DESCRIPTION

Document ID	JERICO-DS-WP1-D1.2-011222_V2
--------------------	------------------------------

REVISION HISTORY			
Revision	Date	Modification	Author
V1.0	08/07/2022	First version (Draft)	Lucie Cocquempot
V1.1	23/10/2022	Comments	Dominique Durand
V1.2	23/10/2022	Comments	Holger Brix
V2.0	01/12/2022	Final version	Lucie Cocquempot

APPROVALS				
	Name	Organisation	Date	Visa
Coordinator	Laurent Delauney	Ifremer	05/12/2022	X
WP Leaders	Marcello Magaldi	CNR	02/12/2022	X

Diffusion list			
Consortium beneficiaries	Third parties	Associated Partners	other
X			

PROPRIETARY RIGHTS STATEMENT
THIS DOCUMENT CONTAINS INFORMATION, WHICH IS PROPRIETARY TO THE JERICO-DS CONSORTIUM. NEITHER THIS DOCUMENT NOR THE INFORMATION CONTAINED HEREIN SHALL BE USED, DUPLICATED OR COMMUNICATED EXCEPT WITH THE PRIOR WRITTEN CONSENT OF THE JERICO-DS COORDINATOR.

According to the Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) and the 78-17 modified law of 6 January 1978, you have a right of access, rectification, erasure of your personal data and a right of restriction to the data processing. You can exercise your rights before the Ifremer data protection officer by mail at the following address: IFREMER – Délégué à la protection des données- Centre Bretagne – ZI de la Pointe du Diable – 29280 Plouzané - FRANCE or by email: dpo@ifremer.fr + design.jerico@ifremer.fr
Ifremer shall not hold your personal data for longer than necessary with regard to the purpose of the data processing and shall destroy it thereafter.



Table of Content

EXECUTIVE SUMMARY	4
Introduction	5
Preamble	5
Scope and purpose of the deliverable`	5
Main report	7
Outreach, dissemination and communication activities	14
Conclusion and next steps	14
Annexes and references	14

EXECUTIVE SUMMARY

EU environmental Research infrastructures (RI) are the result of a construction by scientific communities and are therefore organised, most often, by thematic domains. They are designed to respond to scientific questions and/or service demands, and involve technological developments and innovations. However, a certain number of infrastructures are interconnected and/or allow for cross-cutting, interdisciplinary studies in various environments, from physical-chemical processes (climate, elemental cycles, etc.) to the functioning of systems. Research infrastructures in Earth system and environmental sciences are one of the cornerstones of the response to the major scientific challenges posed by the UN's SDGs for the 2030 horizon or those of the UN Decade of Ocean Sciences for Sustainable Development (2021-2030). They provide essential tools for making observations and acquiring data on processes and modelling them.

In order to optimize the position and role of JERICO-RI in the European landscape of environmental RIs and more particularly in the hydrosphere domain (such as EMSO, ARGO, DANUBIUS, AQUACOSM, eLTER), the present deliverable 1.2 aims at outlining a framework for collaboration with other IRs. Part of this task is being treated in the JERICO-S3 project by a top-down approach in JS3-WP2, the present work will ensure a bi-directional or even nested scientific approach by studying the landscape, the relationships already established by each national RI and the scientific and social needs.

The main outcomes of this Deliverable D2.1 (preliminary version) are :

- A description of the landscape of environmental Research Infrastructures at European level, with a focus on those directly associated with the observation inland waters and ocean systems and therefore within the perimeter of JERICO-RI
- Two national examples of structuring interactions between national nodes of European marine research infrastructures: France and Italy
- The formulation of preliminary suggestions for the implementation of a collaborative framework at European level based on the prioritised societal needs expressed by the nations

This deliverable is a preliminary version, the full content will have to be discussed, enriched and validated by all WP1 members and representatives constituting the Nations Committee.

1. Introduction

Preamble

Environmental Research Infrastructures (RIs) aim to understand the functioning of the Earth System and the Environment, from the solid earth and continental surfaces to the fluid envelopes of the oceans and the atmosphere, as well as the biosphere and interactions with socio-anthropogenic systems. This research is fundamentally linked to the major issues of global change, the scarcity of resources and therefore the development of our societies. Strong links exist between RIs and the sustainable development goals (SGGs) defined by the United Nations. The work done in RIs is conducted on an international scale and, as a minimum, they are part of the European research area, in particular the ESFRI roadmap. The data from research infrastructures, even if they are not initially dedicated to the production of operational services, nevertheless allow for a better understanding of our environment and its crises, and therefore for the development of adaptation or mitigation strategies.

The purpose of Environmental Research Infrastructures is to share the major community logistical tools necessary for research, in particular fleets (ships, aircraft, etc.), as well as to make observation, experimentation, collection, demonstration and modelling tools available, and to produce analytical, observation or experimental data. Environmental issues are intrinsically at the confluence of the "physical environment" and the "living" and therefore also concern communities close to the biological sciences with which they share certain RIs. One of the major characteristics of Environmental RIs is the pooling of observation and experimentation tools constituting fundamentally distributed networks from data collection to data sharing. Environmental RIs allow the transition from networks to a community tool. Environmental RIs are accompanied by e-infrastructure specifically dedicated to making available data from various sources, from field observation to satellites. Most of the RIs dealing with both data production tools and the data themselves and their uses have the capacity to integrate or found infrastructures on a European scale.

Scope and purpose of the deliverable`

JERICO-RI is aimed at designing and building a sustained pan-European integrated Research Infrastructure dedicated to the observation of coastal marine systems. In the evaluation report of the JERICO-RI application to the ESFRI 2021 roadmap, given the large number of terrestrial and oceanographic RIs already in place, the coast has been labelled as a "forgotten frontier" and the JERICO effort as a "refreshing-to-see" RI being "fully focussed on the coast". JERICO-RI indeed fills the gap underlined in the Landscape Analysis of the Strategy Report on Research Infrastructures of the 2021 ESFRI Roadmap which, in the section entitled "Gaps, challenges and future needs" of the Marine Environmental subdomain, states:

"As the coastal ocean is currently a key component of the UN Decade of Ocean Science for Sustainable Development and has become a high priority on the worldwide environmental political agenda, Europe needs dense enough, well instrumented sites and regions to study, observe and monitor water of the coastal

shelf. The comprehensive analysis of the changes in the coastal ecosystems requires an integrated basin approach to understand the impact of different drivers and to find measures for coastal preservation, management and planning. The long-term observation is needed to address transversal scientific and societal challenges acting at various spatio-temporal scales, and to understand large-scale processes that can significantly impact coastal and littoral areas. This could only be achieved at the pan-European level."

The same gap is visually evident in the Figure 1 below, taken from the same Strategy Report but for the 2018 ESFRI Roadmap. Such a figure still represents a valid reference as no new entry has been registered from 2018 in the last Roadmap in the Environment Domain. In filling the volume of this recognized gap, it is clear from the evaluation report of JERICO-RI application to the ESFRI 2021 roadmap that JERICO-RI has to clarify "its interaction in overlapping areas (geographical and scientific disciplines) with established RI".

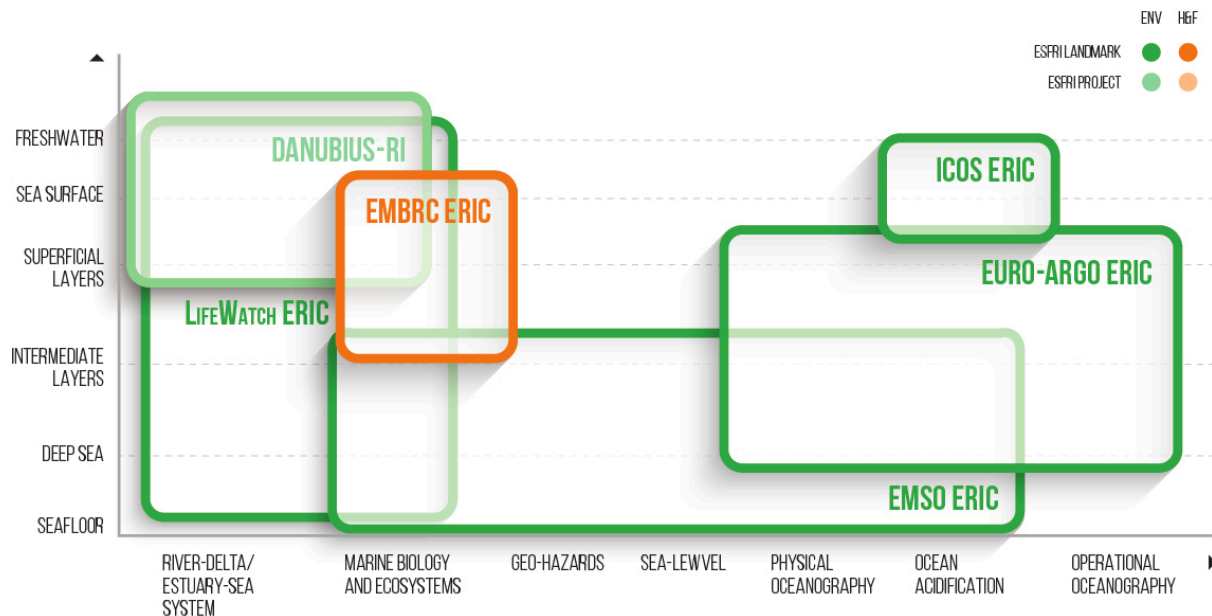


Figure 1: Simplified diagram of the observation capabilities of ESFRI Landmarks and Projects respect to the hydrosphere components (Y axis) and to the environmental processes therein (X axis). Source: Strategy Report on Research Infrastructures of the 2018 ESFRI Roadmap.

The general objective of the JERICO-DS WP1 is the establishment of the long-term scientific plan for the creation of JERICO-RI, including a description of socio-economic impacts at national, European and global levels. This objective is pursued following three main directions/tasks:

- including national needs, assets and strategies (Task 1.1);
- drawing the boundaries of JERICO-RI in the national landscapes and contributing to global coastal observations (Task 1.2);
- defining Key Performance indicators (KPIs) for scientific excellence and impact of the services provided (Task 1.3).

The scientific synergies with other marine and environmental RIs at the national level and the monitoring of the national strategic long-term plans regarding the respective national RI landscapes are the general goals of Task 1.2 and at the core of the Deliverable D1.2: "First

elements to unify environmental RI efforts at national level: national scientific expectations across RIs (specific goals, expertise, data)".

To optimise the position and role of JERICO-RI in the European landscape of environmental and of course marine RIs (such as EMSO, ARGO, DANUBIUS, AQUACOSM, eLTER, etc¹), the JERICO-DS project makes a special effort to establish a framework for collaboration with other RIs. As part of this task is addressed in JERICO-S3 through a top-down approach in JS3-WP2 with representatives of the RIs², task 1.2 of JERICO-DS is ensuring the two-way scientific approach by investigating the scientific needs, expertise and type of data that each RI expects from the other national RIs in order to foster synergies between RIs at national level. Deliverable D1.2 is a first step in the exploration of RI synergy which will be complemented by the contributions of Work Packages 2 and 3 which will assess technical complementarities, Work Packages 4 and 5 will assess the consequences on business plan and governance. The present deliverable D1.2 will thus help design the dynamic framework in which JERICO-RI will evolve over the next 10 years.

2. Main report

2.1. Context

The current Environmental Research Infrastructures landscape is increasingly complex and at times overlapping, making it difficult to distinguish the roles of individual RIs. The marine landscape is no exception here, as RIs start to expand their missions into the marine environment. As a consequence adjustment is required in the face of the growing number of RIs wishing to claim their part of the marine territory.

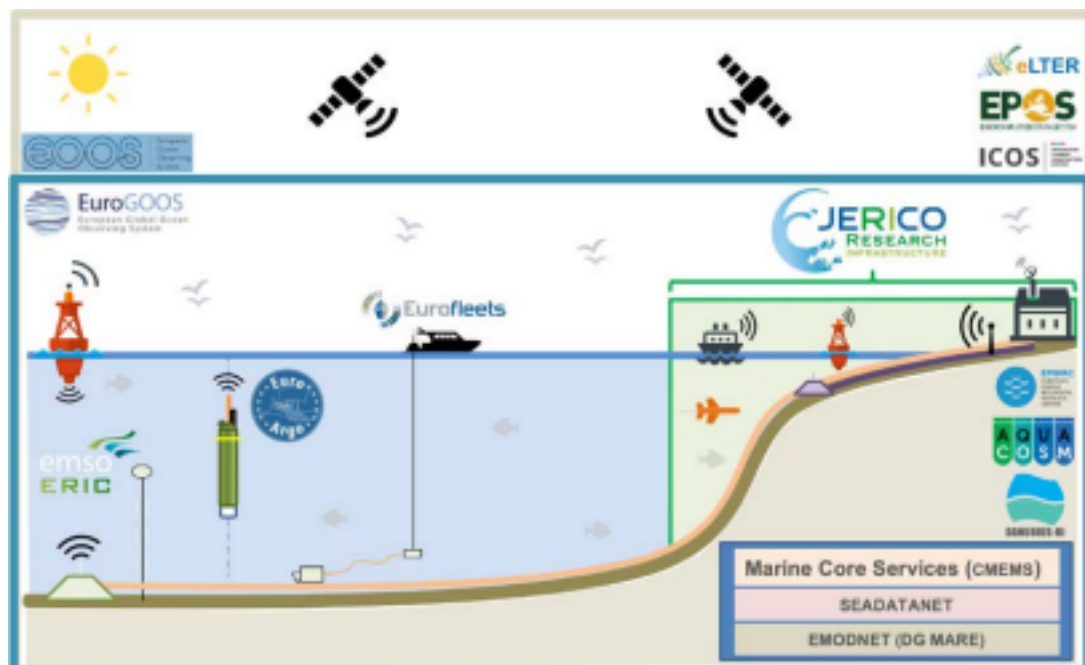


Figure 2 : The EU marine landscape around JERICO-RI

¹ A description of the environmental RIs close to JERICO is available in Annex 1

² A case-study of JERICO-S3 regional approach of RI interaction is available in Annex 2

General statement from marine RIs

In order to support the European Commission in this needed coordination, marine RIs of the ENVRI community prepared and sent an official statement to members of the Mission board for *Healthy Oceans, Seas, Coastal and Inland Waters* in June 2020, which reads: “*In the spirit of the ENVRI Community Statement on Horizon Europe, the Research Infrastructures with expertise in the marine domain are ready to contribute to the Mission for Healthy Oceans, Seas, Coastal and Inland Waters.*”

Jointly EMBRC, EMSO, EuroARGO, EuroFleets+, JERICO-RI and Danubius present a unique opportunity to support the observation, monitoring, and study of marine systems from the land to the open ocean. Together, they can provide an integrated pan-European multidisciplinary platform, combining in situ and remote observations of physical, chemical, and biological parameters with experimental manipulation, to provide the basis for a holistic understanding of European marine systems, from the Arctic to the Red Sea. They establish the framework upon which marine systems are observed, analysed, understood and forecasted. They enable open access to state-of-the-art and innovative experimental facilities, resources, and services, fostering international scientific collaboration and championing FAIR data. Collaboration with other environmental research infrastructures covering several domains, such as Danubius, eLTER, EUFAR, and ICOS, provides further added value by addressing specific questions related to the carbon cycle, effects of climate change, and sea-air interactions. The data, products and services offered by the marine RIs are an essential contribution to the European Open Science Cloud (EOSC) initiative.”

JERICO-RI targets observations of the coastal ocean processes, providing multidisciplinary datasets for coastal science and societal applications. As such, JERICO-RI interfaces with a number of other harmonised initiatives such as other ESFRIs, data management institutions as well as observing regional and global observing systems. The creation and development" of JERICO-RI represents an important opportunity to coordinate RI efforts in the marine domain and valorise strong complementarity and added value in the observation and services offered by marine RIs, notably EuroARGO-ERIC, EMBRC-ERIC, EMSO-ERIC. This is also providing the opportunity to clarify key-interaction with the RIs that address also inland waters and air, such as Danubius, eLTER, LifeWatch, ICOS-ERIC, and Aquacosm.

2.2. Method

2.2.1. Strategy to clarify the levels of interaction with the sister-RIs

Collaborations with different RIs can occur at different levels according to different motivations. In the framework of the JERICO-S3 project (H2020 funded) a JERICO-RI Board of RIs (or at least a RIs reunion framework³) has been set up to foster collaboration with EuroARGO-ERIC, EMBRC-ERIC, EMSO-ERIC, Danubius, eLTER, LifeWatch, ICOS-ERIC, Aquacosm, including face to face discussions to agree on common subjects of collaboration. Where appropriate, work towards establishing Memorandums of Understanding (MoUs) is undertaken. In addition, specific regional collaborations will be explored, created and reported in regional sites of JERICO-RI (WPs 3 & 4 of JERICO-S3) in order to build upon factual exercises and elaborate future frameworks.

In order to promote a bi-directional approach (both top-down and bottom-up), a first step was to map the different levels of interaction of the JERICO community with the other RIs. Table 1 illustrates this diversity according to research questions, national structures and political

³ JERICO-RI Board of RIs first met in JERICO Week #2 in April 2021

contexts. We can therefore sometimes speak of nested approaches rather than considering a 'high' level (strategic and political) and a 'low' level (close to local research issues)

Local level	Collaboration motivated by the sharing of equipment, techniques or expertises for the ecosystemic observation of a given environment. <i>Example: the Northern Adriatic region observed by DANUBIUS and JERICO</i>
Institutional level	Collaboration motivated by the expertise of an institute strategically positioned to coordinate observational infrastructure <i>Example: Marine Institute in Ireland, national node for EURO-ARGO, EMSO-ERIC, JERICO-S3</i>
National level	Collaboration decided by a national scientific strategy from the national ministries (often Ministry of Research) or by an inter-organisational agreement. <i>Example: in France, the recently created FR-OOS (French Ocean observing system) aims to coordinate the interactions of the various infrastructures at national level. Its constitutive agreement was established in consultation with all the scientific institutes in charge of ocean observation</i>
European level	Collaboration decided by the management teams of the two European infrastructures <i>Example: Draft agreement to develop joint Transnational access between AQUACOSM and JERICO</i>

Table 1 : The different levels of interaction of the JERICO community with the other RIs

While the national level is essential because it is the one that will guide the policy of an ERIC and ensure long-term sustainability, it is important to ensure that it responds to expectations at the local and institutional levels, and that a space for collaboration is possible at the European level.

2.2.2. National strategies to structure the European Environmental RI landscape

The strong involvement of national partners of JERICO-DS in other environmental ESFRIs is a strong asset. As shown in figure 1 nearly all nations covered by the consortium are represented in several already-existing marine RI infrastructures (in blue shades in the histograms). JERICO-DS will also benefit from the experience of the 2 nations (France, Italy) in the consortium that are members of more than 20 initiatives from the ENVRI community

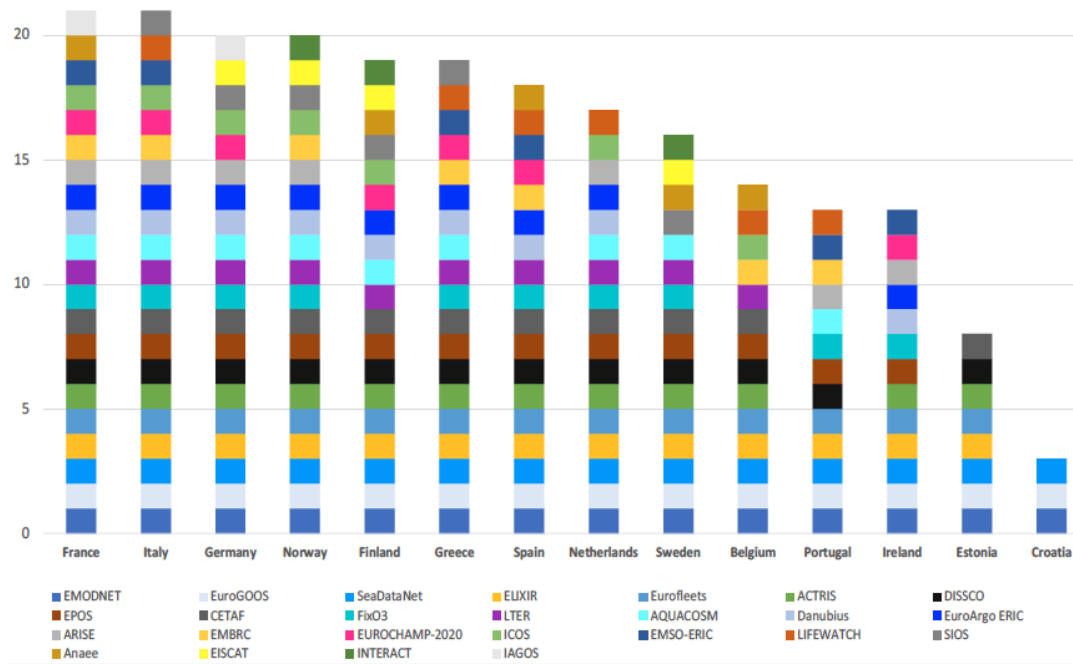


Figure 3 : JERICO-DS Nations involvement in EU environmental RIs and initiatives (ENVRI Community)
(Initiatives regarding marine sciences are represented in blue shades)

An overview of French research infrastructures in the field of Earth system and environmental sciences and coordinating initiative for marine observation

In France, the Ministry in charge of research has set up a structuring approach that led in 2008 to the publication of an initial national roadmap for research infrastructures, updated in 2012, 2016, 2018 and 2021, in parallel with the successive updates of the European ESFRI (European Strategy Forum on Research Infrastructures) roadmap. In 2021, it included 25 research infrastructures in the field of the environment, some of which are shared with the Biology-Health or Energy domains. The thematic breakdown into four major domains (atmosphere - oceans - hydrosphere, continental ecosystems and soils - geosphere) adopted by the European ESFRI roadmap serves as a framework for this document. Analysis shows the consistency of the French research infrastructure system within each field : The basic building blocks of the organisation are, for the most part, national observation and measurement networks that are the result of an effort to build them over several decades by communities, organisations and institutions. Many of these national systems are French mirrors of European or international infrastructures. These networks also have local or regional variations. Some of the schemes extend well beyond metropolitan France, to the national overseas territories, but also abroad, thanks to long-standing partnerships with the countries concerned. This strong and original point enriches the understanding and modelling of the mechanisms of evolution of the Earth, the physical world and living organisms.

Marine sciences cover a range of disciplines (biology, geology, ecology, hydrodynamics, biogeochemistry, oceanography, etc.), which are essential for understanding the functioning and evolution of the seas and oceans. These sciences cover a wide range of spatial and temporal scales, from the global ocean to the microstructure and from the century to

seconds. French Research infrastructures in the oceanic field therefore reflect this diversity and interdisciplinarity.

In 2019, within the framework of the UN Decade of the Oceans (2021-2030), two major institutions involved in ocean observation, CNRS and Ifremer, agreed on the design of an ambitious project for a French Ocean Observing System (Fr-OOS) by 2030, in order to set up a major research infrastructure for observing the global ocean, from the coast to the deep sea and the open sea, bringing together national nodes of JERICO-RI (ILICO), EMSO-ERIC, EURO-ARGO and a possible offshore infrastructure at national level. This meta-infrastructure could mirror the European Ocean Observing System (EOOS). This decision was supported by a white paper on French research infrastructures of the Earth and Environment group at national level.

A joint agreement between all the French institutes involved in ocean observation is in preparation and has received the support of the Ministry of Research, the aim of this FR-OOS coordination structure being to :

- Strengthen long-term ocean observation at global, regional and coastal scales for research, sustainable ocean management and the development of ocean services in response to societal expectations.
- Harmonise activities related to long-term ocean observation, promote the pooling of resources and align/simplify the associated governance bodies.
- Organise the interfaces between the national research infrastructures Argo-France (IR* EURO-ARGO), EMSO-France (EMSO-ERIC), ILICO (National Node of JERICO), a possible future offshore infrastructure (OHIS), the networks not organised as research infrastructures, the Fleet* as well as transversal activities, in particular, on the interfaces with data centres (IR DATA TERRA), space observations and ocean, meteorological and climate modelling and forecasting centres.
- Insert Fr-OOS in the international (GOOS, OceanObs19, Ocean Decade) and European (EOOS, ESFRI, EMODnet, Copernicus) dynamics.

This initiative was very positively received by the coordination teams of the different French nodes of the European infrastructures: even if each of the compartments of the ocean has distinct techniques and competences and these particularities deserve to be preserved, there are many subjects (metrology, data quality assessment, etc.) that would benefit from being shared and fields of study that are transverse to all compartments.

Italian initiative to coordinate European marine observation infrastructures at national level

In Italy, the National Research Programme ("Piano Nazionale per la Ricerca", PNR) is put forth by the Ministry of University and Research ("Ministero dell'Università e della Ricerca", MUR) to provide the strategic development for the national research policies.

As in the past, the last 2021-2027 PNR edition, specifically refers to the National Research Infrastructure Plan ("Piano Nazionale Infrastrutture di Ricerca", PNIR) for all matters and specific aspects related to RIs. The purpose of the PNIR is to provide details on the technical-strategic plan for Research Infrastructures, defining and updating the national priorities.

The PNIR document recognizes that Research Infrastructures are decisive for the national ability to make scientific progress and promote innovation, in order to address the most

challenging European and national objectives. Italian RIs are thus categorised embracing both the European and the national level, which are considered to be closely related.

The PNIR document supports the transversal action of the new European Research Area (ERA), emphasising the fundamental contribution that RIs can make in this area, also in view of the significant contribution made by the European Strategy Forum for Research Infrastructures (ESFRI) to the progress of the sector in Europe. At the national level, the PNIR also emphasises the strategic and prospective contribution made by the National Recovery and Resilience Plan ("Piano Nazionale di Ripresa e Resilienza", PNRR), which considers RIs as a key factor for the development of the nation.

The PNIR identifies a number of main actions to be implemented at the national level and, in some cases, in synergy with the European level, which are:

- the strengthening of access policies;
- the recognition of RIs as tools for participation in European Partnerships;
- the use of RIs in higher education;
- the use of RIs as research tools in the areas identified by the PNR.

It is indeed the PNR that identifies the following eight criteria to identify and categorize RIs at the national level, namely:

1. scientific excellence;
2. socio-economic impact;
3. critical analysis of history and prospects;
4. completeness of access policies;
5. international relations and pan-European relevance;
6. political commitment and financial support from participating countries;
7. governance, management and human resources management;
8. financial aspects.

At the methodological level, the MUR preliminarily proceeded with a national online consultation of relevant stakeholders, in which both Italian Public Research Institutions and universities were involved. Thanks to the results of this consultation, and on the basis of the aforementioned PNR criteria, it was possible to draw up a clear picture of the Italian RI landscape, made up of 131 RIs. 74 RIs are considered "high-priority" at the national level as they are all already inside the ESFRI Roadmap, including all those in Figure 1 inside the Marine Domain. JERICO-RI is identified as a "medium-priority" RI of European importance together with the EuroFleet initiative.

A very recent and important national coordination is taking place within the ITINERIS project of the National Recovery and Resilience Plan (Mission 4, Component 2, Line of Investment 3.1) which is funded under the framework of the NextGenerationEU Programme. The marine domain workpackage (WP5) of the ITINERIS project is coordinated by the GOOS National Focal Point and the president of the Italian Oceanographic Commission (COI), National body of the UNESCO-IOC. The most relevant outcome of WP5 is the implementation of the Italian Integrated Ocean Observing System (I-IOOS). Within this system, data and services from marine RIs will be harmonized and integrated, data gaps in biological and ecosystem observations will be filled and NRT data and products will be made available to the research community as well as to stakeholders. I-IOOS will improve quality and interoperability of ocean sensors, infrastructures and data at the Italian national level, for three critical themes: climate, operational services, and marine ecosystem health. ITINERIS will start in November 2022 and will last 30 months.

Towards a consideration of very heterogeneous situations in Europe

While historical context, centralised research policies or Europe-oriented funding strategies may have guided collaboration frameworks for both national and European nodes of Environmental Research Infrastructures at national level in some countries, the very heterogeneous situation amongst JERICO-DS partner nations needs to be considered in our JERICO-RI implementation strategy.

Therefore within WP4 Sustainability, task 4.2 “Design of national commitment framework” will establish a roadmap for capturing and tracking national commitments with regard to observing Europe’s coastal seas. The ultimate aim of such a task (post-project) is to have a strong coastal observing element embedded in national coordination mechanisms aligned with GOOS. The scope of National Infrastructures being included in JERICO-RI will also be defined.

Discussions aiming to unify environmental RI efforts at national level, will also be fostered by JERICO-RI’s initiative developed with the help of The French Ministry of Research, network of scientific ‘attachés’ (officers) in embassies across Europe. Embassy scientific attachés are responsible for promoting bilateral scientific agreements between the country they represent and the country where they are based.

Meetings will be held in order to progress towards both shared vision of national efforts to better address their coastal priorities and financial agreement.

2.2.3. National participation in Environmental RIs directly connected to coastal observations

Table 3 reduces the scope of Environmental Research Infrastructure collaborations to those related to coastal observation. New countries appear to be interesting to investigate in terms of overlapping infrastructure domains, such as Greece, Spain or Norway.

Note: we have deliberately excluded from this table the cross-cutting infrastructures of the domain: the European oceanographic fleet and the data infrastructures.

We have also added here the biological infrastructures necessary for the understanding of marine ecosystems.

	JERICO-RI	eLTER	EURO-ARGO	ICOS	EMBRC	EMSO-ERIC	DANUBIUS	AQUACOSM (Marine)	LifeWatch	Total
Italy	1	1	1	1	1	1	1		1	8
Greece	1	1	1		1	1	1	1	1	8
Spain	1	1	1	1	1	1	1		1	8
France	1	1	1	1	1	1		1		7
Norway	1	1	1	1	1	1		1		7
Finland	1	1	1	1			1	1		6
Netherlands	1	1	1	1			1		1	6
Germany	1	1	1	1			1			5
Portugal	1	1			1	1		1	1	6
Ireland	1		1			1	1			4
Sweden	1	1		1	1			1		5
Belgium	1	1			1				1	4
Estonia	1									1
Croatia	1									1
Total	14	11	9	8	8	7	7	6	6	

Table 3 : JERICO-RI Nations participations to Environmental RIs directly connected to coastal observations

The added value of JERICO-RI is to adopt a common strategy of collaboration at the European level. However, given the nesting of the different scales of collaboration (see Table 1) and the heterogeneous nature of the structuring of the infrastructure landscape at the national level (see above) a robust way to look at interactions at the national level is to focus on the common societal needs that emerged through the analysis presented in D1.1.

Thanks to a survey filled by National Representatives from the JERICO-DS project, common societal needs were prioritized at European scale according to their priorities and implementation status at the national level. Main results from the survey indicated that nations shared six high-priority needs which were indicated at least by 13 out of 14 nations:

- non-indigenous species,
- aquaculture,
- climate change,
- localised measures/protection from marine litter,
- riverine inputs,
- impact/effects of storms and floods

A strong recommendation from D1.1 is to consider this strategic priority when developing specific Data-to-Product Thematic Services (D2PTS).

A suggestion of D1.2 would then be to build partnership agreements with other environmental RIs on the basis of their contribution to these societal needs. This would allow them to play a structuring role in the landscape, to reinforce a service-oriented approach and also to leave the necessary flexibility to adapt this agreement to countries and regions according to their specific context.

	JERICO-RI	eLTER	EURO-ARGO	ICOS	EMBRC	EMSO-ERIC	DANUBIUS	AQUACOSM (Marine)	LifeWatch
Non-indigenous species,	x	x			x		x	x	x
Aquaculture,	x	x			x		x	x	x
Impact/effects of storms and floods	x		x			x			
Climate change	x		x	x		x			
Riverine inputs	x	x					x		
Localized measures/protection from marine litter	x	x							

Table 4 : Preliminary distribution of the EU RI effort to coastal societal needs

This idea as well as the preliminary distribution of the RI involved in each of the themes (table 4) will be discussed in a future Nation Committee.

(It should be noted that the aspects of data banking and observation technology are not addressed in this study, because they are the responsibility of other European coordination efforts of national initiatives, respectively EOSC (European Open Science Cloud⁴) and EOOS (European Ocean Observing System⁵)

⁴ "The EOSC Portal is part of the EOSC implementation roadmap as one of the expected "federating core" services contributing to the implementation of the "Access and interface" action line. It has been conceived to provide a European delivery channel connecting the demand-side and the supply-side of the EOSC and all its stakeholders". <https://eosc.eu/>

⁵ "The mission of the European Ocean Observing System (EOOS) is to be a stakeholder driven framework that integrates Europe's ocean observing communities and facilitates coordinating the multiple organisations operating, supporting and maintaining ocean observing and monitoring infrastructures." <https://www.eoos-ocean.eu/our-purpose/>

3. Outreach, dissemination and communication activities

This Deliverable D2.1 is a preliminary document of internal use, whose objective is to provide first elements to unify environmental RI efforts at national level.

This deliverable is thus not expected to be widely disseminated outside the JERICO consortium or to a wider audience at present.

D2.1 can be seen as a provider of inputs to the specific following WPs:

- JERICO-S3 WP1: for the establishment of the long-term scientific plan, including a description of socio-economic impacts at the national, European and global levels. Further developments for D1.2 preliminary analysis will be integrated into D1.3 Final report for a long term (M24)
- JERICO-DS WP4: for establishing a roadmap for capturing and tracking national commitments to observing Europe's coastal seas.
- JERICO-DS WP6: for the creation of some communication material dedicated to the interaction with national key high-level stakeholders.

4. Conclusion and next steps

The main achievements of this Deliverable D2.1 are :

- A comprehensive description of the landscape of environmental Research Infrastructures at European level, with a focus on those directly associated with the observation of the coastal ocean and therefore within the perimeter of JERICO-RI's scope
- To provide two national examples of structuring interactions between national nodes of European marine research infrastructures from two countries that are champions of participation in the ESFRI roadmap: France and Italy
- The formulation of preliminary suggestions for the implementation of a partnership framework at the European level based on the priority societal needs expressed by the nations

This deliverable is a preliminary version, the full content will have to be discussed, enriched and validated by all members and representatives constituting the Nations Committee.

5. Annexes and references

Puillat, I., Delauney, L., Tagliana, B., Blauw, A., Brix, H., Burden, J. Cocquempot, L., Coppola, L., Durand, D., Fernandez, J.G., Gaughan, P., Godiveau, L., Grémare, A., Griffa, A., Legrand, S., Liblik, T., Magaldi, M.G., Muñoz, C., Nair, R., Nolan, G., Petihakis, G., Pfannkuchen, M., Rabouille, C., Reilly, K., Rubio, A., Seppälä, J., Vitorino, J., Wehde, H. (2020) - MAIN ELEMENTS FOR THE DESIGN OF JERICO-RI.



Marcello G. Magaldi , Lucie Cocquempot, Antoine Grémare, Holger Brix, Annalisa Griffa, Anna Rubio (2022) "Preliminary report for long-term scientific plan" JERICO-DS D1.1

Annex 1

Description of the European marine infrastructures

○ Danubius

DANUBIUS-RI's mission of offering "state-of the art research infrastructure that will facilitate excellent science on the continuum from river source to sea and provide the integrated knowledge required to manage and protect RS Systems" is very much aligned with JERICO-RI's vision to improve and innovate the cooperation in coastal observatories in Europe. An alignment of strategies will be achieved through a different set of case specific activities carried on both at regional and European level. Indicative activities encompass sharing of technologies, best practices, by, for example, organizing common workshops to contribute to the interoperability and standardization of data across the European RI landscape, shared organization of brokerage events with industry, stakeholders and policy makers and other events for the promotion of RIs. At local/regional level, joined collaborations are explored and/or underway for example within the Elbe River-North Sea system (jointly hosted workshops, coordination of new research installations' locations and instrumentation) and the Po River - Northern Adriatic system (exploration of data exchange and shared use of facilities).

○ Aquacosm

Some fundamental ways the oceanic ecosystem is functioning, such as adaptation/acclimation of organisms, their metabolic rates and responses to perturbations, are difficult to observe directly. To study the causes and effects of different disturbances on marine ecosystems, experimental research is often required. Experimentation allows studying the effects of various stressors separately and together in a planned way, as well as testing future scenarios. JERICO-RI will collaborate with AQUACOSM-RI, combining field observations with mesocosm based studies. Observations provide a realistic background for scenarios and hypotheses to be tested. Experimental results may assist interpretation of observational results, by resolving inherent rates of ecosystem functioning not possible to study by observations (like metabolic rates and biogeochemical transformations). Together the observations and experimentation could strongly support marine ecosystem modelling and their co-development, as well as understanding how ecosystems respond to alterations.

○ eLTER

eLTER sites range from the kryosphere down to the coast, comprising terrestrial (forests, grasslands, agricultural and urban areas), freshwater and transitional waters sites. eLTER features a long-term Whole System Approach covering all important biotic and abiotic components and processes of the given ecosystem. JERICO, focussing on the zone between the coastline (not estuaries, but close) and the open sea (slope), where it hands over to RIs like EMSO, comprises biotic and abiotic components. Clusters of nearby located eLTER- and JERICO sites or definitely co-located (co-used) sites are considered as excellent opportunities to further specific collaborations, co-located operation and complementarities between JERICO and eLTER. To this end an analysis of the two site networks was carried out and resulted in 5-15 candidate clusters that seem appropriate for this purpose.

○ EMBRC

Of particular relevance to JERICO-RI, is the organisation of the observation space of the coastal region. Although the coastal zone is arguably the best studied marine environment, there is still a significant lack of biological observation data. Whereas EMBRC is developing a strategy for fixed point 'omics based observation around its long

term study sites, JERICO-RI, with a network of stationary observations, gliders, and autonomous vehicles, has the potential to add significantly to biodiversity observation by filling in the gaps along Europe's coastline. In order to ensure complementarity between fixed point observatories and temporary observation points, JERICO-S3 and EMBRC must explore complementary methodologies and metadata standards to ensure comparability of data between their sites. Deployment of similar sampling technologies will also be explored and calibration exercises carried out on a regular basis between the observatories. The coordination of observation efforts will also contribute to the creation of so-called "Super Sites", where multiple RI activities take place in the same area, creating a high resolution site covering many parameters and substantially increasing the contextual data available for each type of observation.

○ EMSO

The EMSO ERIC consortium is composed of standalone and real-time fixed platforms mainly located in the open ocean in order to continuously observe different biogeochemical and physical variables that address natural hazards, climate change and marine ecosystems using advanced sensor arrays. In regional seas, the connection with the JERICO-RI infrastructure is essential to observe the land-sea continuum that is relevant for scientific and societal needs (e.g., NW MedSea, Baltic Sea,...). Then, common integration of platforms is necessary for example to observe the different spatial and temporal variabilities. This common integration of observation platforms between EMSO and JERICO-RI has already started with the JERICO-S3 project (2019-2023) by adapting and test-proofing the EMSO Generic Instrument Module (EGIM) to coastal applications. This will allow JERICO-RI and EMSO to develop dynamic (adaptative) monitoring towards integrated observing systems. Then, data harmonisation protocols should be detailed and joint observations organised around the common monitoring areas where coastal bottom observatories are situated, like Smart bay (IR), Obsea (ES), Molene (FR), Plocan (ES)

○ EuroARGO

The Euro-Argo ERIC allows active coordination and strengthening of the European contribution to the international Argo programme. Argo must be considered in its ensemble: not only the instruments, but also the logistics necessary for their preparation and deployments, field operations, the associated data streams and data centres. That's why Euro-Argo establishes a high level of cooperation between partners in all implementation aspects.

With JERICO, several axes of collaboration are possible, for example, on:

- deployment and recovery of coastal floats and sharing information on network maintenance and boat opportunities.
- design of an observation network with a **wide coastal continuum** for the needs of certain users, particularly operational individuals (CMEMS, nationals).
- links with manufacturers and sensor needs, EuroArgo and JERICO-RI have sensors in common, especially the one used on gliders and moorings.
- FAIR data services aspects.

○ Lifewatch

Whereas LifeWatch ERIC is producing open access data and developing strategic reproducible analytics to access, analyse and visualize biodiversity data, JERICO, with a network of stationary observations, moving platforms, and autonomous vehicles, has the potential to add tremendously to the missing biodiversity observation component. In order to ensure complementarity between the two initiatives, collaboration must explore reciprocity of methodologies and of metadata standards to ensure compatibility of the data streams and analysis processes. joint workshops could be elaborated to explore the setting up of case studies which would pave the way for a long-term collaboration and co-creation.

In the framework of JERICO-DS, a review is being carried out of the main scientific



questions, strategies and monitoring solutions implemented or planned in the coastal ocean at the level of the Global Ocean Observing System (GOOS), and of the main worldwide OOS. The work will build on previous JERICO projects experiences. As an example, regarding coastal issues such as oil spills and search and rescue, a link has already been established between JERICO projects and the HF radar networks of the US and Australia, that was proven very useful for the planning of the JERICO-RI and European network. A similar approach can be carried out for other scientific topics that address sustainable development goals, related to climate change and coastal management issues.

○ ICOS-ERIC

ICOS-ERIC mission is to produce standardised, high-precision and long-term observations and facilitate research to understand the carbon cycle and to provide necessary information on greenhouse gases. ICOS-ERIC promotes technological developments and demonstrations related to greenhouse gases by linking research, education and innovation. Thanks to its high-precision data, ICOS-ERIC aim to support policy- and decision-making to combat climate change and its impacts.

The strong links between ICOS-ERIC and JERICO-RI are attested by the strong interaction of the carbon cycle with other physical and biogeochemical variables in the ocean.

JERICO-RI aims at gathering biogeochemical parameter observation programs in the coastal ocean related to the inorganic carbon cycle, both at the surface and in the water column. JERICO-RI will continue and maintain regular observation operations along the European coasts and will allow the linkage with other observational IRs, including in particular the biogeochemical component of the Argo network, with its extension to oceanic pH or nutrients and dissolved oxygen measurements

Annex 2

Case study : Collaboration between JERICO and Danubius

As part of JERICO-S3, WP 2 (Linking scales and communities) intends to foster cooperation and coordination with existing RIs at regional levels. One important partner that is present in many regions where JERICO-RI has also been active is DANUBIUS-RI. Alignment of strategies achieved through a different set of case specific activities carried on both at regional and European level is a priority. Indicative activities encompass sharing of technologies, best practices, by, for example, organising common workshops to contribute to the interoperability and standardisation of data across the European RI landscape, shared organisation of brokerage events with industry, stakeholders and policy makers and other events for the promotion of RIs. At local/regional level, joint collaborations are explored within the JERICO's Pilot Super Sites (PSSs) and selected Integrated Regional Sites (IRSs). As a proof of concept of mutual benefits, we plan to carry out specific activities in cooperation with DANUBIUS (North Sea-PSS, Adriatic-IRS).

The North Sea-PSS is coordinated by HZG, which also hosts DANUBIUS's Tidal-Elbe SuperSite. As part of an initial effort meetings have been organised between representatives of COSYNA (Coastal Observing System for Northern and Arctic Seas, JERICO's representative in the German Bight), MOSES (Modular Observation Solutions for Earth Systems, an initiative to foster observational capabilities for extreme events sponsored by the Helmholtz Association), DANUBIUS-RI/PP and various stakeholders for the Tidal Elbe. This cooperation is motivated by a keen shared interest in investigating the transition zone from land to sea with a focus on estuaries, where riverine and marine influences interact and determine matter fluxes from land to sea.

A first tangible outcome of this cooperation has been the establishment of a floating research platform that will be set up in Tesperhude at the Elbe about 8 km upstream of the weir in Geesthacht separating the Elbe River and its estuary. The research platform consists of a ponton with a container housing diverse state-of-the-art observation systems providing continuous, high resolution and near-real-time water quality data. These include a Ferry-Box system (e.g. temperature, chlorophyll, turbidity, pH, O₂), nutrient analyzers (NH₄, NO_x, NO₃, PO₄, Si(OH)₄), gas analyzers (N₂O, CO₂, CH₄, Rn), a mobile ICP-MS for element analysis, a weather station and a radiometer, as well as ADCPs. In addition, the research platform contains an automated water sampler, a continuous flow centrifuge and a sedimentation box for suspended matter collection. In combination with data from the JERICO/COSYNA-station in Cuxhaven, the data from the research platform in Tesperhude allows for example to quantify carbon and nutrient budgets for the Elbe estuary. Funds for this project are provided by the Helmholtz Association (through MOSES and COSYNA) and the state of Schleswig-Holstein for DANUBIUS through the European Fund for Regional Development.

The northern Adriatic represents one of the JERICO "Integrated Regional Sites" (IRS) and involves two nations and three institutions: CNR-ISMAR – Institute of marine Sciences and

OGS – Istituto Nazionale di Oceanografia e Geofisica Sperimentale from Italy and IRB - Ruđer Bošković, Centre for Marine Research from Croatia.

Italian partners are part of the JERICO consortium since the beginning and several research projects have benefited from the transnational access offered by two stations located in the area: the Acqua Alta oceanographic tower (8 nm off Venice lagoon) and the S1-GB elastic beacon (located off the Po delta). Croatia is a new partner to this community hence the planning of the North Adriatic IRS is moving now towards the first steps.

Italy and Croatia have both fixed stations and valuable time series of oceanographic and biological data from repeated samplings at fixed points and along a marine transect spanning from the Po river delta to the Istrian peninsula, on the other side of the Adriatic. One of the main goals of the North Adriatic IRS is to provide the basis for a permanent infrastructure to organise, harmonise and integrate existing coastal observing networks and activities including in situ data and modelling.

The Po delta together with the lagoons of Venice and Grado-Marano represents a DANUBIUS supersite, designed to study the interactions between riverine loads, lagoons and the Italian coastal area of the North Adriatic. Both the Italian institutes involved in JERICO are also partners in DANUBIUS and this will facilitate a future collaboration between these two consortiums.

