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JERICO-S3 MILESTONE

Joint European Research Infrastructure network for Coastal Observatory

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Consortium beneficiaries	Third parties	Associated Partners	other
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1. Objectives

The objective of this milestone is to provide an early version of the deliverable D9.5 "JERICO-RI preliminary design". The main report that follows shows the early structure of D9.5, that will be updated later on.

2. Main report

A. JERICO in a nutshell

1. Coastal ocean main specificities

The specific characteristics of the coastal ocean influence the nature of the main associated scientific/environmental/societal issues. JERICO generates and processes solid observation data to tackle them.

● **Coastal ocean: a heterogeneous interface where a large variety of potential drivers are interacting over a large range of nested spatio-temporal scales**
The coastal ocean is located at the interface between the continent, the open ocean and the atmosphere and is in tight interaction with these adjacent systems. Both its structure and functions are affected by a large variety of fluxes originating from those systems. Interplay between major river discharge and winds creates Regions Of Freshwater Influence (ROFIs), which are largely differing from the surrounding ocean regarding their physics, biogeochemistry and biology, whereas changes in coastal ocean biodiversity and biological productivity are largely cued by climatic processes/oscillations primarily affecting the open ocean. Spatial heterogeneity therefore clearly constitutes a first major characteristic of the coastal ocean. The coastal ocean is also showing strong dynamics over a large range of temporal scales. These include a number of nested components: (1) long term (e.g. in relation with climate change), (2) interannual (e.g., in relation with climatic oscillation), (3) seasonal (in temperate areas), (4) mesoscale related and (5) short term, including episodic events (e.g. in relation with the occurrence of rare/extreme events that constitute key factors in controlling the structuration and the functioning of coastal marine systems).

Due to this heterogeneity, observing, understanding and ultimately predicting changes of coastal marine systems over a large range of spatio-temporal scales constitutes a first key objective for JERICO.

● **Coastal Ocean: a stake area for society and economy**
The coastal ocean is the most productive part of the world ocean and is one of the major sources of food for humans. Biological productivity in coastal waters results from a complex interplay between biological, biogeochemical and physical processes. The coastal ocean is providing a large variety of other ecosystem services including: (1) transportation, (2) availability and access to raw materials and resources for industry, (3) repository and dilution of contaminants, and (4) leisure and cultural resources. The coastal ocean is by far the most economically valuable component of the world ocean and the economic values of the littoral components can be comparable and even higher than the highest ones of continental biomes. The exploitation of these services results in the densification

of human coastal populations and the intensification of their activities (although some estimates stated that up to one human being out of 2 lives close to the coast, globally, the percentage may be overestimated but still significant; see Small and Nicholls, 2003; McGranahan, Balk & Anderson, 2007), which is planned to increase substantially (Merkens et al., 2016). The coastal ocean is therefore the component of the world ocean most affected by anthropogenic disturbances. A second key objective for JERICO is to assess negative anthropogenic impacts in order to enhance the sustainability of the ecosystem services provided by the coastal ocean and to ensure the conservation of a Good Environmental Status (GES) for coastal marine waters. This is far from trivial since anthropogenic impacts are superimposed to those of natural ones.

B. Science & Technology cases

1. Science case

The science case for JERICO lies in its ability to provide comprehensive, high-quality data and advanced observation systems that are essential for addressing the multifaceted challenges of coastal environments. **JERICO's science strategy** is centred on developing and integrating innovative coastal observation technologies and methodologies to monitor and predict changes in the coastal ocean. This leads to a better understanding and management of coastal ecosystems, contributing to sustainable development and the protection of marine resources. JERICO supports EU policies aimed at achieving environmental sustainability and resilience against the growing threats posed by climate change and human activities by bringing together various Research Infrastructures (RIs) and fostering collaboration across Europe. The three **Key Scientific Challenges** (KSCs) are the following:

- **KSC#1:** Assessing changes under the combined influence of global and local drivers.
- **KSC#2:** Assessing the impacts of extreme events.
- **KSC#3:** Unravelling and predicting the impacts of natural and anthropogenic changes.

In addition, 16 **Specific Scientific Challenges** (SSCs) were defined. These challenges align with societal needs and policy requirements, such as climate change adaptation, marine biodiversity conservation, and sustainable resource management.

The last elements of the scientific framework are **Research Axes** (RAs). RAs represent specific projects or activities designed to address the KSC and SSC, such as the development of new monitoring technologies, data integration strategies, and innovative research methodologies.

Within the JERICO scientific framework, KSCs and SSCs are enduring questions tailored to the marine coastal environment and are key components of the science strategy. RAs, however, are more focused on variables and processes that evolve in response to emerging scientific questions driven by societal needs. In this context, KSCs and SSCs contribute to the integrated observations (see JERICO-S3 D1.3).

The need for JERICO is further underscored by the increasing pressures on coastal zones, including sea-level rise, ocean acidification, pollution, and habitat degradation. These areas are often hotspots of biodiversity and economic activity, but they are also some of the most threatened environments globally. JERICO's integrated approach to monitoring and understanding coastal processes at multiple scales — from local to regional and pan-European — enables effective responses to these challenges. It provides critical data that informs environmental policies and management strategies, ensuring that interventions are timely, targeted, and based on the best available science.

To address scientific challenges effectively, the KSCs, SSCs, and RAs consider various scales, recognizing the dynamic and complex nature of ecosystems where ecological processes and human interactions can vary significantly, over short distances. An integrated multi-scale approach is essential for the effective management of these areas, so as to enable responses to local challenges and align efforts with regional and European strategies. This integration is crucial for addressing societal challenges related to the marine and coastal environment in a coordinated, holistic manner. Environmental management interventions, such as oil spill cleanups, habitat restoration, and fishing regulations, require precise and localised data to be effective. Small-scale observations enable targeted interventions in high-risk areas. Coastal zones are disproportionately affected by sea-level rise, ocean acidification, and extreme weather events. A multi-scale approach facilitates monitoring these impacts and adapting policies accordingly, considering local specifics while ensuring broader regional coordination. To fully understand coastal processes, it is paramount to combine detailed local observations (small scale) with broader analyses (regional or pan-European). For instance, regional climate models benefit from precise local data to refine their forecasts and scenarios.

Regions involved in JERICO-S3, including **Integrated Regional Sites (IRSs)** and **Pilot Super Sites (PSSs)** (WP3 and WP4), play a vital role in the integration, harmonisation, and efficient operation of coastal observatories. They contribute significantly to the pan-European effort of monitoring and understanding coastal seas by aligning with the overarching JERICO-S3 science strategy while addressing specific regional challenges. These regions standardise data collection methods, deploy innovative technologies, and engage a diverse range of stakeholders, including researchers and policymakers. Transnational and cross-regional integration is encouraged to extend regional activities to broader areas and jointly identify observational gaps. Furthermore, actions by IRSs and PSSs aim to promote the use of their data and products in collaboration with other RIs, in order to support EU directives, Regional Sea Conventions (RSCs) and European strategies and initiatives:

- JERICO could be instrumental in **the implementation of the marine Strategy Framework Directive (MSFD) and the Water Framework Directive (WFD)** by providing harmonised, high-quality data (*e.g.* concerning marine biodiversity, water quality and marine ecosystems) that could significantly help to assess the environmental status of marine and coastal waters.
- JERICO could **contribute significantly to RSCs** such as the **OSPAR** (North-East Atlantic), the **HELCOM** (Baltic sea) and the **Barcelona** conventions
- JERICO could be well-aligned as well with broader European actions, such as the **European Green Deal** and the **EU Biodiversity Strategy 2030**, by supporting sustainable resource management, marine spatial planning and biodiversity protection. JERICO could also **enhance climate change resilience**, for example by providing data on sea-level and coastal erosion.

More globally, **JERICO would as well contribute significantly to several Sustainable Development Goals (SDGs)**, that are related to environmental sustainability, climate action and the sustainable use of marine resources:

- **SDG 14 (Life below water)**

  JERICO could provide extensive and high-resolution data on marine ecosystems, water quality and biodiversity; such data is vital in order to track progress towards managing and protecting marine habitats. JERICO could also help for the identification and management of Marine Protected Areas (MPAs); thus helping the conservation and restoration of marine ecosystems.

- **SDG 13 (Climate action)**

  JERICO contributes to this SDG by monitoring the impacts of climate change on coastal and marine environments, with the availability of long-term time series on sea-level, ocean warming and acidification and coastal erosion. This could lead to much improved climate adaptation strategies and affiliated mitigation measures.

- **SDG 6 (Clean water and sanitation)**

  Data on water pollutants and contaminants, or eutrophication phenomena, are of great interest for the sustainable management of water. Such data for coastal areas could be provided by JERICO.

- **SDG 9 (Industry, innovation and infrastructure)**

  JERICO also supports SDG 9 by fostering innovation in the field of ocean observation technologies. JERICO enhances the development and deployment of new technologies, which in turn fosters innovation in marine industries and in the Blue Economy, and encourages investments.

- **SDG 11 (Sustainable cities and communities)**

  Data provided by JERICO is relevant for SDG 11 as well, in order to ensure a sustainable urban and coastal development; in particular, the real-time monitoring of sea-level and other coastal hazards (*e.g.* Harmful Algal Blooms) helps cities to better prepare for and mitigate the impacts of natural disasters.

- **SDG 17 (Partnerships for the goals)**

  JERICO contributes to SDG 17 by favouring international collaboration, as a pan-European RI; indeed, JERICO facilitates cooperation between various nations, research institutes and other bodies, around a knowledge-sharing, capacity-building platform. This strengthens the ability of coastal nations to address global environmental challenges.

Integration is the cornerstone of JERICO's overall science strategy, achieved not only regionally but also through technological innovation and experimentation (see JERICO-S3 D1.3). The goal of integration is to observe and understand complex processes occurring at different time and space scales, by combining multiple scales of distributed marine observations into a unified observation system, delivering freely accessible data to end users. This involves implementing an infrastructure comprising platforms and science-based sensor systems that measure physical, chemical, and biological properties and processes in coastal waters, from the boundaries of open ocean to those of the land-sea interfaces.

In JERICO, integration occurs on two levels: 1) the regional level, aimed at connecting disconnected, overlapping, or neighbouring systems and addressing gaps in existing observations, a concept demonstrated to some extent in the IRS/PSS; and 2) at pan-European level, where global harmonisation led by JERICO governance ensures coordinated coastal observations across regions to meet global needs. A central structure to coordinate these regions is essential, as developed in governance strategies.

The contributions of regions to the KSCs and SSCs are diverse (Figure 3). There are differences between IRS and PSS in terms of implementation and maturity. Within the PSS, approaches vary by region, depending on the region's history, scientific objectives, expertise, technological innovations, and connections between countries and existing RIs. In some regions, actions have broad regional representativeness, while in others experimentation is focused on small-scale processes. D1.3 emphasises the importance of interregional and transnational integration, as well as collaboration with other initiatives and programs beyond JERICO.

		Pilote Super Sites					Integrated Regional Sites				
KSC	**SSC**	**North S.**	**EC**	**NWM**	**CS**	**BS/GF**	**BOB**	**NAS**	**IAM**	**K/S**	**Nor S**
Assessing changes under the combined influence of global and local drivers	Land-Ocean continuum	✓		✓			✓		✓		✓
	Sea-atmosphere interface										
	Connectivity and transport			✓			✓		✓	✓	
	Biodiversity		✓				✓		✓		
	Primary productivity		✓		✓					✓	
	Ecosystem functionning	✓			✓	✓		✓		✓	
	Carbon budget and CO2 system	✓				✓				✓	
Assessing the impacts of extreme events	Extreme events & impacts on ecosystems			✓	✓	✓	✓	✓			
	Extreme events & coastal hazards						✓		✓		
	Harmful algal blooms		✓			✓				✓	✓
Unravelling and predicting the impacts of natural and anthropogenic changes	Climate change impacts					✓	✓		✓	✓	
	Eutrophication		✓	✓		✓					
	Impact of big cities			✓							
	Litter and plastic			✓			✓	✓	✓	✓	
	Contamination			✓					✓	✓	✓
	Unravalling impacts					✓	✓				✓

Figure 3: List of the 16 Specific Scientific Challenges addressed by the Pilot Super Sites and the Integrated Research Sites as identified during the JERICO-S3 and their further grouping in three Key Scientific Challenges (KSC). North S: North Sea, EC: English Channel, NWM: Northwestern Mediterranean, CS: Cretan Sea, BS/GF: Baltic Sea: Gulf of Finland, BOB: Bay of Biscay, NAS: Northern Adriatic Sea, IAM: Iberian Atlantic Margin, K/S: Kattegat/Skagerrak, Nor S: Norwegian Sea (table from D1.2)

The evolution of thinking around SSCs and RAs, along with increasing societal expectations, has led the JERICO community to consider explicitly addressing the land-sea interface. This includes observing coastal geomorphology, the transport of mineral and organic compounds, the impacts of land-originating discharges (both point-source and diffuse), and extreme coastal events (*e.g.*, heat waves, storm surges, habitat degradation), as well as pelagic-benthic coupling.

Many JERICO partners already address these scientific questions at the national level, with the necessary infrastructure and long-term funding in place. Thus, incorporating these topics within JERICO's scope was seen as a natural progression. Moreover, this inclusion provides a strong scientific foundation for leveraging complementarities between RIs, such as DANUBIUS (river to coast), EMBRC (marine biological resources), EMSO (deep waters), and ICOS (quantification of carbon fluxes), and developing joint research actions and services. The memorandums of collaboration (MoC) established bilaterally with these RIs reflect this complementarity and shared vision (see JERICO-S3 D2.1).

JERICO's science strategy is built on a multi-scale and multidisciplinary approach to understanding the complexity of coastal environments. It is based on the integration of multiple platforms and may be enhanced through collaborations with other established marine RIs within the EU landscape (*e.g.*, EMSO, EMBRC, EURO-ARGO, ICOS, DANUBIUS). Strengthening collaboration and interoperability with these RIs is viewed as crucial for maximising the value and impact of these RIs (including JERICO) on science and society and for supporting EU policies. A mapping of commonalities between RIs (Figure 4) has formed the basis for establishing MoCs with these RIs.

Collaboration field	EMBRC	EMSO	EuroARGO	ICOS	DANUBIUS	eLTER	LifeWatch
Marine Biology	X	X			(X)	X	X
Ecology Research	X				X	X	X
DeepSea Platforms		X	X				
Subsurface Ocean Properties			X	Not yet			
Marine Carbon Cycle			X	X			
River-sea Continuum					X		
Ecosystem structure and functions						X	X
Near shore sites	X	X		X	X	X	
Biodiversity	X	X				X	X
Mesocosms							
Biogeochemistry		X	X	X	X	X	
Data	X	X	X	X	X	X	X
Services	X, access	X	X (data provision)	X	X	?	X (IT services)

Figure 4: Collaboration field proposed in the different MoC with others RIs (from JERICO-S3 D2.1)

In these collaborations, JERICO will offer extensive expertise in coastal and shelf seas, providing access to platforms, FAIR data (Essential Ocean Variables, EOVs, with high-quality control procedures), and in-depth knowledge of coastal processes across different regions (*e.g.*, water mass transport, acidification, phytoplankton distribution).

DANUBIUS has been identified as a high priority. For example, observations conducted by DANUBIUS are crucial for JERICO, as river discharges significantly influence physical, biogeochemical, and biological processes in coastal waters (*e.g.*, organic matter and nutrient fluxes, impacts on salinity and total alkalinity, primary production). Such collaborations will be demonstrated in the HORIZON-CL6-LandSeaLot project (grant #101134575), which seeks to enhance integration and collaboration between communities working at the land-sea interface, including the JERICO and DANUBIUS communities.

Collaborations with EMBRC will focus on developing tools (and/or best practices) for imagery (plankton morphology) and DNA analysis (plankton species) and deploying these tools on JERICO platforms as they reach a high level of maturity and performance (or Technology Readiness Level, TRL, for sensors). In this context, JERICO will provide long-term time series with spatial coverage of oceanic data, benefiting EMBRC in interpreting and understanding plankton distribution in the marine environment (*e.g.*, bio-regions, clustering). Scientific collaborations around environmental issues, such as Harmful Algal Blooms (HAB), invasive species, and conservation/restoration actions, are already envisioned by the two RIs.

Collaborations with EMSO and EURO-ARGO will focus on (1) technological developments of mutual interest (*e.g.*, coastal profilers, cabled observatories, autonomous observing vehicles) and (2) ensuring a seamless observing continuum from the coast to the open ocean and deep ocean. JERICO will contribute observations, expertise, and insights into processes occurring in coastal regions.

For ICOS, there is a need to extend and improve observations of air-sea CO2 fluxes at the land-sea interface and in coastal regions. Since 2015, the JERICO community has been working on observing the carbonate system in coastal waters. Currently, this is done using coastal fixed buoys and Ferrybox systems, but in the future, it could involve autonomous platforms, an area where JERICO has significant expertise (*e.g.*, gliders). Collaboration between ICOS and JERICO experts may accelerate the deployment of tailored solutions to better understand the carbonate system, its variability, and its ecosystem impact in coastal regions. JERICO will provide auxiliary variables necessary for ICOS to adjust and validate carbonate variables, which require enhanced accuracy in coastal waters (*e.g.*, measurements for Total Alkalinity, Total Carbon, and pH), along with access to multiple platforms for deployment.

2. JERICO Technological Roadmap

JERICO-DS WP2 was responsible for defining the technical design of JERICO, drawing on national capacities and visions and working closely with WP1, which focused on the Scientific Strategy. This process involved a Technology Outlook, which served as the foundation for a Technology Gap Analysis. This analysis then facilitated the development of a comprehensive Technology Roadmap, created in close collaboration with WP3, which focused on the future e-infrastructure of JERICO to ensure optimal integration with the physical infrastructure.

The technological design of JERICO began with a detailed survey distributed to national representatives, providing a clear overview of technical capabilities, refined through JERICO-DS deliverable D2.1. The design process addressed four key technical aspects critical to JERICO's operation: Strategy - how to coordinate technology use and align with existing initiatives; Systems - selection and implementation of technologies; Structure - organisation of technical work and technologies to achieve JERICO's goals; and Staff and Skills - required human capacities and competencies. The technological framework established essential components and "core variables," which were initially based on GOOS Essential Ocean Variables (EOVs) and later expanded to include variables necessary for addressing JERICO's specific KSCs. These variables can be observed at least semi-continuously with current sensors and platforms, with the option to introduce new variables that enhance the KSCs and ensure interoperability with existing "core" variables.

C. Design of JERICO

JERICO provides a fundamental component of the EU effort in observing and understanding the coastal ocean. JERICO is the natural convergence of a) the actions of several European countries for the structuration of their NRIs (National Research Infrastructures) dedicated to national coastal Observation, and b) three successive EC-funded projects, of which the last two ones have concluded or are to be soon (JERICO-S3 and JERICO-DS).

The Design for the future sustainable pan-European JERICO builds on the scientific case presented in Section B, in terms of KSCs, of SSCs and of RAs (see Figure 3). A key concept that underlies all the JERICO projects and NRIs, is the consideration of the entire data cycle, from sensors to data and to products and services. This concept is applied to multidisciplinary data, implying multiple data life cycles, with the goal of using them jointly to successfully tackle the KSCs and provide extensive services of excellence. The Design strategy is articulated in order to ensure a sound strategy for the JERICO and follows the architectural development of JERICO, as reported in Section B. Here we briefly indicate the main directions that are then expanded in the following subsections.

The first direction (expanded in section C.1.) addresses the core of the JERICO, *i.e.* the design of an harmonised RI in the coastal ocean. Starting from an overview of the extensive present observing system that composes the JERICO, future developments are designed, including enhanced best practice applications for multiparametric sensors to be used in a holistic way, and developments of innovative technologies. Parallel to this direction, and starting from the present regional approach of JERICO, a design of the future site and observation system structuration (section C.2.) is carried out. As a next step, the elaboration of Services for science and society is presented (section C.3.), to be considered together with the plan involving users and stakeholders (see section A.3.b.). Present services are discussed and a roadmap for future ones is presented. Another crucial point in the design of the JERICO is the collaboration with existing harmonised observation initiatives (section C.3.a.). Here, general support statements from other RIs are presented and a collaboration plan is designed. Finally, the design of the JERICO governance is presented (section C.4.).

1. A harmonised European RI for Science & Society in the coastal and littoral area

As described in section B (see also Figure 9), observations for the coastal ocean encompass a great number of platforms and techniques, most of them relying on automated high frequency sensors, including fixed platforms (*e.g.* buoys and moorings), ferryboxes, gliders, coastal cable observatories, and HF radars. The JERICO observing infrastructure includes today all these types of platforms, and is distributed on nearly every European coastal border from the northern Norwegian coast down to the Canary Islands. As a result after the last 11 years of projects, during which the JERICO community structured and coordinated the step by step development of a European Coastal Ocean Observing System (ECOOS), the observation system is Europe wide, multisystem, multiparameter, multidisciplinary, integrative and involves 14 nations.

The JERICO is made of 432 fixed platforms/stations, 7 coastal seabed based observatories, 27 HF Radars, 16 Ferry-box lines, 16 glider transects, 4 referenced coastal profilers, 1 saildrone, 1 surface drifters and 34 regular and long term manual sampling stations (see also Figure 10). It is an impressive coverage, where fixed platforms/stations are prevalent, but also other platforms play an important role. HF radars, for instance, are less numerous but they cover large areas and, being a relatively recent operational technology, are rapidly developing in terms of implementation. Ferry-box lines are mainly situated in Northern Europe even though some transects are maintained also in the Cretan sea. Gliders transects, on the other hand, are mainly located in the Mediterranean Sea. Only a few coastal profilers are mapped, that is not surprising due to their vulnerability in coastal areas. In terms of variables observed, there are 327 water temperature measuring points, 127 for conductivity, 121 for turbidity, 103 for dissolved oxygen, 64 for pH and only 6 for pCO_2. Surface current is measured in 56 locations. Biology is observed in 118 locations by Chl-A fluorescence and in 54 locations as phytoplankton observations. Chemicals are observed in 33 locations only. It appears that when the technology that needs to be used for a variable, such as pCO_2, is not based on optics, thermocouple or resistive electrodes, the number of locations where the variable is addressed is low. Wind speed and direction, air pressure and air temperature are measured in nearly 100 locations as well.

Special equipment items described in section B.2. could be part of the JERICO observing systems as "services". Indeed these special equipment items could be proposed by JERICO to be deployed temporarily, on demand, in specific regions to address specific scientific topics. Transnational Access (TA) mechanisms could be used in order to organise the provision of equipment to scientific teams.

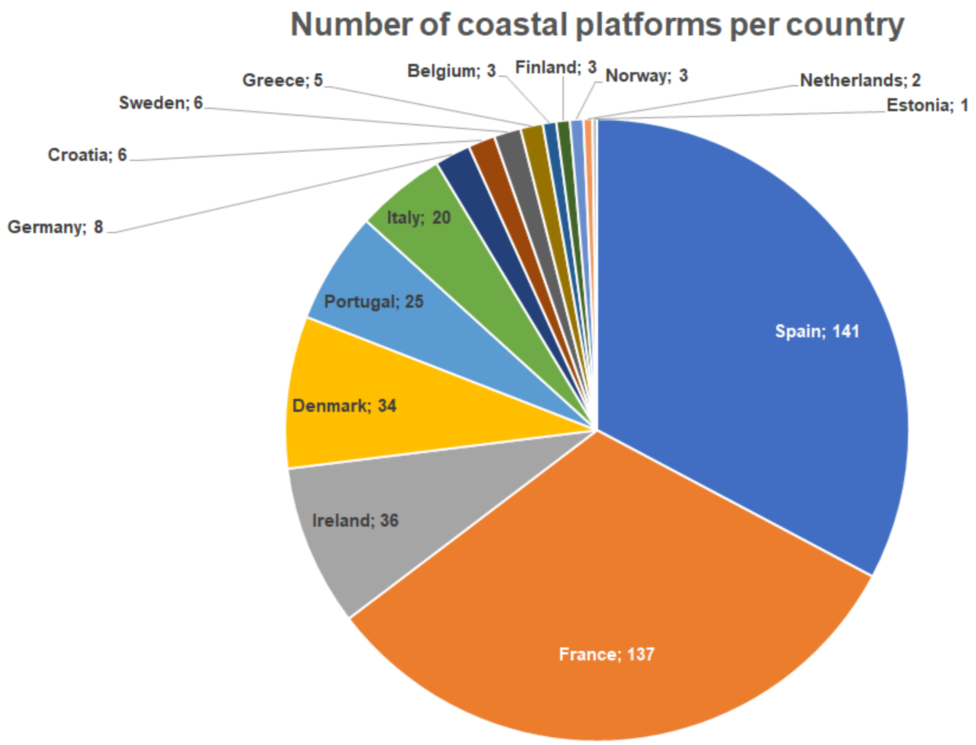

Figure 9: Distribution of fixed point coastal observing platforms in Europe per country.

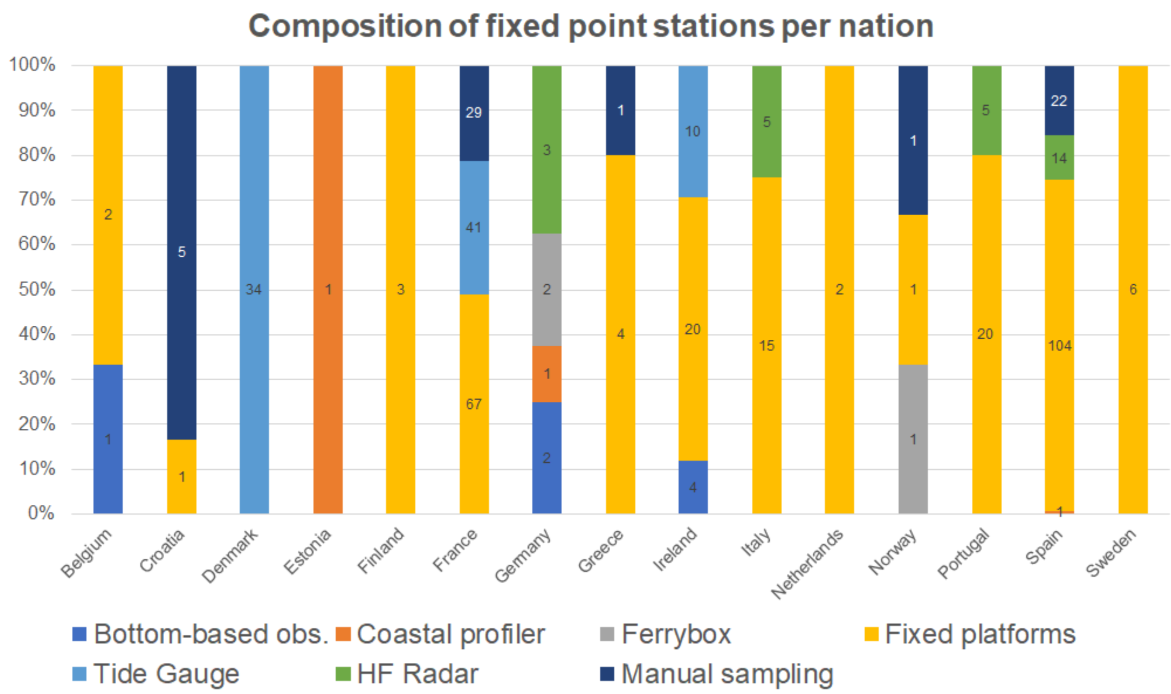

Figure 10: Distribution of fixed point coastal observing platforms in Europe per type of platform.

As a first conclusion, we highlight that JERICO covers the European coastline and is well suited to provide data to meet the various KSCs. JERICO maintains a fair amount of various observing platforms. The use of autonomous profiling systems can be further developed, since given the complexity of coastal waters with respect to the open ocean, at present they are not largely deployed along the European coasts.

Of the various nations involved in JERICO, France and Spain stand out per the number of fixed point coastal observation stations deployed and per the need to cover two significantly different areas: the Atlantic Ocean and the Mediterranean seas. Their observation capacities are succinctly described hereby, as case studies in the framework of JERICO.

French Coastal Observation Systems

France has a robust mesh of research and observation initiatives known as *Service National d'Observation* (National Observation Service, abbreviated by SNO), coordinated under the NRI *Infrastructure de Recherche Littorale et Côtière* (Littoral and Coastal Research Infrastructure, abbreviated by ILICO). ILICO integrates various SNOs, facilitating comprehensive coastal and marine environmental monitoring, each SNO contributing to coastal and marine environmental monitoring. These infrastructures are operated by CNRS, IFREMER, and various French universities and span various geographic locations across France, not including at the moment overseas territories (which are monitored by several SONEL stations and by 2 specific SNOs: Corail & ReefTemps), also covered by observation initiatives. In total, France has 137 fixed-point stations (Figure 9), mostly fixed platforms (Figure 11) focused on physical, chemical or biological (Figure 12) data according to the observation program aims.

- **DYNALIT** focuses on turbidity measurements across major river systems (the Gironde, Loire, Rhône, and Seine), using manual sampling methods.
- **MOOSE** monitors chemical and physical parameters such as Chlorophyll-A (Fluorescence), dissolved oxygen, salinity, water temperature, and currents across various fixed platforms, moorings, gliders, and radar stations. Data collection encompasses both surface currents and deeper water layers.
- **PHYTOBS** focuses on phytoplankton and other biological measurements.
- **SOMLIT** integrates fixed platform observations, covering a wide range of environmental parameters such as salinity, dissolved oxygen, pH, turbidity, and water temperature.
- **SONEL** specialises in sea level monitoring, with fixed platforms located in coastal areas (usually harbours), contributing to long-term sea level data.

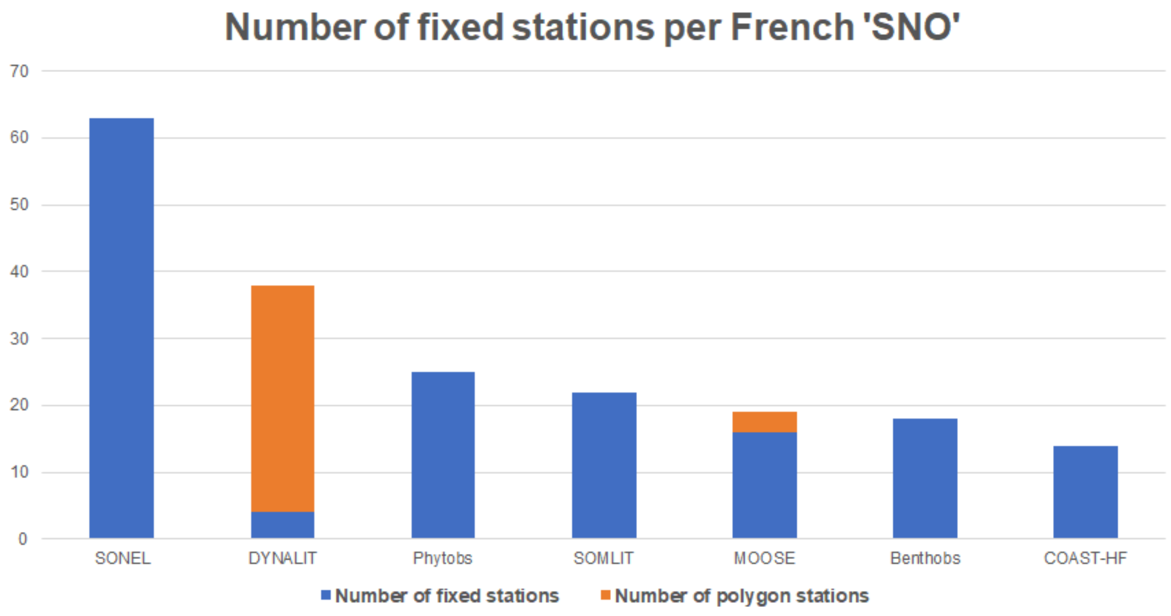

Figure 11: Distribution of fixed point coastal observing platforms in France per coastal observation initiative.

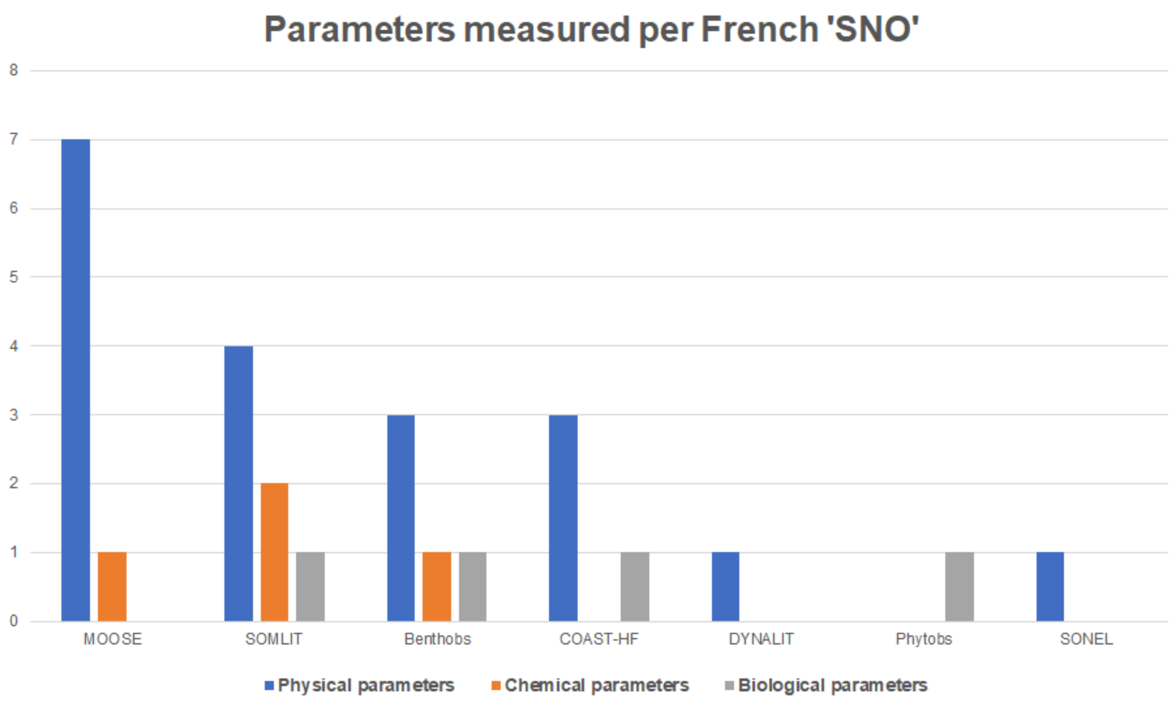

Figure 12: Parameters measured by each French coastal observation initiative.

ILICO and its associated SNOs present a comprehensive effort by France to observe and analyse its coastal and marine environments. Each initiative focuses on specific parameters essential for understanding marine ecosystems and their responses to environmental changes. The French systems will provide JERICO with comprehensive datasets that cover both the high-energy environments of the Atlantic and the more stable, yet equally critical, conditions of the Mediterranean.

Spanish Coastal Observation Systems

Spain has at its disposal various coastal and marine observation points, primarily operated by AZTI and Puerto Del Estado, in the Bay of Biscay, the Iberian Margin, and the NW Mediterranean, focusing on different types of platforms (HF Radar, fixed platforms, manual sampling, see Figure 13) and a variety of observed parameters such as surface and water column currents, air pressure, temperature, salinity, dissolved oxygen, phytoplankton, and biological benthic data.

For AZTI-operated stations in the Bay of Biscay, notable systems include:

- **HF Radar Systems** at Matxitxako and Higer, which track surface currents.
- **Fixed Platforms** like the Donostia buoy and Pasaia and Bilbao stations, observing parameters ranging from air pressure to water temperature, wave patterns, and wind direction.
- **Manual Sampling Points** such as L-A10, L-B10, providing detailed biological data, including benthic organisms, chlorophyll-A fluorescence, dissolved oxygen, salinity, and turbidity.

SOCIB (the Balearic Island Coastal Observing System) is also a significant contributor to coastal observations in Spain, focusing on the Balearic Sea and providing vital data for JERICO's objectives. Their integration of advanced technologies enhances the range and accuracy of collected data.

PDE-operated systems span a broader geographical range, from the Iberian Margin to the NW Mediterranean, with similar platforms and data collection:

- **HF Radar Stations** such as Faro de Cabo Silleiro and Antena Tarifa, tracking surface currents.
- **Fixed Platforms** like buoys near Gran Canaria and Tenerife, which capture a comprehensive set of environmental parameters including currents, waves, and air pressure.
- **Tide Gauges** located at several coastal points like Bilbao and Barcelona, focusing on sea level and wave observations.

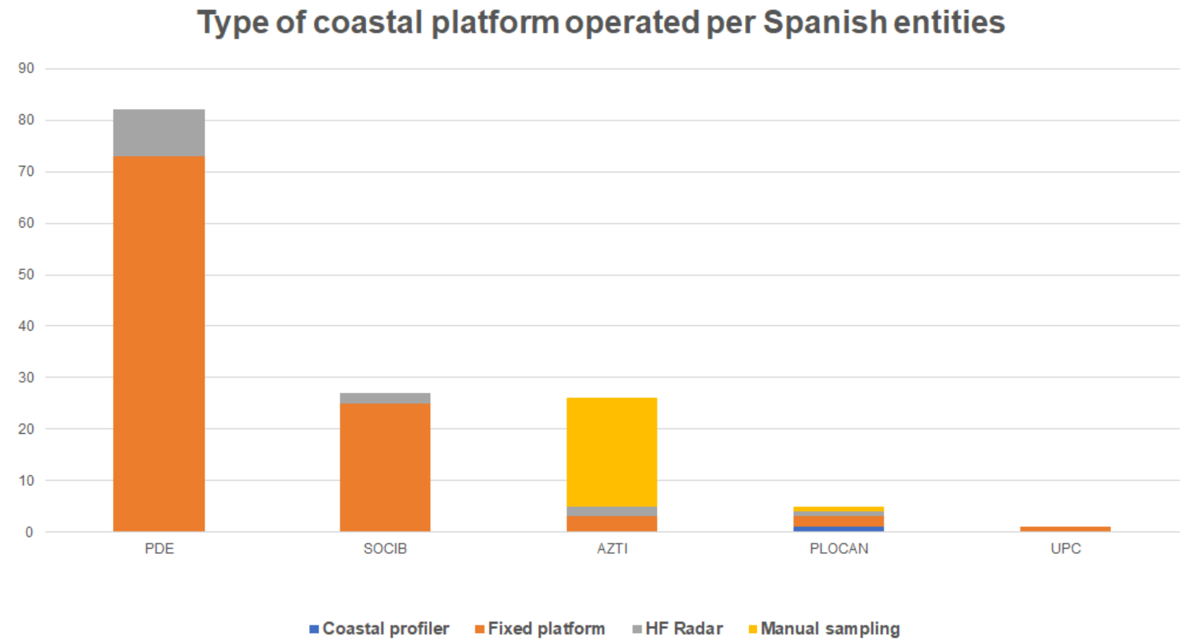

Figure 13: Type of platform used by Spanish coastal observation initiatives.

Spain's systems contribute to JERICO by providing a detailed view of the Mediterranean's environmental pressures and the Atlantic's dynamic conditions. This dual perspective enhances the ability to address diverse challenges and supports more effective regional and international marine management strategies.

2. JERICO observation system: future strategy and design

C. Feasibility of JERICO

It can not be overstated that the current application capitalises on a robust foundation of Member States' established and recognised NRIs. These dynamic communities of actors have gained official recognition and sustained ressources from their respective nation's political entities. This has prepared the terrain to achieve the ambition of a pan-European Research Infrastructure. The privileged contacts of the nationally recognised entities with national funding agencies and relevant State ministries (or equivalent) provides the strength and unity of voice essential in a rapidly evolving context. These established national RIs are facilitators for other member states with the serious ambition of further developing their national observation systems and integrating JERICO. The feasibility of JERICO is further attested by the favourable development of key performance indicators. Numbers of accessible facilities continue to rise as do Virtual Access capabilities, the breadth and diversity of variables measured, the involvement with the private sector and the production of valuable scientific knowledge. As indicated above, the involvement of Nation-supported entities and infrastructures is projected to rise, riding on the political support secured by JERICO's initial members - there is no question of the added value and necessity of this level of organisation to address national and global issues. The national infrastructures are briefly presented. Despite the multiplicity of drivers (and levels of organisation), the JERICO community shares many common goals, presenting both strong leverage and insurance for JERICO's success.

1. Strong National Research Infrastructures

The establishment of JERICO as a fully integrated European Research Infrastructure on coastal observation relies on the strong scientific achievements of the consortium's European nations. JERICO will also capitalise on well established NRIs on coastal observation and benefit from their long term experience and expertise. The national coastal RIs involved in JERICO are:

- ILICO, France
- CNR-OGS network of observations builds on the RITMARE effort, Italy
- POSEIDON / HIMIOFOTS, Greece
- EIrOOS Irish Ocean Observing Systems, Ireland
- COSYNA, Germany
- FINMARI, Finland
- KKOBS, Marine Component of the Estonian Environmental Observatory, Estonia
- MARINE OBSERVATION SYSTEM, MOS, Sweden
- MONIZEE, Portugal
- ICTS-SOCIB, Spain
- COASTWATCH, Norway
- RBINS+VLIZ+ Meet Net Vlaamse Banken, Belgium
- MWTL + WOT, Netherlands
- Coastal RI Under construction, Croatia.

2. A European answer to nations concerns

JERICO will be the only Research Infrastructure holistically embracing coastal marine systems. It will therefore fill a crucial gap in the European RI landscape. Existing environmental RIs are either focusing on deep ocean (EuroArgo and EMSO) or on inland and transitional environments (DANUBIUS and eLTER). Regardless of the major importance of the services they provide, none of them are designed to address the specific issue of coastal marine systems. The JERICO community intends to establish collaborative agreements with relevant environmental RIs as expressed in JERICO projects recently accepted for H2020 funding.

As part of the JERICO-DS proposal, we conducted a survey to assess the alignment between the available scientific expertise and the national priorities of each member country within the JERICO-DS consortium. This survey was shaped by the Marine Strategy Framework Directive (MSFD) and reflected the consortium's strong commitment to an ecosystem-based approach. The results highlighted variations across nations in both expertise and priorities, underscoring how these differences could complement one another. In some cases, nations were found to possess high levels of expertise in areas not considered a national priority, suggesting untapped potential that could benefit other countries. Conversely, some nations could address their expertise gaps by drawing on the strengths of others within the consortium, facilitated by JERICO's collaborative framework. Overall, these findings demonstrate the clear value of JERICO in fostering joint progress across nations, allowing them to effectively share knowledge and expertise to advance coastal research and policy efforts.

3.Conclusion

This early version of D9.5 will serve as a basis for making feedback, in order to consolidate a proper final version that will be submitted.