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

MILESTONE NAME: Analysis of regional actors and critical gaps in multidisciplinary data provision for user needs per PSS

Authors: Jukka Seppälä (SYKE), Costas Frangoulis (HCMR), Holger Brix (HZG), Ingrid Puillat (IFREMER), John Allen (SOCIB), Joaquín Tintoré (SOCIB), Alain Lefebvre (IFREMER), Laurent Coppola (CNRS)
Involved Institution: SYKE, HCMR, HZG, IFREMER, SOCIB, CNRS
Date: 20.12.2020

→ **Please specify the type of milestone:**

□ Report after a workshop or a meeting (TEMPLATE A)
□ Report after a specific action (TEMPLATE B) (test, diagnostic, implementation,…)
X Document (TEMPLATE B) (guidelines,...)
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JERICO-S3 MILESTONE

Joint European Research Infrastructure network for Coastal Observatory
Science, Services, Sustainability

Milestones title	Analysis of regional actors and critical gaps in multidisciplinary data provision for user needs per PSS
Work Package Title	WP4
Milestones number	MS17
Description	To support planning of JERICO-RI Pilot Supersite sampling strategy planning and implementation, regional actor analysis (3rd party observatories including other environmental RI networks, modelling communities, remote sensing communities) has been carried out, and critical gaps in multidisciplinary data provision for user needs have been identified.
Lead beneficiary	SYKE
Lead Authors	Jukka Seppälä
Contributors	Jukka Seppälä (SYKE), Costas Frangoulis (HCMR), Holger Brix (HZG), Ingrid Puillat (IFREMER), John Allen (SOCIB), Joaquín Tintoré (SOCIB), Alain Lefebvre (IFREMER), Laurent Coppola (CNRS)
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Security	Consortium Only or Public

Diffusion list				
Consortium beneficiaries	X			
Third parties				
Associated Partners				
other				

PROPRIETARY RIGHTS STATEMENT

TABLE OF CONTENT

1. Objectives

JERICO-S3 Task 4.2 defines the concept of a coastal Supersite and jointly with WP1 and WP2 sets and harmonises the overall targets and procedures of PSSs to reach the WP4 objectives. The regional specificities in societal information needs and open scientific questions are analysed together with WP1 and prioritised for each PSS. With WP2, regional actor analysis (3rd party observatories including other environmental RI networks, modelling communities, remote sensing communities) will be carried out, and critical gaps in multidisciplinary data provision for user needs will be identified. Results of these analyses are disseminated to WP1 and WP2 (MS 17).

2. Implementation process

The work for Milestone 17 was integral part of creation of Deliverable 4.1 (JERICO-S3 Pilot Supersite monitoring strategies). JERICO-S3 WP4 lead and co-lead partners defined the initial structure for Deliverable 4.1 in fall 2020, including sections

3.6. Key regional actors and user communities

3.7. Critical gaps in multidisciplinary data provision for user needs

Nominated Pilot Supersite leads and working group of T4.2, as contributors of MS17, were responsible for the regional content of these sections. In addition, the relevant parts of the analysis of JERICO-RI users and usage strategy, as created in WP9 (Task 9.2), was used.

The information described in this milestone was completed by 20.12.2020 and used in completing the Deliverable 4.1.

JERICO-S3 WP1, 2 and 3 followed the process for MS 17 and D4.1, participated in relevant WP4 meetings (see MS 18), and had access to draft documents.

3. Main report

3.1 Key regional actors and user communities

In the pan-European scale, Supersites will link to various Ocean data portals (EMODnet, Copernicus Marine Services), EC marine and environmental actions and initiatives (European Environment Agency, JPI Ocean, Joint Research Centre, European Marine Board) and environmental research infrastructures (e.g. EMSO-ERIC, EMBRC-ERIC, ICOS ERIC, EURO-ARGO ERIC, LifeWatch-ERIC, AQUACOSM-RI, DANUBIUS-RI, EuroGOOS, etc.).

In the regional scale, the number of actors and user communities, Supersites will connect to, is even higher. Mapping all of those is hard, but likely the most important ones are already well known. This section will review the key regional actors PSSs link to in observations, modelling and remote sensing. The list will evolve together with PSSs activities. The section continues by analysing which user communities within each PSS regions are already linked to JERICO-RI actions and may benefit from improved observation capacity by Supersites. This analysis will link to WP2 and WP9 of JERICO-S3 working with links of JERICO-RI and progressing sustainability of RI, respectively.

Key regional actors (data collection, modelling, remote sensing) for different PSSs were identified by PSS lead partners (Table 7). It is likely that not all the actors listed will be directly communicated during PSS implementation, but they are likely to be linked through regional work and PSS dissemination, e.g. through ROOSes. Mapping the regional actors is a continuous process in PSS work, carried further by Supersites, as linking with all key regional activities is one target of Supersites.

Table 7. Some of the Key regional actors for PSS regions for Observations, Modelling and Remote sensing

PSS region	Observations	Modelling	Remote sensing
GoF PSS	DE: IOW EE: TALTECH, EMI FI: SYKE, FMI, RU: Roshydromed, RAS SE: SMHI All: Regional environmental administration, Universities	DE: IOW, HZG, BSH DK: DMI EE: TALTECH, EMI FI: FMI, SYKE SE: SMHI, Stockholm university	DE: HZG, IOW EE: TALTECH, EMI, Tartu Observatory FI: FMI, SYKE PL: IOPAN SE: SMHI, Stockholm University

NW-MED PSS	FR: IFREMER, CNRS IT: CNR, ENEA, LAMMA, DLTM, ARPAL, ARPAT, CIBM, ISPRA, OGS, NATO-CMRE SP: SOCIB, PdE, Obsea	FR: IFREMER, CNRS IT: CNR, ENEA, LAMMA, ARPAL, DICCA (Università di Genova), OGS SP: SOCIB	FR: ACRI, CNES IT: CNR, LAMMA
NSEA-PSS	DE: BSH, HZG, AWI, ICBM, THÜNEN NL: DELTARES, RWS, NIOZ BE: VLIZ, RBINS UK: Cefas, PML, SAHFOS DK: DMI NO: IMR, NIVA, NORCE	NL: DELTARES DE: HZG, BSH, ICBM DK: DMI UK: PML, CEFAS, Southh.Univ. NO: Nansen Centre, MET NO, IMR, NIVA, NORCE	DE: HZG, DLR NL: DELTARES UK: PML BE: RBINS, VLIZ NO:Nansen Centre, MET NO, IMR, NIVA DK: DMI, DTU-Space
CHANNEL-PSS	FR: IFREMER, UMR LOG, BOREA laboratory, Roscoff Marine Station UK: Cefas, PML, Southampton Univ. Be: RBINS, VLIZ NL : Deltares, RWS	FR: IFREMER, UMR LOG UK: Cefas, PML, Southampton Univ. Be: RBINS, VLIZ NL : Deltares, RWS	FR: IFREMER, UMR LOG, ACRI/ARGANS UK: PML Be : RBINS, VLIZ NL: Deltares
CRETAN PSS	GR: HCMR, University of Crete	GR: HCMR, Univ.of Aegean, Univ. of Crete, Univ.of Athens, Univ. of Thessaloniki IT: OGS, CMCC	GR: HCMR, University of the Aegean, University of Athens

The analysis of JERICO-RI users and usage strategy will be created in WP9 (Task 9.2). Here we briefly summarise preliminary results already obtained as relevant for PSSs. The analysis identified a large number of users for each region, after the JERICO-RI region representatives compiled the information for JERICO-ESFRI application purposes. The analysis is done per region, not per PSS, but the differences are not likely very large. The results are also very preliminary as not all users were yet identified for each region.

Number of users varied from 24 to 67, for regions where PSS activities will take place (Figure 3). In all these regions, except in the North East Mediterranean, the public users were the largest user group. Academia was noted as the second largest group of users, except in the North East Mediterranean it was the largest group. Private companies were identified as an important user group in all regions as well, while the NGO's were noted as a minor group.

This distribution of user groups does not consider the actual number of individual users (e.g. number of scientists within a given university using JERICO-RI results), or the amount of used information per user. This analysis, just highlighting the number of users identified, needs to be followed by a more thorough one where the needs, effectiveness and impacts of various users are also considered in detail. Such analysis will take place in JERICO-RI WP9 and PSS will deliver a reconsideration of their user communities during the implementation phase.

As a starting point, however, this analysis shows the diversity of user communities and that the overall number of users will likely be very high (expected eventually >100 per region, if thorough analysis is done). This has clear implications that Supersites need to serve a large community and the products, services and capacities need to be planned accordingly.

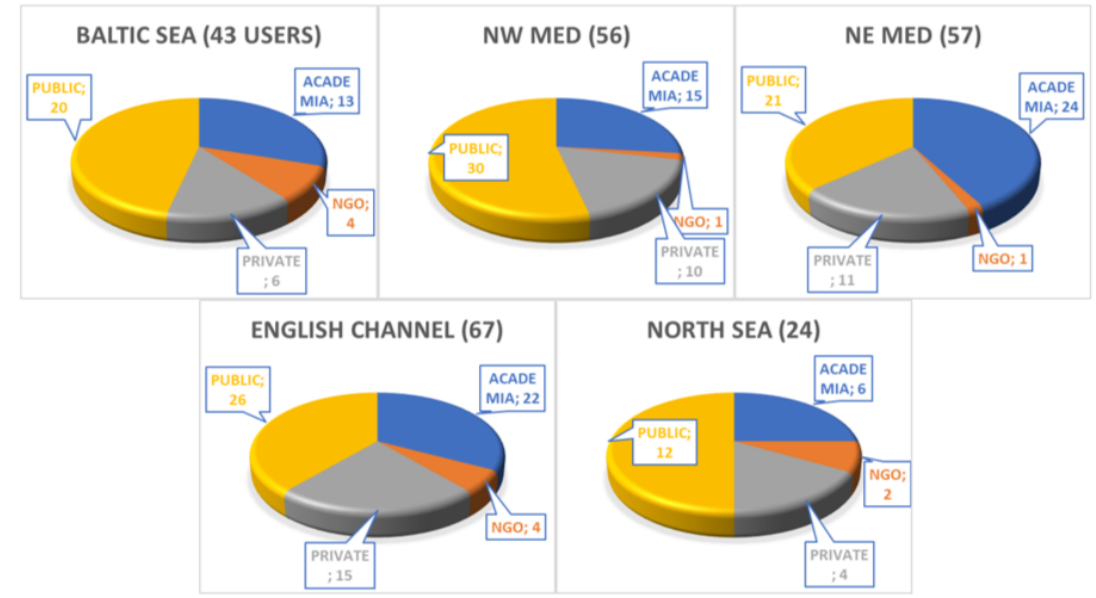

Figure 3. Number of users for regions with Pilot Supersite activities. The number of users and their categories was collected by JERICO-RI region representatives while compiling the information for JERICO-ESFRI application.

3.2. Critical gaps in multidisciplinary data provision for user needs

Summarising the materials presented in previous sections, it is evident that some gaps in the current data provision, for the needs of various users, exist. In some cases, these gaps are due to lack of methodologies, or deficiencies in the spatio-temporal distribution of observations. The primary reasons for the gaps, not analysed in depth here, may be related to the lack of knowledge, expertise or funding, or related to non-optimal structuration of observation capacity. The original priorities for making observations (location, timing, methods, variables, accuracy) may be different than requested by various users and prevent further uses of data. In addition to the technical and economic reasons, gaps may also be due to not adopting FAIR principles in data distribution, or not using adequate QA/QC measures degrading the usability of data. In this section we aim to provide outlook, which are the major gaps for PSS regions, especially referring to set priorities KSC#1-3.

All PSS regions agree on the importance of investigating and considering the Land-Ocean continuum, while the actual pressures and the relevant coastal characteristics vary a lot between regions. In some regions nutrient and particulate loads from rivers are the main concern to be studied. In other areas, the exchange between the coast and ocean is considered as a prominent driving force, whereas in other areas, it is the exchanges with the atmosphere. The related questions are very complex and require extensive multidisciplinary and integrated observations, and all regions identified this as a point for further developments. For this topic, the developments may be best achieved by coordinated

collaborations within regions and between adjacent regions, as well as all-embracing transfer of knowledge.

Sustained observation for the quantification of atmospheric loads and studying their impacts is not very developed in most regions. This may reflect the lower impact of these loads, but also technological difficulties in performing reliable measurements. For the southern regions, the topic is important due to the influence of Sahara dust events in oligotrophic areas (e.g. phosphorus limitation), while in all regions the industry and traffic are important sources for emissions (anthropogenic sources).

The connections within regions, between adjacent regions and Ocean are well established within some regions. NW Mediterranean Sea, for example, have integrated platforms, variables and models readily available. Overall, this topic was well covered in most regions.

Biodiversity variables are well covered in the Baltic Sea, whereas in other areas, such as the Cretan Sea, there are few long-term biodiversity studies. Overall, the observation capacities for zooplankton and benthos biodiversity trends are lower than those for phytoplankton. When studying the ecosystem processes, the analysis identifies clear deficiencies in many regions. Such analysis is awkward even using traditional sampling and laboratory techniques and requires complicated setups when studied using sensor deployments. For long term observations, biological data storage remains also complex and not yet harmonized between regions.

The same difficulties apply when measuring carbon fluxes and budgets, and these are typically carried out during short-term studies, and few of them are sustained for long term observations (e.g. ICOS ERIC Oceanic Stations). Although carbonate system variables are quite well studied, the results indicate a low level of sensor integration (few pCO_2 and pH sensors are ready for sustained observations). This may reflect the uncertainties in the measurements in coastal areas with high dynamics in the carbonate system, and requirements for more accurate technologies and in situ sampling to validate the autonomous measurements.

The JERICO-RI experts consider that in many regions the observations of rare events and their impacts are well covered, in particular for the Baltic Sea, the North Sea and the NW Mediterranean Sea. While this issue was also considered as important for the English Channel, only recent specific studies considered high resolution data and associated reliable numerical processing methodologies to define extreme events and their dynamics and consequences.

The long-term observations for variables reflecting the environmental shifts due to climate change seem to be quite well covered in most regions, especially related to physical variables. In this respect, Cretan Sea and NW Mediterranean, and English Channel showed thoroughness in observations. Much more improvements are required for observations to resolve impacts of anthropogenic disturbances. Answering such complicated and regionally varying questions is not easy, especially using traditional non-dynamic observation networks. Subsequently, the sampling strategies need to be improved, which is a key point for development within JERICO-RI in the future. Moreover, extracting the most relevant ecological information from such complex datasets requires the implementation of optimized or new numerical methodologies (e.g., Machine Learning, Artificial Intelligence). The same applies to integration of various long-term datasets for studying issues related to biogeochemistry and biodiversity.

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4. Conclusion

4.1. Synthesis of main conclusion

The analysis indicates JERICO-RI strengths in covering most of the topics in various coastal regions. But of course, the capacities vary between regions and between Key Scientific Challenges and their subtopics. These gaps need to be analysed further and prioritised to guide the future developments. The existing observation capacity does not mean, however, that all of the required pan-European observational products and/or services are in place. It will be a task of JERICO-RI to make this capacity fully operational by harmonizing operations and integrating observations. This integrative work needs to consider regional specificities, as the key support to major part of observations still comes from regional and national initiatives. Therefore, one big task of JERICO-RI will be balancing between pan-European and regional aspects, trying to optimise and rationalise the use of coastal RI.

4.2. Next steps (work plan)

In short term, next milestones to evaluate the Supersite concept, criteria for Supersites and the progress made, are the follow-up deliverables: D4.2 Refined PSS monitoring strategies, D4.3 Progress report on PSS implementation and D4.4 Assessment of PSS implementation. The links with other Work Packages within JERICO-S3 will bring additional elements to this evaluation and refinement of Supersite concept, as related to overall JERICO-RI scientific strategy, connections to other communities, and developments of new technologies and e-infrastructure solutions, to mention some of them. Parallel to this, JERICO-DS will interact with Pilot Supersite Actions, in searching solutions how to best design technical and organisational aspects of JERICO-RI. Finally, it will be a task of JERICO-RI preparatory phase project to outline which is the desired form of coastal Supersites.

4.3. Annexes and references

JERICO-S3 D4.1. JERICO-S3 Pilot Supersite monitoring strategies
https://www.jerico-ri.eu/download/jerico-s3_deliverables/JERICO-S3_DELIVERABLE_4.1_V2-FINAL.pdf