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## *"BLUEMED RESEARCH INFRASTRUCTURES ROADMAP"*

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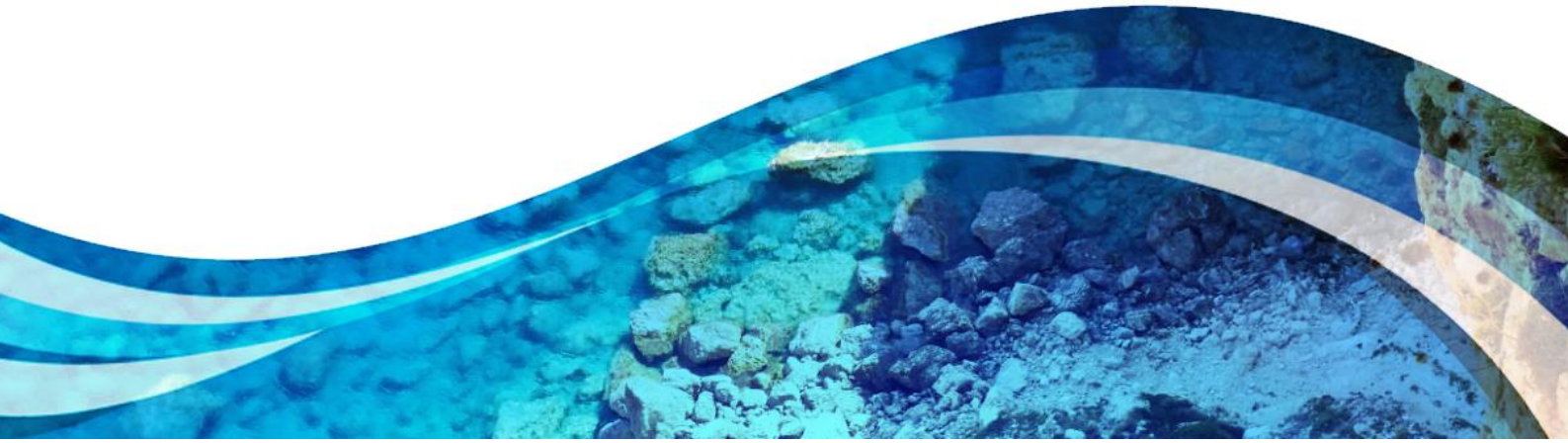

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# CONTENTS

## Executive summary / abstract

In order to ensure the efficient implementation of BLUEMED key priorities identified in the BLUEMED Implementation Plan, research infrastructures (RI) are key tools. This roadmap aims at giving an overview of the actions to be carried out at the Mediterranean level to further support the scientific needs of research and innovation communities and it results from a long bottom-up process carried out throughout the whole CSA. A preliminary BLUEMED Research Infrastructures Workshop was first organized in La Seyne-sur-Mer on 3 and 4 July 2017 with 40 experts from 13 Mediterranean countries, including non-EU countries, who gathered and worked in small groups to draft the first conclusions on marine and maritime RI. The outcomes of this first workshop led to the redaction of Deliverable D3.3 Research Infrastructure Assessment, which depicted the existing RI in the Mediterranean and identified the needs and gaps to be tackled in order to facilitate the implementation of BLUEMED SRIA actions. In a second time, the BLUEMED Mediterranean Research Infrastructures Stakeholders Conference was organized in Paris on 13 and 14 June 2019 and welcomed a wide diversity of actors and stakeholders from public bodies, private sector, research and innovation, economy, and experts in RI. Participants split into three different working groups to focus on the way RI can be used as valuable tools to help solving some of the main challenges faced by the Mediterranean Sea. Answers provided during the discussions of this two-day landmark event have been a very strong basis to help building this RI Roadmap.

## Scope

This Roadmap on Research Infrastructures aims at giving an overview of the actions to be carried out at the Mediterranean level to further support the scientific needs of research and innovation communities. It aims at presenting pragmatic solutions to increase synergies between existing RI in the Mediterranean area and it proposes a vision for enhancing the cooperation and facilitating the access to RI needed for supporting solutions toward the sustainable development of Blue Economy in the Region. This document will be used to set up a framework future programs and actions related to marine RIs in the Mediterranean. It will circulate among BLUEMED community, especially through the representatives from the GSO BLUEMED Working-Group who are crucial contact points with their respective national governments. Beside Mediterranean national governments, this document will be used in the following months and years as a basis to shape lobbying actions in the framework of Horizon Europe[1] and it can help promoting relevant future calls to highlight the importance of marine RIs in the next seven years programming. This document can also be useful material in the framework of the UN Decade of Ocean Science for Sustainable Development, especially under the thematic of "predicted oceans".

[1] CERIC (2020), *Opinion – Research infrastructures, Horizon Europe Missions and wider policy goals* [online]

The document is structured as follows:

- The first part presents the main challenges identified in terms of infrastructures to support marine and maritime research and innovation in the Mediterranean. This part is based on the results of the conference held in Paris in June 2019;

- The second part proposes a list of pilot projects to be investigated on a priority basis and aiming at filling the most important gaps. Their implementation can be intended on a medium-long term perspective, e.g. 3-5 years after the dissemination of the Roadmap;

- The last two parts address the issues of governance, financing and shared access to marine infrastructure with particular attention to North-South disparities.

# Introduction

**Research Infrastructures (RI) are facilities, resources and services that are used by the research communities to conduct research and foster innovation in their fields.** They include major scientific equipment (or sets of instruments), knowledge-based resources such as collections, archives and scientific data, e-infrastructures, such as data and computing systems and communication networks and any other tools that are essential to achieve excellence in research and innovation. They may be 'single-sited', 'virtual' and 'distributed'[2]. Ocean observation is currently a key component of the EU Strategy for Marine and Maritime Research and has become a high priority on the worldwide environmental political agenda[3].

**Marine RIs** are therefore **key tools** to support efforts led to preserve marine resources, environments and ecosystems, while they can also reinforce Blue Growth economic activities in the Mediterranean Sea by making sure they do not harm the marine resources, environments and ecosystems through analysing their impacts and monitoring anthropological pressures in the basin. In that way, RIs are essential to ensure the **achievement of the priorities and actions** identified in the **BLUEMED Implementation Plan**.

In Europe Marine RIs consist of up to 800 – increasingly networked – distributed facilities, serving various domains such as ocean – seafloor, subsea floor and water layers above – and coastal sea monitoring, marine biology research, blue biotechnology innovation, research in aquaculture and ocean engineering. Their observation and data management components form the foundation for a **European Ocean Observing System (EOOS)**, providing the platforms and services to deliver environmental data, information and ultimately knowledge[4].

The **2018 European Strategy Forum on Research Infrastructures (ESFRI) Roadmap** strongly highlights the importance of the ***multi-messenger* aspect of RIs**, and this BLUEMED Roadmap on RIs aims at closely following this perspective. The concept of multi-messenger research relies on exploiting diverse sources of information from different research methodologies to yield an integrated complementary ensemble of data that becomes the true insight on the phenomenon studied. **A multi-messenger approach presents a high potential to address complex phenomena like grand societal and scientific challenges by using synergistically RIs from all fields**[5].

The Mediterranean Sea is a dynamic complex system that provides a large amount of resources, food, jobs, energy and revenues for all the inhabitants living on its coasts. It is facing major contemporary societal and scientific major challenges such as climate change adaptation and mitigation; understanding and tackling pollution; food resources management. Therefore, tremendous collective efforts are needed from all

[2] Article 2 (6) of Regulation (EU) No 1291/2013 of 11 December 2013: "Establishing Horizon 2020 – the Framework Programme for Research and Innovation (2014-2020)"
[3] ESFRI (2018), *Roadmap 2018 – Strategy report on research infrastructures* [online] – p.70
[4] Same reference – p.70
[5] Same reference – p.16

the stakeholders whose activities take place at sea. This joint cooperation has to go **beyond disciplinary methods and limits**, and this is why Mediterranean marine RIs services and tools need to be widely open and be jointly used both by different scientific communities, but also by other blue economy stakeholders that do not belong to the academic sector. It is essential to think about developing, maintaining and creating marine RIs whose services and tools can benefit to the **largest diversity of users** possible in the Mediterranean basin. That implies the development of shared guidelines and methodologies, open data practices and protocols to promote the harmonization of collected information and make sure they can be easily findable and reusable for a large diversity of users.

Several well working networks of cooperation and strong RIs facilities and tools already exist in Europe. The BLUEMED Roadmap on RIs belongs to this wider context and it is important to capitalize on efficient and already existing efforts and initiatives. These have been assessed in the first BLUEMED Deliverable D3.3 and the ESFRI Roadmap 2018 also highlights key marine and water related RIs as well as EU projects and initiatives supporting network of relevance for marine research.

For a more detailed Mediterranean marine RIs assessment, please refer to first BLUEMED deliverable on the issue[6].


[6] BLUEMED CSA (2017), *D3.3 Research Infrastructures Assessment* [online]

# I – Tackling major challenges in the Mediterranean Sea through Research Infrastructures

## 1) The BLUEMED Mediterranean RI Stakeholders Conference (13-14 June 2019): expectations and objectives

The **BLUEMED Mediterranean Research Infrastructures Stakeholders Conference**, which took place in June 2019 in Paris had the objective to pave the way for this roadmap. The expectations of the conference were to **bring together various blue economy stakeholders and RIs experts and encourage them to provide answers to scientific and technical obstacles to the use and sharing of RIs.** They were also asked to formulate first proposals and recommendations for concrete actions that would efficiently contribute to blue economy competitiveness in the Mediterranean region and would support the development of public policies through a better use of RIs.

As previously mentioned, conclusions resulting from those two days were a very strong basis to help preparing this document. Discussions held during this event were organized around **three parallel workshops** to enable participants to brainstorm in small groups on three major challenges that are faced in the Mediterranean Sea:

- Which tools to address key pollution issues in the Mediterranean Sea?
- Which tools to support adaptation and mitigation of climate change in the Mediterranean Sea?
- Which tools to ensure a sustainable use of bio-resources in the Mediterranean Sea?

Shaping the event around those three crosscutting challenges was the way to bring together different scientific communities in the perspective of working together on common contemporary issues beyond disciplinary methods and frontiers.

## 2) The BLUEMED Mediterranean RI Stakeholders Conference (13-14 June 2019): conclusions and outcomes of the event

About 50 participants from 13 different countries attended the meeting. Their contributions and recommendations were relevant for BLUEMED developments, including the Implementation Plan and the Pilot Action on Healthy Plastic-free Mediterranean Sea. Some of them are summarized and developed below:

### A) How can RIs address key pollution in the Mediterranean Sea?

**Understanding the effects of pollutions and the way to combat the various forms it takes** (including plastics, emerging chemical pollutants and underwater noise)

remains an acute challenge in the Mediterranean basin and is one of BLUEMED top priority. Detecting and understanding pollution is a pre-requisite to ensure the proper management and improvement of marine environment and connected activities in the Mediterranean. At this stage, there is a lack of knowledge on emerging pollutants such as **plastics** (micro and nano-plastics) and their consequences on marine environment, their inhabitants and the food web. Moreover, there is a lack of harmonized protocols to monitor and assess those pollutants at Mediterranean scale. RIs can provide key tools and services to scientific different communities and blue stakeholders for sustainable prevention, mitigation and remediation of pollution in the Mediterranean basin.

Several recommendations for future evolutions have been made and here is the highlight on two of them:

- **Toward a Mediterranean integrated system to address natural hazards and prevent damages from acute pollution events**

Monitoring geohazards (earthquakes, landslides, tsunamis…) and preventing potential damages to coastal and offshore infrastructures and population, the development of networks of observatories and early warning systems is necessary.

The Mediterranean Sea witnesses a very important traffic of vessels and also hosts tankers highways. Risks for potential leaks at sea and in the harbour areas are high and it is therefore important to encourage the identification of hotspots (e.g. Algeria, Sicily Channel, Cyprus, Strait of Gibraltar). It has also been proposed to use RIs and new technologies to implement a **Mediterranean monitoring and alert system of oil spill**, similar to the one already existing for forest fire monitoring. Such a system, using satellite data could detect, locate, characterize and monitor damages of oil spills. Information could be sent quickly via mobile technology to those responsible for controlling and managing such damages (REMPEC).

- **Encourage the development of programs such as the UN Programme for the Assessment and Control of Marine Pollution in the Mediterranean MED POL**

It is essential to assist and provide Mediterranean countries with a **policy framework** aiming at supporting the formulation and implementation of pollution monitoring initiatives and main protocols, including pollution control measures and the drafting of action plan (at national and regional levels) aiming at eliminating pollution from land-based sources.

### B) How can RIs support adaptation and mitigation of climate change in the Mediterranean Sea?

The Mediterranean Sea has been identified as a **climate change vulnerability "hotspot"** by the IPCC. Most countries are already experiencing, high temperatures and increased humidity or drought coupled with increasing water scarcity, forest fires and the possibility of desertification. Climatic changes are expecting to have major impacts

on the ecosystems and the provision of ecosystem services, but also on human safety as well as global and national economies.

There are still gaps in research and innovation with regard to understanding climate phenomena, hence developing the appropriate mitigation and adaptation strategies. Climate change adaptation is a major crosscutting issue. It requires increased knowledge, technological and social innovation and policy shifts and the Mediterranean as a region needs to tackle this in a unified way, as there are important adaptation gaps, behavioural and economic barriers that hinder the effectiveness of measures[7]. In this perspective, RIs can be used as key tools to improve knowledge on climate change and it is essential to develop cooperation schemes around them to increase potential solutions to better understand, mitigate and adapt to this acute challenge.

Several recommendations for future evolutions have been made and here is the highlight on four of them:

- **Increase climate change awareness in non-EU Mediterranean countries**

Climate change mitigation is a priority in Europe and population is in majority well aware of the challenges it implies. However, this is not the case everywhere in the Mediterranean region and non-EU representatives explained during the discussions that there is a **lack of climate change awareness in southern countries**, both among society and public authorities. Therefore, it is of crucial importance to lead strong **lobbying actions and awareness campaigns** in southern countries among decision-makers and citizens to put this critical issue on top of the agenda.

- **Strengthen cooperation between land and sea communities to tackle common issues related to climate change**

The importance to **better connect land and sea scientific communities** has been raised, as they do not use common ways and tools for modelling ecosystems. A first step toward a stronger cooperation between those communities would be to develop new **common modelling tools and protocols**, to bring together the different scientific communities around common climate change topics relevant to the River-Sea systems.

- **Programming joint synoptic campaigns, explorations and observations**

Encourage the development of **synoptic campaigns** on key topics related to climate change rather than geographical campaigns which tend to focus on strategic areas. It would be a way to concentrate and intensify efforts around the same goal from scientists belonging to very different communities.

In the same way, it has been recommended to encourage the integration of in situ observation platforms around common scientific challenges connected to climate change.

[7] BLUEMED IP Working Document Fiche 3 K-B2 – Preparing to climate change and define adaptation/mitigation measures

- **Encourage long-term experiments**

**Long-term experiments** are essential to study climate change topics, and it is essential to keep that in mind when thinking about the creation and development of RIs. Sustainable and targeted long-term financial commitments are therefore required to ensure the sustainable and maintaining of dedicated RIs.

### C) How can RIs ensure a sustainable use of bio-resources in the Mediterranean Sea?

Major efforts have been led during the past decade in terms of **marine biological observations** in order to better understand biogeochemical cycling, ecosystem services, marine biodiversity, coastal ecosystems and complex biological variables. However, major work is still required to better characterize marine ecosystem health and understand the growing effects and pressures of human activities on marine biodiversity and bio-resources. Improving knowledge is an indispensable pre-requisite to pave the way for reasonable decisions to protect our marine environment.

The number of infrastructures for marine biological observations is growing and it is important to remind the work done by existing networks to coordinate those facilities and improve knowledge on marine biology and ecology research. It is for example the mission of the **European Marine Biological Research Centre (EMBRC-ERIC),** which aims at increasing the access to necessary and relevant services, facilities and technology platforms to study marine organisms and ecosystems.

One of the major issues raised during the discussions was the difficulty for researchers to ensure the long-term maintenance of RIs belonging to the domain of bio-resources. There is a need to find new mechanisms to ensure the sustainability of those RIs on the long-term.

The issue of reference materials, methodologies and standards analyses in the domain of seafood testing has been expressed. Analytical tools and methodology for labelling and accreditation are also lacking. BLUEMED Start-Up Action LabMaf, when scaled-up as planned in the Implementation Plan, could bring potential solutions and new examples of protocols to follow in the matter of labialisation process. As a reminder, one of LabMaf's objectives is to develop a step-by-step labelling approach for small fisheries and advertise governments on the importance of such labelling processes to support sustainable and artisanal fisheries.

Several recommendations for future evolutions have been made, among which:

- **Creation of a Mediterranean Cluster for Blue Biotechnology**

Clusters are a key concept for regional development and innovation, they are **privileged platforms** offering fertile ground for creation and commercialisation of innovative products and services as they offer a place where companies, scientists,

public authorities and potential investors can easily interact[8]. At this stage, there is not such a platform dedicated to marine biotechnology in the Mediterranean region. The necessity to develop a Cluster for Blue Biotechnology has been raised during the discussions, in order to share information and good practices between the different stakeholders in the domain. Such a platform should also propose **training and lobbying activities on marine biotechnology** and should be open and equally accessible for users from the two shores of the Mediterranean Sea. Moreover, such an initiative would strongly support the implementation of BLUEMED Priority 8 Exploring the potential of blue-biotech.

- **Clearly and regularly assess Mediterranean RIs for aquaculture and use already existing platforms such as EurOcean database to increase their visibility**

The necessity to **increase visibility of Mediterranean RIs for aquaculture** has been raised. A better promotion of those facilities would facilitate their access and avoid unnecessary duplication of means and tools. It has been proposed to make sure that all Mediterranean RIs in the field are correctly added into the existing **EurOcean database**, which already contains information on more than 110 European Aquaculture Experimental and Research Facilities but does not include those from non-EU countries.

For more details on the BLUEMED Mediterranean RIs Stakeholders Conference and the discussions held during this event, please refer to the full and detailed report at the end of this document (Annex A).

[8] NETBIOCLUE (2008), *Do's and don't for biotech cluster development: the results of NetBioClue,* [online] p.10

# II – Pilot projects to increase cooperation around marine Research Infrastructures in the Mediterranean

Building, operating and maintaining a Research & Innovation Infrastructure require not only a significant investment but also a long lasting effort. In order to make the most of the resources allocated to the development of R&I infrastructures, it is therefore important to prioritise projects for which a long term commitment of various funders willing to cooperate together can be obtained.

In this respect and with the aim to maximise the benefits of the resources devoted to infrastructure development in support to the blue economy in the Mediterranean space, BLUEMED proposes to initiate a step by step approach by launching pilot projects. After of a few years (e.g. 4 years), an evaluation will make it possible to assess the effectiveness of the project, to inflect the orientations, to detail the contours and to scale-up the R&I infrastructure.

The pilot projects suggested in the following list aim at **providing answers to the main gaps and challenges identified in the domain of Mediterranean RIs** in the framework of BLUEMED CSA's work. They aim both at strongly **supporting the implementation of BLUEMED SRIA Priorities and increasing cooperation in the Mediterranean around RIs**. During the remaining time of BLUEMED CSA, it will be important for BLUEMED community to reach a consensus on these pilot projects in order to discuss, approve and launch over time their successive implementations.

## 1) Research Vessels

- **Mediterranean Joint Programme for planning transnational campaigns and increasing vessels sharing with non-EU countries**

The fleet in Europe is composed of 99 vessels operated by 62 operators in 23 different European countries[9]. It plays a key role in supporting the development of scientific knowledge of the marine environment, as it is a key complimentary component of the wider global observing system[10]. Several efficient networks already exist at EU level to enhance collaboration between countries and to facilitate joint access to research vessels, such as EUROFLEETS+, ERVO or OFEG. However, it has to be noted that those networks tend to predominantly involve European fleets and scientists. It would be important to develop new networks, programmes or partnerships enabling a stronger involvement of non-EU scientists in research campaigns at sea and facilitating their access to European fleets.

[9] EMB (2020), Position Paper 25 – Next Generation: European Vessels – Current status and foreseeable evolution [online]
[10] EMB (2020), *Policy Brief – Next Generation: European Research Vessels* [online] – p.3

Such a mechanism is strongly advocated by the European Marine Board, it **would foster scientific exchange, collaboration and excellence in European and Mediterranean scientific capacity**[11]. Moreover, such a mechanism would enable a growing number of non-EU scientists to co-build and take part to research campaigns in the Mediterranean Sea. **A wider involvement of non-EU countries through the organization of pluri-annual and transnational campaigns would allow a better coverage of the Mediterranean**. Programming such joint campaigns would enable non-EU scientists to be fully involved in the project building process, from the very beginning. This aspect has been raised on several occasion during the BLUEMED meeting in June 2019 and southern representatives expressed their wish to reinforce co-planning and co-construction of scientific projects.

It could be interesting to involve systematically **students** in this kind of transnational campaigns, in order to insist on the importance of **training on board** to develop new skills and reinforce **capacity building** for young researchers.

Moreover, the development of new activities should be promoted to **train marine technicians, vessel crew and shore-based staff throughout their whole career**, especially to adapt at best to fast evolutions of technology, equipment and tools. It is very much important to valorise these career paths in order to support the growing needs for research vessels and to efficiently support marine science community's activities.

- **<u>Mediterranean Cross-Sectoral Observation Programme between fisheries commercial fleet and scientific community</u>**

**Strengthen the cooperation between scientific communities and fishing sector** is a precious opportunity to increase the number of automated sampling and analysis for physical, biochemical and biological parameters at sea.

Marine environment protection concerns all stakeholders whose activities take place at sea and it is important to involve them in the collection of data and increase their knowledge about the environment in which they live and work. Therefore, it is important to encourage synergies between research, economic sectors, citizens to help preserving marine and coastal resources and environments. Involving such a large diversity of actors in marine observation is a strong opportunity to maximize and cumulate a large amount of information. This requires the development of shared guidelines and methodology.

*Potential future evolutions/declinations: this type of initiative combining observation and another blue activity could be declined in collaboration with other marine economic activities. For instance, the number of automated instrument packages could be increased on board of various ships and new strategic routes and areas could be defined (e.g. cooperation with ferry lines or other commercial maritime companies, example of FerryBox-like projects).*

[11] Same reference – p.5

## 2) Marine based facilities and in situ observation

- **Mediterranean Coordinated Network of Coastal Multidisciplinary Observing Stations**

**Develop a transnational joint observing systems**, through a network of marine based facilities and multidisciplinary stations, able to address physical, geochemistry and biodiversity observation, environmental threats and pollution, and related hazards. The overall target is to develop a capacity to monitor and understand ecosytem changes to the extent of improving alerts and anticipate risks such as marine food chain disruptions and impacts from pollution; better understand the potential transboundary sources of contaminants reported in national marine waters: through international networking, dedicated assessments to quantify and locate non-local sources of pollution, and study connective pathways for the transport of pollutants in the Med region.

This project can be supported by the set up a regional task force composed of experts, relocatable instruments to be deployed for dedicated joint activities and services including bordering countries.

## 3) Land-based facilities

- **Mediterranean Network of Marine Environment Laboratories (chemistry, biotech)**

To make an accurate diagnosis of the state of marine ecosystems, the pressures exerted on them, the acquisition of quality, comparable data is a necessity. This must be based on qualified laboratories using identical methods validated by intercalibration exercises. To this end, it is proposed to establish **a Mediterranean network of marine environment laboratories**. The establishment of such a network in **various disciplines** (physics, chemistry, biology) will meet the need to better assess gradients and trends in an enclosed sea such as the Mediterranean.

Such a network will especially be an asset for addressing the crucial need of improving the monitoring of pollution (plastics, chemical contaminants, underwater noise) as well as the observation of biodiversity changes.

## 4) Satellites and spatial

- **Multi-disciplinary Programme using New Space technologies for risk-mitigation against natural hazards in the Mediterranean**

A **multi-disciplinary Mediterranean Programme** could be launched around **New Space technologies such as CubeSats and Nano-satellites** to monitor and increase the level of knowledge on those **natural and geological hazard risks in the marine environment** of the region. Surveillance and weather forecast activities led in the sky should be closely connected to land-based facilities to draw the most complete picture

possible to anticipate the risks and preserve economic activities and Mediterranean societies from major events.

This programme could involve a lot of **universities and students** for the creation and development of Nano-satellites projects. Increasing cooperation between BLUEMED community and those institutions would be a way to:

- Raise awareness among the next generation of space researchers and engineers about the current challenges faced by the Mediterranean Sea and how spatial activities can help providing answers;
- Reinforce capacity building for this future generation of scientists and engineers coming from the two shores of the Mediterranean, linking their knowledge and technical skills on CubeSats/Nano-satellites with broader scientific knowledge on marine and coastal Mediterranean environment. This could be a way to create potential new vocations on how New Space can serve Blue Growth in the Mediterranean.

Besides the implication of numerous universities in New Space activities, this domain also witnesses a **very strong involvement of industries and private companies**. Here again, such a programme would allow the creation of a platform to strengthen relations between the BLUEMED scientific communities and various private stakeholders to foster new cooperation opportunities.

## 5) Data

There is already a good level of data integration at the European level and several efficient, well-structures networks and databases already exists and contain a large amount of information on the Mediterranean Sea. However, this level is not the same everywhere in the Mediterranean region and there is no real data sharing policy in every country of the basin. **Data integration first needs to be promoted at national level in non-EU countries**, and strong initiatives involving representatives from these countries such as BLUEMED could play a key role of levier to lead lobbying actions among national governments.

- **MedBlueNet – Blue Economy Mediterranean Observatory (integrated data service connected with Emodnet and Copernicus)**

Alignment and coordination with EMODnet, Copernicus and other national marine core data services and cooperation with other relevant European initiatives such as Blue Cloud. **Creation of MedBlueNet – integrated data service providing open access to data layers at different scales (regional and coastal) for both scientific /technical (research, environmental management, surveillance, security, industry) and non-technical (legal, socio-economic, policy) aspects.**

This programme could be accompanied by the promotion of **DOI mechanism**. DOI are essential to develop national databases and they are attributed by a given institution. It would be important to increase the number of bodies and agencies able to attribute DOI to develop national databases, especially in countries where data integration is not

as strong as in the EU. BLUEMED GSO WG could be used as a key political levier to encourage national governments to take further actions in this perspective.

The following table aims at illustrating the **correlation between the suggested RIs pilot projects and the priorities highlighted in the BLUEMED Implementation Plan.** The number of stars indicates how strong and efficiently a given pilot project can contribute to achieve the related BLUEMED SRIA Goal (from one start * to three *** stars to indicate if they partially or perfectly match).

## Correlation between the pilot projects from BLUEMED RIs Roadmap and BLUEMED SRIA key priorities highlighted in the Implementation Plan

| | MEDITERRANEAN JOINT PROGRAMME FOR PLANNING TRANSNATIONAL CAMPAIGNS AND INCREASING VESSELS SHARING WITH NON-EU COUNTRIES | MEDITERRANEAN CROSS-SECTORAL OBSERVATION PROGRAMME BETWEEN FISHERIES COMMERCIAL FLEET AND SCIENTIFIC COMMUNITIES | MEDITERRANEAN COORDINATED NETWORK OF COASTAL MULTI-DISCIPLINARY OBSERVING STATIONS | MEDITERRANEAN NETWORK OF MARINE ENVIRONMENT LABORATORIES | MULTI-DISCIPLINARY PROGRAMME USING NEW SPACE TECHNOLOGIES FOR RISK-MITIGATION AGAINST NATURAL HAZARDS | MEDBLUENET - BLUE ECONOMY MEDITERRANEAN OBSERVATORY (INTEGRATED DATA SERVICE CONNECTED WITH EMODNET AND COPERNICUS |
|---|---|---|---|---|---|---|
| P1 Understanding Pollution Impacts, Mitigation, and Remediation in the Mediterranean Sea | ★★★ | ★★ | ★★★ | ★★★ | ★★ | ★★ |
| P2 Support solutions for sustainable food production and consumption | ★★ | ★★★ | ★★ | ★★ | ★★ | ★★ |
| P3 Preparing to climate change and define adaptation/mitigation measures | ★★★ | ★★ | ★★★ | ★★ | ★★★ | ★★ |
| P4 Towards an observing system of systems | ★★★ | ★★★ | ★★★ | ★★★ | ★★★ | ★★★ |
| P5 Linking tourism, tourists and environment | | ★ | ★★ | | ★★ | ★★ |
| P6 Effective maritime spatial planning in the Mediterranean | | | ★ | | ★★ | ★ |
| P7 Greening vessels, facilities and services | | ★ | | | | ★★ |
| P8 Exploring the potential of blue-biotech | ★ | | ★ | ★★ | | |
| P9 Promote the role of Marine Renewable Energies in the Energy Transition phase | | | ★ | | | ★ |
| P10 Open data, open science and open innovation | ★★ | ★★ | ★★★ | ★★ | | ★★★ |
| P11 Building capacity, blue skills and blue professionals | ★ | ★ | ★★ | ★★★ | ★★ | ★★ |
| P12 Strengthen synergies among science, industry, policy makers and society | ★ | ★★★ | ★ | | ★★ | ★★★ |
| P13 From traditional maritime economy to Blue Growth activties | ★ | ★★ | | | ★ | ★★ |

# III – Marine Research Infrastructures governance and financing in the Mediterranean Sea

It is costly to build, operate and maintain RIs and it is therefore essential to have a **long-term plan to support their development and existence**. This section exposes several recommendations to further support the long-term sustainability of marine RIs in the Mediterranean Sea by engaging further lobbying actions with public sector to reinforce their will to fund RIs, reinforce cooperation with the private sector and with NGOs for win-win situations.

## 1) Lobbying actions to encourage further public funding in RIs

It is indispensable to adopt a long-term vision to sustainably develop and operate RIs in the Mediterranean. Such a vision requires relevant policy framework and it is therefore primordial to promote marine science and scientific explorations and observations as a way to **serve society**, to **increase well-being** and to **provide answers in a context of global change** where marine resources are threatened. Lobbying actions are needed to make all Mediterranean policy makers aware of the usefulness of marine RIs to serve Mediterranean societies. Such awareness actions will help **strengthening political commitments and shape relevant financial policy framework at national level**.

## 2) Reinforce cooperation between academic and industry sector

It is important to **strengthen the engagement of marine RIs with industry** as they have a huge innovation potential and can provide economic stakeholders with very useful tools, service and data to fulfil their activities. Therefore, **public-private partnerships with industry** should be increased, these opportunities are a way to ensure **maximum return and therefore financial and societal long-term sustainability**. The contribution of RIs to application scoped research and development can be improved[12]. In this perspective, it is necessary to:

- Raise awareness on opportunities provided by RIs;
- Raise awareness on the needs of Mediterranean economic stakeholders, and make sure that scientific communities can be responsive to those needs;
- Use RIs sites and campuses as a privileged place to strengthen the connections between scientific communities and business stakeholders at a regional/local level;
- Encourage the development of innovation ecosystems such as Living Labs where businesses and scientists can fully cooperate on joint projects and fully share the services and instruments provided by marine RIs. Consumers can also be involved in those ecosystems, in order to have all the players of the socio-economic value-chain involved in the creation of a new product.

[12] Also mentioned in ESFRI Roadmap

### 3) Reinforce cooperation between academic sector and NGOs

It is also important **to increase the engagement of Mediterranean marine RIs with NGOs,** who are producers of knowledge and which are also involved in marine and coastal data collection. NGOs are prominent stakeholders in the preservation of marine ecosystems, environments and resources and they can benefit from a very strong visibility and they benefit from a strong credibility among policy makers and public opinion. **Developing stronger cooperation schemes and interactions between Mediterranean RIs and NGOs can therefore be a precious opportunity for financial returns and can be a platform to lead strong lobbying actions toward public authorities** (e.g. The Pew Charitable Trusts that works to encourage responsive government and support scientific research on a wide range of issues, including global ocean governance. The Trusts dedicates a large amount of its budget to lead lobbying actions and it financially supports several environmental organizations and research centres).

# IV – Research Infrastructures North-South disparities

This section aims at analysing some of the **main disparities existing between the North and the South shore of the Mediterranean Sea in the domain of RIs**. It is essential to tackle this acute challenge to support marine scientific needs in the whole basin. Each following paragraph highlights a specific disparity existing in the Mediterranean and exposes a proposition that can be further explored to mitigate the difficulty at stake. These propositions are based on what representatives from non-EU countries expressed during the BLUEMED Conference on RIs in June 2019.

Beyond technical issues related to RIs, representatives from southern countries also expressed their wish to be fully involved in the project building process, from the conception right from the beginning to the implementation. It is therefore essential to **promote a balanced scientific cooperation based on co-constructed and co-planned initiatives and partnerships between EU and non-EU countries.** Moreover, receiving feedback and contribution from non-EU representatives is essential when it comes to build key documents such as this roadmap aiming at giving an overview of the actions to be carried out at the Mediterranean level. It will be important to pursue ongoing efforts to encourage their involvement in the future.

## 1) Trans-National Access Opportunities

In Europe, key national and regional RIs are already widely opened thanks to mechanisms (transnational access, based on calls for proposals or virtual online access) aiming at facilitating their access to all European researchers, from both academia and industry, ensuring their optimal use and joint development. Also, it is easy for European researchers to move from one EU country to another.

However, non-EU scientists may encounter **visa issues** to visit the northern shore of the sea. In addition, it may also be difficult for them to access and use European facilities. Already 20% of the total amount of Trans-National Access units provided by European RIs can be granted to institutions based outside the EU of in associated countries. Due to a **lack of visibility,** it appears that non-EU scientists are not always aware of this and do not seize the chance to use **TNA opportunities** (and that leads to duplications of means and facilities).

- **It is therefore essential to lead systematic strong awareness campaigns on RIs TNA opportunities among non-EU institutions and reinforce TNA calls to avoid duplication of facilities and reinforce cooperation between the two shores of the Mediterranean Sea.**
- It is primordial to **capitalise on existing RIs communication networks to share information and valorise at best existing RIs and facilities**, in the perspective to avoid unnecessary duplication of means and tools. It would be interesting to **extend the EurOcean database to the whole Mediterranean basin**.

- To reduce visa and administrative issues, **BLUEMED Initiative and GSO BLUEMED Working Group could play a key role of political leviers to raise at the highest level those circulation problems**. Lobbying actions toward national governments should be encouraged in order to find political agreements to facilitate researchers' mobility.

### 2) Data disparities

Data became more and more accessible in the Mediterranean during the past years, but still, there is a general **imbalance of data coverage between the Northern Western Mediterranean and the Southern Western part of the basin**. High resolution is not fully operable everywhere and countries from the southern shore often have to pay for them. The majority of measurements is made in the Western part of the Sea, while there is a lack of fine scale studies in the East (e.g. Levantine basin).

As it was raised before, it is very much important to **promote data integration first at national level for non-EU countries,** which do not have a strong national data sharing policy. There is a very **high potential for collaboration** between southern countries, and scientists are very keen on cooperating but there is a lack of political agreements to enable these exchanges. Therefore, it is essential to develop data integration at national level in order for all countries to be able to fully contribute and benefit from a Mediterranean framework for data sharing.

### 3) Capacity building in Southern Mediterranean

There is a large amount of **involuntary migration flows in southern countries** as southern young scientists often have to leave far away to use RIs and complete their technical skills. There is therefore a need to develop solutions and facilities to limit this **brain drain** and to empower young researchers at local level so they can make their own expertise without having to leave far away.

- **Encourage the creation of a Centre of Excellence in Marine Sciences in Southern Mediterranean** to reinforce cooperation between southern Mediterranean countries at the local scale and strengthen capacity building. By developing strong connections and joint projects with northern Mediterranean RIs and other centres of excellence in the region, technology and good practices transfers would be facilitated.

### 4) Open the whole Mediterranean Sea to explorations

Scientists have a limited access to several areas in the Mediterranean Sea, which are under national jurisdictions (e.g. Egyptian and Algeria territorial waters and Exclusive Economic Zones or Fisheries Protection Zones) and are hardly accessible for foreign

researchers. The BLUEMED GSO WG could act as a key levier to raise the issue at the highest level and encourage national governments to open their territorial waters.

- **Encourage governmental agreements to enable scientific campaigns and explorations in the whole Mediterranean Sea.**

ISC-PIF, 11 Place Nationale, Paris, 13-14 June 2019

# BLUEMED Mediterranean Research Infrastructures Stakeholders' Report

# List of attendees

| First name and name | Organisation | Country |
|---|---|---|
| Nicolas ARNAUD | CNRS | France |
| Alberto BASSET | LifeWatch ERIC | Italy |
| Amélie BATAILLE | CNRS | France |
| Debora BELLAFIORE | CNR | Italy |
| Jason BONGAILAS | Malta Marittima | Malta |
| Mónica CAMPILLOS | IEO | Spain |
| Margherita CAPPELLETTO | CNR | Italy |
| Aurélie CHAMIOT PRIEUR | MTES | France |
| Selma CHERCHALI | CNES | France |
| Elena CIAPPI | CNR | Italy |
| Ghaleb FAOUR | CNRS-L | Lebanon |
| Rosa FERNANDEZ OTERO | EMB / CETMAR | Spain |
| Rhoda FOFACK-GARCIA | France Energies Marines | France |
| Françoise GAILL | CNRS | France |
| Maryvonne GERIN LASLIER | CNRS | France |
| Antonia GIANNAKOUROU | HCMR | Greece |
| Paula GRECH BONNICI | MCAST | Malta |
| Samir GRIMES | ENSSMAL | Algeria |
| Frédéric HUYNH | IR Système-Terre | France |
| Erasmia KASTANIDI | HCMR | Greece |
| Thorsten KIEFER | JPI Oceans | Belgium |
| Alain LAGRANGE | MESRI | France |
| Olivier LEFORT | Ifremer | France |
| Ferial LOUANCHI | ENSSMAL | Algeria |
| Giuseppe MAGNIFICO | EMSO ERIC | Italy |
| Emina MAMACA | Ifremer | France |
| Katarzyna MARINI | MedECC | France |
| Pascal MORIN | Ifremer | France |
| Laurent MORTIER | ENSTA-Paristech | France |
| Nicolas PADE | EMBRC - ERIC | France |
| Clément PAYEUR | MEAE | France |
| Giuseppe PROVENZANO | UfM | Italy |
| Alberto RIBOTTI | CNR | Italy |
| Saloua SADOK | INSTM | Tunisia |
| Adriana SALAZAR | UfM | Spain |
| Baris SALIHOGLU | METU | Turkey |
| Wilfried SANCHEZ | Ifremer | France |
| Laura SEDAINE | CNRS | France |
| Richard SEMPERE | CNRS-MOI | France |
| Nayrah SHALTOUT | NIOF / GSO | Egypt |
| Maria SNOUSSI | IRD | Morocco |
| Georgios SYLAIOS | DUT | Greece |
| Fabio TRINCARDI | CNR | Italy |
| Abraham TRUJILLO QUINTELA | AEI | Spain |
| Andrew TYLER | Uni Stirling (DANUBIUS-RI) | UK |
| Marc VANDEPUTTE | INRA | France |

| | | |
|---|---|---|
| Marco WEYDERT | EC - DG RTD | Luxemburg |
| Claude WOHRER | SGMer | France |
| Saviour ZAMMIT | University of Malta | Malta |

Forty-nine participants joined the event. All presentations are available online on BLUEMED website: http://www.bluemed-initiative.eu/bluemed-mediterranean-research-infrastructures-stakeholders-conference-13th-and-14th-june-2019-paris-france/

*Opening remarks*

Marco Weydert (European Commission), Alain Lagrange (French Ministry of Higher Education, Research and Innovation) and Giuseppe Provenzano (Union for the Mediterranean) opened the meeting.

Marco Weydert gave several elements of context in which the meeting took place and he provided information on the next research and innovation framework programme Horizon Europe. He mentioned **the importance of the future mission boards like Healthy Oceans, Seas, Coastal and Inland Waters**, which will be composed of various appointed stakeholders to ensure the success of the missions.

Giuseppe Provenzano provided information on the main missions and structure of the Union for the Mediterranean. He reminded how his institution closely follows the BLUEMED Initiative through supporting several BLUEMED events and sharing knowledge by connecting the project to other UfM activities.

Alain Lagrange highlighted the importance of BLUEMED for the French Ministry of Higher Education, Research and Innovation and the role his institution plays to animate the network of national blue growth stakeholders involved in BLUEMED activities.

*Introduction*

Nicolas Arnaud (CNRS-INSU) introduced the objectives of the event and what was expected from the discussions. He reminded the work already done on Research Infrastructures in the framework of BLUEMED CSA (Work Package 3 – Framework conditions). He highlighted the 13 key priorities that have recently emerged from the BLUEMED SRIA and explained that the workshops have been built according to them. Indeed, **the discussions** held during the event **will both feed a Roadmap on RIs and support the implementation of the BLUEMED SRIA**.

*Keynote speech*

Françoise Gaill (CNRS-INEE and Climate & Ocean Platform) delivered the keynote speech. She presented the global ocean context in which BLUEMED is operating and reminded that a lot still remains undiscovered under the surface. She highlighted the importance of ecosystem services for humanity and in terms of economic resources. Françoise Gaill mentioned **the UN Decade of Ocean Science** coming soon. This **unique momentum** will require the participation of a large diversity of stakeholders with representatives from policymaking, business, scientific communities and civil society. She highlighted the fact that civil society has a growing influence in the discussions and decisions related to oceans.

*Roundtable*

The roundtable enabled Georgios Sylaios (Democritus University of Thrace) to present the scope and progresses of **ODYSSEA**. This project, in its second year of implementation, aims at developing an interoperable, fully integrated and cost-effective **platform** being networked with local and regional observing and forecasting systems across the Mediterranean basin. Its main goals are **to make Mediterranean data easily discoverable, accessible and create services and products based on these data for all users**.

His presentation was followed by Ferial Louanchi (ENSSMAL, EuroMed GSO BLUEMED WG delegate), Ghaleb Faour (CNRS-Lebanon) and Baris Salihoglu (METU, EuroMed GSO BLUEMED WG delegate), who exposed the current state of marine RIs in their respective countries.

After presenting the existing RIs in Algeria, Ferial Louanchi explained that there is no real data sharing policy in Algeria and there is a need for national data integration before Mediterranean data integration. She also expressed her wish for **southern researchers to be fully involved in the conception and analyze of data**, rather than only being data providers. She also explained that there is a need for framework of governmental agreements (such as WestMed), especially to allow foreign vessels to access seas of Algeria.

She introduced Samir Grimes, also attending the meeting, who coordinates the ongoing project on marine biodiversity BANBIOM, aiming at connecting at Algerian level all players of biodiversity.

Ghaleb Faour highlighted several restrictions faced by researchers in Lebanon. He stressed that data became more accessible nowadays, but still, high resolution is not fully operable and countries from the South shore often have to pay for them. He also highlighted the heterogeneity of data and showed that the majority of measurements is made in the Western part of the Mediterranean, as there is a lack of fine-scale studies and observation in the Levantine basin. His recommendations are to **raise awareness of the open access policy of in-situ measurements data**, draw a roadmap for the share ability of in-situ data, provide higher spatial and temporal resolution satellite imageries free of charge.

Baris Salihoglu presented several RIs existing in Turkey such as the National Centre of Excellence in Marine Ecosystem and Climate Research, the observatories, institutes and the vessels. The high number of research vessels in Turkey is an asset for the country. He also highlighted some examples of ongoing collaborative projects in which Turkey is involved (Super Site, BlueExcell). He recommended for **BLUEMED to play a coordinating role in supporting infrastructures and to develop a roadmap for cross-basin cooperation and integration, for co-creating and co-funding mechanisms**.

*Workshop sessions*

Participants then split into the different workshops for the end of the afternoon and the beginning of the second day. They finally grouped together again in plenary session to learn about what have been said in other workshops. Two rapporteurs/workshop facilitators have been previously identified. They moderated the discussions into the different working groups and presented the outcomes of the discussion in their respective atelier in front of the participants.

It has to be noted that workshop outputs are relevant for BLUEMED developments, including the Implementation Plan and the Pilot Action on Healthy Plastic-free Mediterranean Sea.

*Please refer to the part "Workshops' outcomes" at the end of this document for more details on the outcomes of the different workshops.*

*Panel discussion*

Thorsten Kiefer (JPI Oceans) presented the objectives and activities led by the organization he represents, which is a pan-European Research and Innovation platform whose objective is to increase the impact of national investments in marine and maritime R&I. He mentioned the thematic scopes of the JPI Oceans SRIA and provided examples of agenda implementation through JPI Oceans actions and he stressed one example of Infrastructure sharing.

Rosa Fernandez Otero (CETMAR & EMB) came back on the outcomes of EurOCEAN Conference 2019, which took place in UNESCO headquarters in Paris just before the BLUEMED meeting. EurOCEAN's aims were, among others, to discuss the contribution of European marine science to the UN Decade of the Ocean Science for Sustainable Development and provide a forum for interaction among members of the marine research community and marine stakeholders. She reminded that there are reasons for optimism despite the feeling of pressure and urgency to preserve our marine ecosystem services. She ended her presentation by presenting the activities led by EMB in the field of research vessels and the recommendations that emerged during EurOCEAN 2019.

Saloua Sadok (INSTM) mentioned the five laboratories composing her institute and she gave some examples of bilateral cooperation existing between Tunisia and Southern and Northern countries. One of the major issues faced in Tunisia is the lack of jobs for young graduates, who have to move abroad.

*Final remarks*

Finally, Fabio Trincardi (CNR) closed the conference by thanking the organizers, the participants and reminded that a lot of ground has been covered during this two-day event. He underlined that **Blue Growth in the Mediterranean should follow the principles of circular economy to ensure sustainability**. He also stressed the importance of dialogue between Mediterranean countries, between European countries and inside each BLUEMED country to efficiently support marine science developments and as precondition of a global Med.

# Workshops' outcomes

*Workshop n°1 – Which tools to address key pollution issues in the Mediterranean?*

*Alberto Basset – LifeWatch ERIC*
*Jason Bongailas – Malta Marittima*
*Monica Campillos – IEO*
*Ghaleb Faour – CNRS-L*
*Paula Grech Bonnici – MCAST*
*Erasmia Kastanidi – HCMR*
*Ferial Louanchi – ENSSMAL*
*Emina Mamaca – Ifremer*
*Giuseppe Magnifico – EMSO ERIC*
*Pascal Morin – Ifremer*
*Adriana Salazar – UfM*
*Richard Sempéré – CNRS-MIO*
*Maria Snoussi – IRD*
*Alberto Ribotti – CNR*

**Existing sources of pollution in the Mediterranean and potential responses:**

- **Oil spill** – there is a huge traffic in the Mediterranean Sea, with tankers highways and risks of harbor pollution:
  - Identify hotspots (Algeria, Sicily Channel, Cyprus, strait of Gibraltar for example);
  - Implement a monitoring system of oil spill similar to the one existing for forest fire monitoring;
  - Creation of a shared platform at Mediterranean level.
- **Pollution from inlands** is also having dramatic consequences on the Mediterranean:
  - Historic pollutants such as heavy metals or persistent organic pollutants;
  - **Emerging pollutants**: plastics (micro and nano) whose behavior in water is still unknown, hormones, persistent organic pollutants…
  - **Lack of knowledge** on these emerging pollutants;
  - **Develop protocol harmonization to monitor and assess plastic litter at sea** (refer to GESAMP guidelines).
- **Atmospheric** pollution (ICOS ERIC, ACTRIS PP);
- **Acoustic** pollution (EMSO ERIC);
- **Light** pollution (ESA);
- **Harmful algae** (EMBRC & LifeWatch ERICs);
- **Alien species** (EMBRC & LifeWatch ERICs, Euromarine, Emodnet);
- **Acidification** (EMSO & ICOS ERICs).

**Recommendations:**

- Need for a better coordination, organization and integration at Mediterranean Sea level through a better communication and exchange of information in the field of pollution:

- Encourage **protocols harmonization**;
- Encourage access to open **data**, the use of existing common databases like Copernicus, EMODnet and SeaDataNet but also **national databases** and the interoperability of data;
- **Link the BLUEMED community with regional networks such as Eurocean, MonGOOS, EuroGOOS, EOOS, and … Support a better coordination of research vessels** by sharing vessels' activities and time, encourage joint cruises and TNAs (examples of Eurofleets+ and ERVO activities).

**Solutions to improve North-South cooperation:**

- ⇨ **Rely on ENVRI-FAIR ENVironmental Research Infrastructures** building Fair Services accessible for society, innovation and research;
- ⇨ **Encourage the development of co-programmed initiatives** like PRIMA, consisting on EU member states, H2020 associated countries and Mediterranean partner countries on an equal footing basis, with support via co-funding, co-ownership and co-management;
- ⇨ **Involve policy makers** in scientific issues at the very beginning;
- ⇨ **Further encourage the synergies with political science policy interface organization**, i.e. the Union for the Mediterranean, as asset to improve North-South cooperation and **with regional initiatives** like WestMed;
- ⇨ **Support, valorize and capitalize the benefits of existing networks/consortiums of universities such as TETHYS;**
- ⇨ **Encourage the development of more political agreements;**
- ⇨ **Encourage the development of programs such as MedPol,** which assists Mediterranean countries in the formulation and implementation of pollution monitoring programmes, including pollution control measures and the drafting of action plan aiming at eliminating pollution from land-based sources**;**
- ⇨ **Increase cooperation with NGOs.**

*Workshop n°2 – Which tools to support adaptation and mitigation of climate change in the Mediterranean*

*Nicolas Arnaud - CNRS*
*Amélie Bataille – CNRS*
*Debora Bellafiore – CNR – DANUBIUS RI*
*Selma Cherchali – CNES*
*Elena Ciappi - CNR*
*Rosa Fernandez – CETMAR and EMB*
*Samir Grimes - ENSSMAL*
*Thorsten Kiefer – JPI OCEANS*
*Olivier Lefort - IFREMER*
*Katarzina Marini - MedEC*
*Laurent Mortier – ParisTECH*
*Baris Salihoglu - METU*
*Fabio Trincardi - CNR*
*Abraham Trujillo Quintela – AEI*
*Andrew Tyler – University of Stirling - DANUBIUS RI*
*Saviour Zammit – University of Malta*

**Bottlenecks:**

- ⇨ Lack of political will to sign agreements between states;
- ⇨ Lack of sustainable targeted long-term financial commitment;
- ⇨ Lack of climate change awareness in Southern countries, not perceived as a priority;
- ⇨ Lack of research laboratories in the South;
- ⇨ Lack of a culture of data sharing and policies for data sharing and exploitation;
- ⇨ Lack of knowledge about existing data and their status (are they interoperable);
- ⇨ Lack of quality data due to a lack of publication performance (need for DOIs).

**Recommendations:**

- ⇨ **Develop systematic training initiatives through RIs – including exchange and dedicated time for researchers' and students' mobility:**
  - Embarking students on vessels is for example a very efficient way to teach and it is not systematic everywhere in the Mediterranean at this stage.
- ⇨ **Support common platforms to show RIs' outcomes and start building national platforms as a baseline for future information sharing;**
- ⇨ Creation of common observation sites based on the general panorama of infrastructures – refer to ENVRI-PLUS initiative;
- ⇨ Integrating tools (Research Vessels, EO, Drones, UAVs/gliders, in-situ, modelling) to cover spatial, temporal and observation gaps;
- ⇨ **Data rescue** – check historical data, make them available, digitalization
- ⇨ **Support interoperability and standardization initiatives:**
  - Apply already agreed standards;
  - Identify subsets of data relevant for Mediterranean studies.
- ⇨ **Develop common operational protocol to make data comparable;**

- Especially to compare results from experiments led under controlled conditions;
- Develop mesocosms for controlled conditions (identify native species responses, invasive species interactions);
- Support long term experiments, very relevant for climate change topics;
- Identify sub regional climate area.

⇨ **Encourage synoptic campaigns rather than geographical = planning campaigns around common research themes;**

- In the same way, integrating observation platforms around common scientific challenges connected to climate change;

⇨ Create the best conditions for field research (safety, transboundary agreements for cooperation, data policy/sharing agreement);

⇨ **Encourage interactions with NGO's for financial possibility to support co-funding** (example of Pew Charity Trusts);

⇨ **Encourage co-creation and co-development between the North Shore and the South Shore** (relevant examples already existing in Tunisia);

⇨ **Change the perspective and make climate change a priority in southern countries;**

⇨ General imbalance between North/South and East/West data coverage (at surface & depth)

- DOI are attributed by a given institution, this mechanism is essential to develop national databases. **Therefore, this mechanism should be encouraged and institutions in different Mediterranean countries could start the development of national databases;**

⇨ **Pan-euro-Mediterranean initiatives such as BLUEMED and WestMed can encourage Mediterranean countries' political commitments:**

- Need for clearance to access some of southern countries' seas – scientists are willing to cooperate together but they often face political bottlenecks, it has been proposed that BLUEMED GSO WG could encourage national governments to tackle this issue;
- BLUEMED could be a platform to express which data are key, which subsets of data are the most needed, and which standards we should use in the Mediterranean. BLUEMED could also help to develop agreements to make data from southern countries accessible;
- BLUEMED could support standardization and interoperability procedures.

⇨ Encourage pan-Mediterranean initiatives to promote joint North/South research.

⇨ Encourage the development of **collaborative science** and raise awareness on the importance of collaboration between citizens and scientists;

⇨ **Encourage the development of projects to better connect land and sea scientific communities**. They use different ways of modelling ecosystems; we should start to think about the development of common modelling tools;

⇨ **Encourage a homogeneous repartition of skills among countries;**

- **Optimization of funding and equipment to improve local capacity;**
- Integration of marine-based research infrastructures, especially for renewable energy. Effort to make advantage of these infrastructure for multi-purpose monitoring and testing;
- Develop capacity building – need to transfer technologies in the South so researchers can make their own experiments and develop their own expertise.

*Workshop n°3 – Which tools to ensure a sustainable use of bio-resources in the Mediterranean?*

*Margherita Cappelletto - CNR*
*Antonia Giannakourou – HCMR*
*Nicolas Pade – EMBRC*
*Giuseppe Provenzano – UfM*
*Saloua Sadok – INSTM*
*Laura Sedaine – CNRS*
*Nayerah Shaltout – NIOF*
*Marc Vandeputte – INRA*

**Gaps:**

- In the domain of aquaculture and bio-resources, RIs exist in the Mediterranean, but the main problem is related to their **maintenance on the long-term**. It takes time, it is expensive and equipment are not fully working:
  - ➔ Need for mechanisms to ensure the sustainability of RIs.
- **Facilities for seafood testing**:
  - Lack of reference materials, methodologies and standard analyses. Lack of analytical tool and methodology for labelling and accreditation:
    - ➔ Need to apply and adapt methods.
- Lack of aquaculture facilities dedicated to specific Southern Mediterranean **relevant species** (sepia, cuttlefish).
- **Lack of marine sourced libraries** and southern Mediterranean specific libraries.
- **Biological monitoring:**
  - Development of automated biological sensors, connecting genomics/augmented observatories across the Mediterranean.

**Bottlenecks to access RIs:**

- **Visibility and awareness of RIs opportunities and services**:
  - Lack of visibility both in the North and South, knowledge gap, scientists do not always know the existence of RIs, which are not much valorized:
    - ➔ Need to better connect existing RIs communication networks to the Southern Mediterranean. For European RIs, 20% of TNA is made accessible to Southern countries, but most of the time, other countries do not know about that, don't use this percentage and buy their own equipment;
    - ➔ Need to avoid these duplications. Mediterranean RIs for aquaculture should be added to existing RIs databases such as EurOceansdatabase. Need to use the existing

relevant platforms/networks and build on them to answer the needs. Other example: Ocean Facilities Exchange Group for collaborating for vessel time;
➔ Creation of more platforms to reduce duplication and facilitate access & income;

- ⇨ **Administrative issues**:
  - Publication of papers builds scientists' credibility, this is an issue in Southern countries where it can be more difficult to publish;
  - Visa issue: easy to circulate between southern countries but harder to go North. This is a political issue: it has been suggested that BLUEMED could play a role of political levier via the GSO.
- ⇨ **Migration flows:**
  - Develop solutions to avoid involuntary migration and enable South scientists to access RIs without having to leave far away. There is a great potential to increase exchanges between southern countries and for joint work. It has been proposed that BLUEMED could support this kind of initiatives and play a role to tackle deep roots of migrations at research level. Example of *EuroMedMig-ReNet Project.*
- ⇨ **Samples transfers**: issues linked to the Nagoya Protocol, exchanges of samples are not always allowed between Northern African countries;
- ⇨ **Technical bottleneck**: support a better access to chemical supplies/connectivity, supply chain and distribution centres.
- ⇨ **DATA:** encourage FAIR data and develop same standards & protocols, participation in open science initiatives from Southern Mediterranean on equal footing.

**Recommendations:**

- ⇨ **Develop entrepreneurship, encourage a better understanding of markets, bring research to market, tackle the innovation gap and valorize research:**
  - Generalize the proximity of companies and research, encourage enterprises to participate to research and encourage co-funding mechanisms between the private and research sector. (The level of private sector's involvement into research is very heterogeneous depending on the countries and scientific sectors);
  - Encourage public-private partnerships: companies' support is required to enable the up-scaling and help to move from lab scale to factory scale.
- ⇨ **Encourage the development of "Living Labs" related to Blue Growth** to improve technology and knowledge transfer:
  - These are environments around platforms and RIs where researchers, enterprises and society are working together. Young graduates can create their own spin-off with their results within the lab, ready to be sold. Consumers can contribute to provide feedback on how to sell products. Living Labs are hubs of

interaction between different sectors, they are between laboratories and incubators;
    - These are a way to link blue economy stakeholders around RIs.
- ⇨ **Encourage co-creation and co-development in Southern Mediterranean countries**;
- ⇨ **Create centers of excellence in Southern Mediterranean and connect them to Northern Mediterranean RIs** to encourage capacity building, sharing best practices and joint development activities;
- ⇨ **Develop novel use of existing RIs**:
    - Tow tanks and wave tanks for fishing gear innovation;
    - Vessels for assessing fish stocks and avoid overexploitation.
- ⇨ **Create a platform to share information on marine biotechnology:** there is no specific platform for the marine and maritime sector at this stage. It should be open and equally discoverable;
- ⇨ Surveys to identify research in the Mediterranean interacting with international projects, in Europe we have some mechanism. In the Med, we have more people interested than opportunities to interact between students and labs.
- ⇨ **Evolution of RIs funding**:
    - Access model: need for a mix of public and private funding – both need to finance the access to RIs;
    - Transnational openness: allowing the use of national science funding for use/services of RIs based in other countries (bi-trilateral agreements) / use RIs with funding from another country. Make access easy for foreign researchers, even if the RI is funded with national grant money (sometimes the access is denied to foreigners in that case);
- ⇨ **Capitalize on the existing RIs:**
    - Encourage platforms and expertise sharing – (example: vessels' sharing with Turkey);
    - Creation of a joint center between Southern countries.
- ⇨ **Develop management plans of bio-resources everywhere in the Mediterranean** to avoid overuse and conserve the biodiversity;
- ⇨ **Towards a European cluster of RIs on bio-products**: to produce protein, lipids, extract product.


European
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blueMed