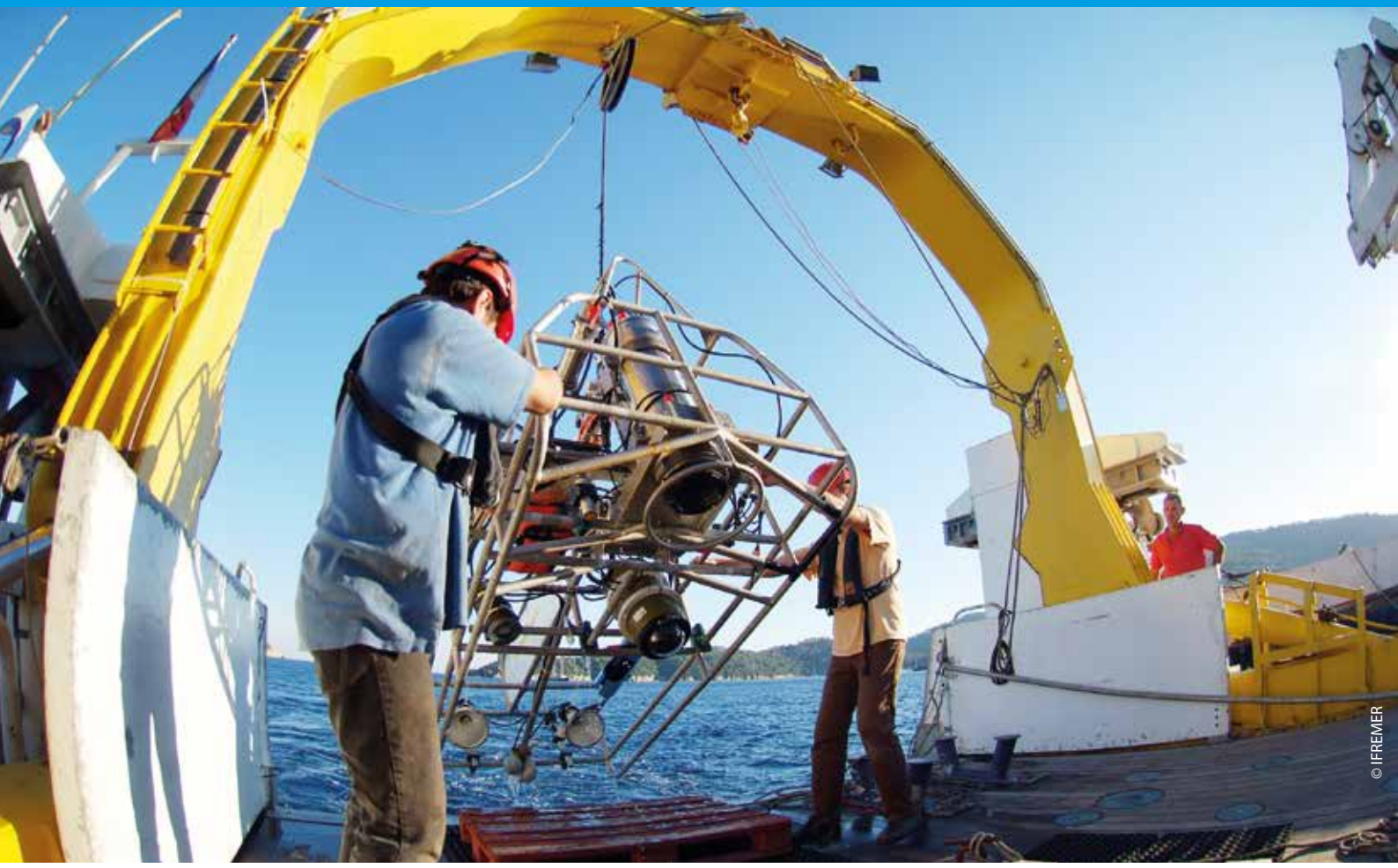
Report of the Inception workshop

IMPLEMENTATION OF THE ECOSYSTEM APPROACH IN THE MEDITERRANEAN:

STRENGTHENING THE SCIENCE-POLICY INTERFACE

December 15-16th, 2015 - Sophia Antipolis, France



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40 Years TOGETHER FOR A SUSTAINABLE MEDITERRANEAN

Plan Bleu

UNEP/MAP project reference: Mediterranean implementation of the Ecosystem approach, in coherence with the EU MSFD (EcAp MED II)

Authors : This report was edited by Lina Todeand Didier Sauzade, Plan Bleu, on the basis of participants' contribution to the workshop.

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Plan Bleu

Plan Bleu pour l'Environnement
et le Développement en Méditerranée

15 rue Beethoven - Sophia Antipolis
06560 Valbonne – France
Tél. : +33 (0)4 92 38 71 30
Fax : +33 (0)4 92 38 71 31
www.planbleu.org

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EXECUTIVE SUMMARY

The workshop "Implementation of the Ecosystem Approach in the Mediterranean: strengthening the science-policy interface" took place on December 15-16th, 2015 in Plan Bleu's premises in Sophia Antipolis, France. The workshop united 44 participants from the South, East and North of the Mediterranean representing Contracting Parties to the Barcelona Convention, scientific and research institutions and projects, NGO's and UNEP-MAP components.

This workshop was organized in the framework of EcAp, a specific process under the UNEP/MAP whereby the Contracting Parties to the Barcelona Convention have committed to implement the ecosystem approach in the Mediterranean with the ultimate objective of achieving the good environmental status (GES) of the Mediterranean Sea and Coasts. Specifically, it was the inception event of the Output 3 "Strengthening the science-policy interface" of a 2015-2018 project (EcAp Med II) aiming to support UNEP/MAP Barcelona Convention and its Southern Mediterranean Contracting Parties to implement EcAp in coherence with the implementation of the European Union (EU) Marine Strategy Framework Directive (MSFD). The Output 3 work plan is mostly based on the organization of workshops during the project life.

MAIN OBJECTIVE

The workshop's main objective was to foster the exchange of information between scientists and policy makers and highlight key policy challenges requiring scientific inputs in relation to monitoring, environmental assessment and new measures. Specifically, it provided an opportunity to:

- identify key scientific gaps to be filled as a priority for the implementation of the planned Integrated Monitoring Assessment Programme (IMAP) being developed by UNEP/MAP;
- discuss and agree on key action points related to the identified gaps allowing the scientific community to contribute effectively to the policy processes;
- provide recommendations on the objectives and methods for subsequent workshops;
- identify key relevant projects and research institutions around the Mediterranean, with the view of creating a network that can have an active role in the implementation of IMAP at various scales.

RESULTS

The workshop succeeded in providing a platform for exchange on best practices in terms of science-policy interfaces (SPI) in the Mediterranean thus initiating the setting up of a network to support implementation of the IMAP.

The presentations and discussions of the workshop participants made it clear that SPI is currently a real issue perceived by scientists and decision makers. The workshop opened up perspectives to develop SPI for IMAP, namely by pointing out the need to (i) formalize SPI along with its structure and processes and to (ii) identify dedicated resources to support SPI.

Furthermore, during working sessions in sub-groups and plenary discussions, around 15 key cross-cutting and topic-specific knowledge gaps to be filled for the complete implementation of IMAP have been identified along with proposed actions to be taken to address these gaps.

The workshop took first steps towards the development of a network of relevant projects and institutions to support implementation of IMAP by uniting 9 major research projects in marine science focusing on the Mediterranean Sea and 35 institutions.

It is now recommended to build on the workshop outcomes and prepare the next steps to strengthen SPI for the IMAP. Capitalizing on the results of this inception workshop in terms of SPI recommended practices and formal SPI recognition / structuration, subsequent workshops should be organized to continue the dialogue between scientific experts and policy makers aiming to document the scientific actions required to address the identified knowledge needs that may impede the full IMAP implementation. These scientific actions will be specially shared with the leaders of other EcAp Med II project actions in order to foster their implementation.

INTRODUCTION, CONTEXT

For the past forty years, UNEP/MAP and the Barcelona Convention with its seven protocols have provided a unique political and legal framework in the area of environmental protection, with all the Mediterranean riparian countries and the European Union as Contracting Parties. Pursuant to several decisions of the Contracting Parties, specific efforts were made during the past decade to implement the ecosystem approach (EcAp) with the objective to achieve the good environmental status of the Mediterranean.

The Ecosystem Approach constitutes the overarching principle of UNEP/MAP Barcelona Convention and refers to a specific process (EcAp) whereby the Contracting Parties at the Barcelona Convention have committed to progressively implement the ecosystem approach in the Mediterranean with the ultimate objective of achieving the good environmental status (GES) of the Mediterranean Sea and coast. The GES has been defined through eleven Ecological Objectives (EO) listed in **Annex 4**. In order to reach these ambitious objectives, the process plans to achieve GES through informed management decisions, based on integrated quantitative assessment and monitoring of the Marine and Coastal Environment of the Mediterranean.

Mainstreaming EcAp into the work of UNEP/MAP Barcelona Convention and achieving the GES of the Mediterranean Sea and coast through the EcAp process have been supported by the EU funded project entitled "Implementation of the Ecosystem Approach in the Mediterranean by the Contracting parties in the context of the Barcelona Convention for the Protection of the Marine Environment and the Coastal region of the Mediterranean and its Protocols" (EcAp MED project 2012-2015).
Key achievements of the EcAp process and the EcAp MED project 2012-2015 include the development of 27 common and candidate indicators (**Annex 5**), which will be the basis of an Integrated Monitoring and Assessment Program (IMAP) covering the whole Mediterranean Sea and coast, based on a common regional basis.

The EcAp-MED project 2012-2015 also assessed the state of play in the Mediterranean, facilitated cooperation between the different actors, undertook a socio-economic assessment of maritime activities and tested an EcAp common candidate indicator on coastal land-use change. In addition, it has been supporting the Marine Litter Regional Plan Implementation, the development of the Offshore Action Plan and the building of a framework to facilitate the joint establishment of Specially Protected Areas of Mediterranean Importance in open seas, made possible through a participatory approach in multiple meetings at various levels in order to build consensus.

To continue to progress towards the implementation of the Ecosystem Approach in the Mediterranean, the EcAp MED II project 2015-2018 supported by the European Union has been developed and focus specifically in assisting the Southern Mediterranean Contracting Parties to the Barcelona Convention to implement the EcAp process and specifically the implementation of the new monitoring and assessment requirements of IMAP.
Additionally, in order to contribute to fulfil the above-mentioned objectives, it appeared crucial to bridge the gaps between the scientific and policy making spheres by strengthening the interface between them, thereby constituting one of the activities to be performed in the framework of EcAp MED II project.
Thus, the present inception workshop of the Science-Policy interface's action is the first organized in the framework of the Output 3 of the EU EcAp MED II project entitled "Stronger Ecosystem Approach related Science-Policy Interface in the Mediterranean". In this context, it is planned to undertake the following three major activities:

1. Based on the identification by Contracting Parties of key science and policy gaps relevant to EcAp, organize scientific workshops on a regional basis, targeting specific areas that were identified by Contracting Parties, with pre-defined questions and by harnessing existing knowledge and relevant EcAp implementation-related scientific projects;
2. Reflect relevant scientific recommendations and results and peer-review the planned draft State of Environment Report of the Mediterranean (2017) by the scientific experts;
3. Follow-up with targeted communication material, ensuring further knowledge sharing and specific scientific input both to the development of national work (monitoring implementation plans), sub-regional and regional-policy development.
   This inception workshop fostered the exchange of information between scientists and policy makers and highlighted the key policy challenges requiring scientific inputs in relation to monitoring, environmental assessment and new measures. Specifically, it was an opportunity to:

based on the analysis of the working document, agree on a list of priority scientific gaps to be filled as a priority for a better implementation of IMAP with maximum two priority scientific gaps identified by Ecological Objectives;
discuss and agree on key action points related to the identified gaps addressing how the scientific community could in a practical manner contribute effectively to the IMAP implementation and regional EcAp process;
provide recommendations on the objectives and methods for the following workshops;
identify key relevant projects and research institutions around the Mediterranean, with the view of creating a network that can have an active role in the implementation of IMAP at various scales.

- To achieve these objectives, participants to the workshop have been selected to represent the main stakeholder groups that may be involved in the strengthening of the Science Policy Interface to best implement IMAP. These groups are mainly:
- MAP Focal Points designated by the countries parties to the Barcelona Convention, representing the policy makers of the coastal and marines environmental policies
- Coordinators and participants to recent or on-going research projects willing to provide project results to serve environmental policies
- Regional scientific bodies having to advise policy makers
- Experts in environmental science policy interface, helping to develop sustained and efficient Science Policy interfaces
- UNEP MAP component representatives, in charge to implement policy decision taken by the Conference of Parties.


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FLOW OF THE WORKSHOP

The workshop took place from December 15th to 16th, 2015 in Plan Bleu's premises in Sophia Antipolis, France. After the opening of the workshop in the early afternoon of December 15th, its general context, flow and objectives were presented, followed by a presentation of the Mediterranean Action Plan working framework. Then the experience of CIESM – the Mediterranean Science Commission with regards to science-policy interface (SPI) was introduced to the participants. After a brief discussion with the participants, the SPI development experience from 7 recent large EU research projects, namely PERSUS, CoCoNet, DEVOTES, IRIS SES, SEA-ERA MERMAID and STAGES was showcased. EMODnet and COLOMBUS projects were also more briefly presented. A preliminary list of knowledge needs for the implementation of the IMAP has been discussed. The first day of the workshop ended with a plenary discussion. On December 16th, after a presentation of SPI issues addressed within the SPIRAL project, participants got together in three sub-groups, with sessions concentrating on the three EcAp thematic "clusters" (i) contamination and litter, (ii) biodiversity and fisheries, and (iii) coast and hydrography. The results of the working sessions were then carried together in a plenary discussion leading to the workshop's closing.


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SUMMARY OF THE PRESENTATIONS OF SCIENTIFIC PROJECTS

Science-policy interface (SPI), the view of the CIESM, by Frederic Briand, General Director

For Frederic Briand, science and policy are two different planets! The media often act as intermediary between these worlds. There are multiple obstacles to good communication between them, in particular the policy makers' lack of scientific culture/background, the complexity of the marine environment, the scientists' lack of time due to their busy fundraising schedule, and scientists lacking a single voice. This distance is also found with the general public who generally has a distorted comprehension of the major risks. Finally governments generally have neither the will nor the ability to integrate scientific advice. These barriers are particularly critical for overcoming key challenges to the Mediterranean marine environment: rapid development of maritime traffic, impacts of the development of offshore oil and gas on marine biodiversity, geo hazards, macro waste... The problems are even greater for the management of the high seas by riparian countries with significant cultural differences which complicate exchanges (cf. Lewis model on country-specific cultural types). SPI activities are provided by CIESM mainly through monographs developed by the network's scientists on topics of interest to policy making (eg. Marine Litter, marine extinctions), a series of political publications (CIESM Marine Policy Series) of which the latest edition is entitled "Doing research is important for the governance of the Sea" and the collective development and international promotion of good practice charters on important issues, such as on access and sharing of the benefits of marine genetic resources.

The activities of the EU PERSEUS project to strengthen SPI for the Mediterranean marine environment by Vangelis Papathanassious, HCMR, scientific coordinator of the project

- This large scientific project (2011-2015) involved over 300 scientists from 53 partners spread over 22 countries. One of the objectives was precisely to provide scientifically based recommendations to develop policies aiming at achieving the GES in the Mediterranean and Black Sea. PERSEUS was able to significantly increase the scientific knowledge usable in the management of the Mediterranean and Black Sea. On this basis, the project organized multiple interactions between scientists and stakeholders, notably through six workshops to strengthen SPI. A framework and a toolkit, the AMP Toolbox, have been developed to help design adaptive marine policies, following the principles of the ecosystem approach. About 100 stakeholders from various riparian countries helped in specifying and testing the AMP Toolbox. Finally PERSEUS published a paper with policy recommendations, which were presented to high level stakeholders in the European Parliament in Brussels. The project sought to cooperate with the Regional Seas Conventions, particularly with UNEP/MAP, in particular through a riverine inputs atlas and the organization, in cooperation with the COCONET, DEVOTES and IRIS SES projects, of a biodiversity workshop (April 2014) for the development of IMAP, which has been a source of inspiration for action to strengthen SPI and which was at the origin of this workshop.
- PERSEUS experience has shown that scientists and

policy makers are on the same planet but do not speak the same language. Concerning policy making, scientists should be aware that the common interface between scientific evidence, political will and capacity of socio-economic structures is generally narrow. SPI relevant lessons learned from the project are:

- Involve stakeholders of environmental issues from the inception of a project
- Foster multidisciplinary research efforts, including social science and humanities, focusing on the complexity of the Mediterranean system, particularly how to practically implement the principles of management according to the ecosystem approach, including an integrated environmental vision and participatory approach
- Provide decision makers with needed management support tools, when it is scientifically possible
- Listen to policymakers and make the effort to transmit their knowledge, or rather their "wisdom" coming from knowledge (data> knowledge> wisdom)
- Explain to policy makers the implications of research rather than the research results themselves
- Be aware that one of the strengths of research is to produce inclusive diplomacy, particularly important in the Mediterranean

The interface between science and policy lessons from the EU project CoCoNet, Ferdinando Boero, Università del Salento CNR-ISMAR, Project Coordinator

CoCoNet (2011-2016) is a large scientific project with political objectives for the Mediterranean Sea and the Black Sea: Recommendations for the establishment of Marine Protected Areas and Wind Chart for the installation of offshore wind farms.
Ferdinando Boero emphasized a gradual evolution of environmental legislation, from anthropocentrism (scenic beauty, remarkable biodiversity) to the consideration of the benthos and the biocentrism (all ecosystem components, GES). Unlike in speeches often heard, science could not fully follow this development, due to a lack of knowledge on ecosystems and their functioning. Both knowledge and experts in taxonomy to do this job are particularly absent, and taxonomy is a discipline in full decline because of the preeminence of molecular biology.
This development also raises unresolved questions about the definition of GES, Man's place in ecosystems, the role of the economy, which must be contained in ecology, and taking into account the natural capital, the concept of sustainable development... For Ferdinando, environmental policies must respect the rules of ecology, or otherwise risk failing. Scientists' recommendations to policy must take into account the views of all relevant disciplines, including taxonomists, often absent for the reasons mentioned before. Policies should encourage upgrading this discipline, or otherwise risk receiving incorrect recommendations.
CoCoNet tried to adopt a holistic approach, by implementing coherent units of management and conservation of marine ecosystems. Cells of ecosystem functioning were defined comprising volumes and not just areas. They were documented by multiple layers of information and can be used for observation, monitoring and protection of biodiversity. In conclusion, good science creates interfaces with policy makers by itself.

Interface between science and policy, the EU project DEVOTES, Angel Borja, AZTI, Project Coordinator

The project DEVOTES aims to develop tools for understanding marine biodiversity, assessing the state of the environment and assisting in the implementation of policies. It has sought to better understand the impact of human activities and climate change. Maps on monitoring and ecosystem services were produced. A description of the socio-economic implications has been done, particularly from a legal angle. The main obstacles to achieve GES have been identified. Support software for the selection and refining of state indicators has been developed and used for national waters of several Member States and at regional level.
For the project DEVOTES, SPI has taken the form of a management support tool summarizing all results of the "NEAT" (Nested environmental assessment tool) provided for policy makers, citizens, researchers, NGOs ... who are interested in these issues.

Interface between science and policy, the EU MERMAID project, Eleni Kaberi (HCMR), Project Coordinator

MERMAID (February 2013 - September 2015) is a Seas-era project on marine environmental target indicators of regional management schemes in the Mediterranean Sea. MERMAID worked especially on the descriptors 3 (exploited species), 7 (hydrography), 8 (environmental chemical contamination), 9 (chemical contamination exploited species) and 10 (marine litter).
MERMAID has developed a tool for linking targets and management measures to achieve GES. This tool allows synthesizing expert opinions on the assessment of the cost / effectiveness of MSFD programs of measures. It has been tested in different case studies and is the main contribution of MERMAID to strengthening SPI, along with the work of setting targets.

The SPI experience of the EU IRIS SES project, Popi Pagou (HCMR), Project Coordinator

IRIS SES (Oct. 2013 - March 2015) is a pilot project of DG Env for preparing the integrated regional monitoring implementation strategy in South European Seas.

This applied research project has faced multiple challenges:

- Large spatial scales
- Multiple elements of ecosystem
- Multiple pressures and human activities
- High cost of monitoring, often seen by policymakers as a compulsory expenditure and not an "insurance policy" to protect goods and services provided by ecosystems.

In terms of SPI, the project especially adapted intelligent

tools for decision makers, as a GIS monitoring and decision support system, DeCyDe-4-IRIS, to help develop common monitoring programs in South European seas. This tool was presented and tested by stakeholders during several regional workshops, allowing to identify and collect their needs and suggestions on the further development of the tool. Thus, opportunities for collaboration have been identified between Cyprus, Greece and Turkey.

However, meetings with stakeholders have highlighted a difficulty concerning the coordination of monitoring activities of a marine region:

- Many indicators are still under development and need to be intercalibrated
- Alack of a common data repository, enabling access data for all - not only aggregate but also raw data when necessary. The comparability of data is often insufficient.
- Decision makers need information on the indicators being monitored and not on models.

Science in support of the MSFD, EU STAGES project, Marisa Fernandez, CETMAR, Co-coordinator of the project

STAGES (September 2012 - August 2014) responds to the EC's strategic need to develop a long-term SPI to support the implementation of MSFD, to bridge the gap between data producers and users. This took the form of extensive consultations with stakeholders, in addition to an interactive workshop. The project resulted in two reports:

- On the views and expectations of stakeholders regarding an effective SPI platform for MSFD
- Proposals and recommendations for an SPI to support the implementation of MSFD

Key components of such SPI were identified:

- Knowledge Mobilization
- Scientific and technical advice
- Evaluation and Knowledge Synthesis
- Knowledge Brokerage

Among the proposals for SPI:

- Balance the bottom up approaches (driven by science) and top-down (driven by policy)
- Optimize SPI with the political cycle of MSFD
- Increase the coherence of different geographical scales
- Share and align with other regulatory requirements (WFD ...) and recognized standards

Science supporting blue growth, EU project COLUMBUS, Marisa Fernandez, CETMAR, Co-coordinator of the project

This project on knowledge transfer for blue growth (March 2015 - February 2018) was introduced as a result of STAGES. The overall objective is to ensure that scientific and technical knowledge can be effectively transferred to advance the governance of marine and maritime sectors in order to promote blue growth. COLUMBUS implemented nodes of expertise, including one in the Mediterranean (aquaculture) where science support processes for policy making will be developed. Marisa is in charge of the node on the governance and management of the sea. The Regional Seas Conventions are also associated, as Virginie Hart from UNEP/MAP/MEDPOL also participates in the External Advisory Board.

Interface between science and policy, the EU EMODnet project Mediterranean Sea checkpoint, Sofia Reizopoulou, HCMR, in charge of the checkpoint

Dans le cadre d'EMODnet, le réseau européen de données Under EMODnet, the European marine observation and data network, basin checkpoints are responsible for evaluating the adequacy of monitoring systems with regards to the challenges of blue growth. Seven sectoral challenges were identified:

- Wind farm siting
- Marine Protected Areas
- Oil platform leaks
- Climate and coastal protection
- Fisheries management
- Marine environment
- River inputs
-

The corresponding services to these challenges include: a browser on the data sets, a dashboard and a data adequacy report pertaining to the challenges. The challenges will be progressively activated, as it is already the case for oil platform leaks.

Getting more from the science and policy relationship - the EU SPIRAL project, Estelle Balian, MEDIAN

The overall aim of SPIRAL is to enhance the connectivity between biodiversity research and policy making in order to improve the conservation and sustainable use of biodiversity. SPIRAL was both a research project, aiming to improve our knowledge and understanding of Science-Policy Interfaces for biodiversity as well an action and learning project, with a resource support group and contributions to designing or improving real-life science-policy interfaces.
The information document in **Appendix 3** presents a summary of the SPIRAL main recommendations.


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5. WORKSHOP DISCUSSIONS AND OUTCOMES

5.1. SPI FOR THE IMAP

5.1.1. GOALS

The goal of SPI for the implementation of IMAP is to enhance the relationship between science and policy in order to improve the delivery of IMAP in terms of monitoring and assessment of the status of the Mediterranean Sea and coasts as a basis for further and/or strengthened measures and informed policies for achieving GES.

The expected outcome of SPI for IMAP will be:

- The outputs of IMAP are delivered to decision makers in an appropriate way so as to help them take relevant action towards achieving GES
- Decision makers will make effective use of the scientific information produced under IMAP in view of achieving GES through informed policy making

5.1.2. CHALLENGES AND OPPORTUNITIES

The workshop's participants put forward that any SPI for IMAP needs to adapt to a high level of uncertainty and complexity. Being part of an integrated and systemic approach, IMAP operates in an environment which is per definition complex. The workshop identified the main effectiveness factors of science-policy relationships within IMAP, but also the challenges and opportunities linked to these factors in the Mediterranean context:

- **Knowledge availability**. Different local, national and regional initiatives and projects have been producing a tremendous amount of knowledge relevant to Mediterranean marine and coastal ecosystems. Much of this knowledge can be useful for assessing the gap with the GES and can thus potentially serve as inputs to IMAP, which represents a great opportunity for IMAP. However, the amount of knowledge available is such that some speak of an overabundance of information, an ocean of data. In fact, knowledge production is chronically suffering from a lack of coordination, which hinders stakeholders to take full advantage of the available knowledge.
  - **Knowledge storage and access**. Information is stored in many different places (documents, platforms, websites, etc.) and is not always freely accessible. There is no single-counter making the information accessible for potential users and even less so a single storage.
  - **Timelines**. While some information has been produced over the long-term with a consistent methodology thus forming long and regular time-series, the majority of the knowledge pertaining to Mediterranean marine and coastal ecosystems exists in a much more fragmented way.
  - **Spatial heterogeneity**. Similar data are often produced in abundance in some places and can be missing in other places, making application of homogenous assessment methodologies difficult.
  - **Heterogeneous methodology**. Methodologies used to collect information are not coordinated and do not always allow integrating or comparing information. Interoperability of data is often limited.
  - **Duplication**. The lack of coordination leads to duplication of efforts to produce specific knowledge. Focus, target.
  - **GES-relevance**. Stakeholders have difficulties to identify which information is relevant for monitoring and assessing GES. Much of the available knowledge is not specifically targeted to this end and may be incomplete.
- **Ability to make decisions under uncertainty**. Decision makers generally experience difficulty to make decisions under uncertainty. When decisions involve uncertainty, measures taken can be easily challenged. As science cannot currently produce a complete picture of the state of the Mediterranean Sea and coasts, decision makers need to accept a lack of knowledge for decision making and find ways to be capable to act. Development of adaptive policies, as promoted by the Adaptive Marine Policy Toolbox developed by PERSEUS under the Plan Bleu lead (AMP toolbox), could help to overcome this kind of difficulties.

- **Differences: Disciplines and sectors. Research and policy. Values and worldviews**. Marine and coastal science and decision making in the Mediterranean involve many different actors and disciplines with different jargons, values, interests and capacity. Each of the Contracting Parties may have individual strengths and difficulties with regards to different issues. The presentation given by the CIESM Director especially highlights the existence of cultural differences between Northern and Southern Mediterranean countries, indicating that the "knowledge culture" varies along Contracting Parties.

- **Inappropriate communication procedures**. The workshop participants point out that scientists often provide detailed and segmented explanations while decision makers are asking for holistic opinions. There seems to be a difficulty to find the right "format" to convey scientific messages to decision makers.

- **Balancing and accepting trade-offs**. SPI for IMAP will inevitably come with trade-offs which need to be balanced in the best possible way. These trade-offs include: (i) clarity versus complexity: conveying simple messages versus communicating uncertainty; (ii) speed versus quality: timely outputs versus in-depth quality assessment which takes time; (iii) push versus pull knowledge production: supply-driven versus demand-driven; and (iv) individual time management: interfacing versus doing other things, such as scientific publications which are the bases of the scientists' assessments.

- **Complexity of an iterative/adaptive process**. Science-policy interfacing for IMAP needs to occur in an iterative and adaptive way, as effective relations between science and policy are needed not only to develop measures based on scientific evidence but also to assess the effectiveness of the measures taken or proposed.
  - **Need to overcome project logic – sustainability**. Many elements potentially feeding into IMAP are currently coming from individual projects with a start and an end. While these inputs can potentially be of great use for IMAP, they suffer from the limited duration of projects and their lack of connections with the "outer world". Projects are generally based on their own project logic, methods, objectives, funding and duration (2-4 years) whereas IMAP calls for much longer action.
  - **Funding**. While efforts for interfacing between science and policy exist in the Mediterranean, a dedicated budget line for SPI is usually not provided. However, effective, focussed and regular interfacing requires adequate human and financial resources.
  - **One way communication**. All the showcased projects have developed SPI actions, at least to address the correspondent requirements of the project call. SPI processes were often developed intuitively, and sometimes reduced to a one way communication, from scientists to policy makers, of relevant project results, without policy maker feed-back.

5.1.3. STRUCTURES AND PROCESSES

The workshop participants agreed that a number of SPI structures and processes are currently in place, especially with regards to the presented recent marine scientific projects. These experiences made it clear to participants that there is a number of ways in which science and policy can effectively interface. Given the complex circumstances governing science-policy interaction of IMAP, it appears unrealistic to define one single science-policy interface. It is rather a set of principles, structures, processes and tools, which enrich and complement each other to form an effective SPI framework.
For the set-up of such a framework, three guiding principles have been identified:

- **In the « policy » of SPI, do not confuse policymakers and environmental policies**. Public science lives from targeted funds allocated by national or European, in general high level policymakers. This shows how the relationship between science and political decision makers has always been complex and sometimes conflicting. Some presentations (especially CIESM, CoCoNet) have highlighted this aspect. As part of this action, policy must be understood as relating to environmental policies. This action aims to strengthen the links between scientific experts and those responsible for developing and implementing IMAP.
  - **Formalize the construction of SPI**. Most of the presented SPI structures and processes currently in place have been set up and operate in a rather intuitive way and are mostly not formalized or put forward as a distinctive output of a given project. But in order to address the above mentioned challenges and opportunities, the workshop participants pointed out that any SPI for IMAP has to be based on a formalized construction with defined structures and processes and with a dedicated budget line.
  - **Mainstream IMAP into projects in the MED**. Scientific activities in the Mediterranean have a highly developed project culture and it is realistic to expect that several projects which can potentially produce useful inputs for IMAP are to come in the next years, while not being formally part of IMAP or EcAp. The workshop suggests that IMAP should be consciously built into such projects in a systematic way in order to profit from the opportunity that such projects provide in terms of knowledge generation and dissemination. The mainstreaming of IMAP into new projects should take place already during the project design phase. This will foster the coordination of efforts for the delivery of IMAP and to achieve the GES in the Mediterranean as well as the production of relevant inputs for IMAP while also serving specific objectives on the project level. The mainstreaming of IMAP into such projects will furthermore support stakeholders in achieving shared ownership of results and thus encourage better outreach and impact and involve a maximum of stakeholders.
  - **Sustainability**. The construction of SPI for IMAP should be ideally based on long-term structures and processes, which is in contradiction with the limited span of life of most of the EU funded scientific projects. In this context, it is recommended that project leaders be persistent in SPI processes and continue them in the subsequent projects in which they participate. Sustainability is a strong factor for

mutual knowledge and trust development between given scientists and policy makers, which greatly fosters to strengthen SPI between them.

For an effective implementation of an SPI framework of IMAP, workshop participants recommend the following:

An Integrated Data and Information System as a central underlying structure. The workshop participants call for a consistent structure and single counter for data storage and dissemination, which would be a central structure of the IMAP's SPI framework. It could either be based on a newly created structure or, preferably, on an existing one which would be scaled-up.
IMAP includes provisions for the setting up, deployment and updating of an Integrated Data and Information System (IDIS). This IDIS could serve as a tool to manage the available knowledge and become the central underlying structure of IMAP's SPI.
It will handle data from different activities and ensure that documents, data, and products are managed consistently and are easily available to users. The IDIS will facilitate integrated assessments, overcoming some very fragmented visions of marine scientific disciplines, for example from integrated biological and chemical programmes, or linking the observed changes in spatial distribution and temporal trends in substances or their effects to inputs into the UNEP/MAP Barcelona Convention maritime area.
The IDIS for UNEP/MAP Barcelona Convention requires clearly set roles for data handling and assessment for the various components and a user-friendly reporting platform for Contracting Parties, based on the following strategic points:

- Data and information activities aim to achieve a reliable, quantitative assessment of the status of the Mediterranean Sea and Coast;
- The IDIS should facilitate access to environmental information for the general public.

Basic activities, core elements of UNEP/MAP Barcelona Convention IDIS should include:

- Based on the Common Indicator Fact Sheets and the Integrated Monitoring and Assessment Guidance, develop region-wide, electronic, common indicator based monitoring reporting formats and up-to-date tools for data exchange
- Implement relevant quality control and validation procedures
- Make assessment products available in an integrated manner, on a common platform
- Make data and information available using harmonized standards and practices, following the UNEP access-to-information policy (UNEP/EA. 1/INF/23)

Additionally, training for stakeholders of the IDIS should be ensured and will increase its effectiveness.

A structure such as the IDIS needs to be supported by additional mechanisms in order to function as an effective SPI framework. The workshop mentions the following ones:

Enhancing knowledge presentation -– modelisation and scenarios. Scientific knowledge about the Mediterranean Sea and coast does not always "speak" to decision makers, because raw data is not what they are looking for. Decision makers are keen on recommendations and solutions that are coming out of knowledge. Therefore, the workshop recommends that science and policy could be brought closer by presenting knowledge in the form of scenarios by making use of modelisation. Presenting scientifically based alternate future scenarios has been mentioned to be an effective way to inform policy makers without being prescriptive.

Official bodies have to play a central role for coordination. The workshop calls for improved coordination of initiatives in the Mediterranean. It is suggested to set up governance structures of projects in a way to gear them for more coordination between initiatives by systematically including official policy bodies such as UNEP/MAP as a partner or advisor in projects. Such involvement should start already during the project's early stages and continue all through implementation. This will help improve outcomes and avoid duplication.

Arrangements supporting the formalization and mainstreaming of IMAP's SPI. During presentations and discussions, the workshop identified several mechanisms that can help formalize IMAP's SPI:

- Add official provisions on SPI into the Integrated Monitoring and Assessment Guidance
- Protocols in project documents to define SPI processes and structures which feed into the project design
- Establishing project advisory boards strongly involving (i) policy makers in research projects and (ii) scientists in policy development and governance projects
- Signature of Memoranda of understanding (MoU) between involved actors, projects, institutions, organizations, etc.
- Partnership agreements with local actors (fishers committees for example)
- Setting-up a network of projects

Appropriate communication procedures. The workshop points out that effective communication in SPI needs to be two-way and based on exchange. It is observed that many communication procedures are only one-way (for example scientists writing a policy brief).

Meetings with scientists, policy makers and other stakeholders. Meetings uniting scientists and policy makers can make SPIs effective when they are well prepared and conducted in a way that induces dialogue and incites further exchange. The workshop participants especially highlight the effectiveness of meetings that focus on co-construction of specific outputs, such as databases, tools, interfaces, etc.

Policy briefs. These documents generally inform on a specific issue or present findings and recommendations of a research project to a non-specialized audience. This tool is a medium for exploring an issue, distilling lessons learned from the research and represent a vehicle for providing policy advice. The authors of policy advice need to make sure that their products are really supportive for decision making and that they provide action recommendations (what should happen) and indications about implications (what could happen) . It is equally important to be aware of the limitations of policy guidance documents, especially their need for supportive action in order to be received by policy–makers.

Policy guidance documents should therefore be used in combination with other tools which foster interaction and dialogue, such as meetings with scientists and policy makers. Science briefs. Inversely, although much less frequently used, documents informing scientists about the policy makers' needs for scientific knowledge, with the same limitations as the above, can also effectively support the interactions between science and policy.

Different scopes require different SPI mechanisms. Prior to launching an SPI, the scope on which it will operate should be fixed to make sure that outputs are well received. The effectiveness of mechanisms will differ between regional, national, sub-national or local scales of operation.

Targeting efficient mechanisms and actions to strengthen SPI. Many workshop participants plead for a holistic SPI approach targeting all stakeholders. For example, it can be useful to mobilize specific think tanks or pressure groups because they are known to influence policy making. However, while a holistic approach may be the best case scenario for the overall SPI framework, some SPI actions may be most effective if targeted to a specific audience and/or issue only.

Define the meaning of "policy" in SPI. It should be clearly defined what exactly is meant by the term "policy" within an SPI. While the workshop took into account the broad sense of the term, including policy makers, policy documents and sectoral policies, including the policies responsible for the financial allocations to marine scientific research, SPI for the implementation of IMAP is more focused. Indeed, for IMAP, SPI focuses on marine scientists and experts and the products of their research on one hand and environmental policies and decision makers involved in the implementation of action plans (evaluation, monitoring and measures) to achieve GES in the Mediterranean, on the other hand.

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5.2. KNOWLEDGE NEEDS FOR FULL IMPLEMENTATION OF IMAP

During three working sessions in sub-groups and plenary discussions, the workshop participants have identified a number of knowledge gaps that need to be filled for the full implementation of MAP's IMAP. Some of these gaps are cross-cutting and of general interest, whereas others are related to specific topics. The identified issues are complementary to those already identified in the IMAP reference document (refer to **Annex 7**) and by the STAGES project (refer to **Annex 8**). The remarks presented by the participants are listed in two categories, transversal and thematic, according to the MAP EcAp clusters (biodiversity, pollution and eutrophication, hydrography and coasts).

General observations:

- **A recognized lack of knowledge**. The workshop acknowledges that scientists are not in all areas currently able to provide necessary knowledge to policymakers to support the goal of achieving GES. Participants also recognize that additional efforts for identification, hierarchizing and synthesis of knowledge gaps are currently required.
- **Heterogeneous spatial distribution of knowledge availability**. It is highlighted that knowledge availability differs along Contracting Parties. Generally, a gap between Northern and Southern Mediterranean countries which can impact the robustness of regional Mediterranean models and knowledge can be observed.
- **Monitoring versus obtaining new knowledge**. Workshop participants point out the difference between routine activity with the purpose of monitoring and scientific activities for obtaining new original knowledge. Furthermore, if new knowledge is considered GES relevant, a sustainable monitoring process should be developed.
- **Scientific results to inform different processes**. It is pointed out that the scientific research results produced need to be suitable to cater different purposes integrated in IMAP: (i) monitoring, (ii) integrated environmental assessment and (iii) IMAP further revisions.
- **Ecosystem functioning**. Workshop participants consider that currently available knowledge about the functioning of Mediterranean marine and coastal ecosystems is still lacking, although they also acknowledge that the mobilization around EcAp and the MSFD has so far succeeded in developing new knowledge.

The plenary discussion also proposed a number of action points:

- **Mapping results. It is recommended that outputs of the integrated assessments be mapped under a GIS for a better understanding of environmental processes.**
- **Cost-benefit analysis. Workshop participants bring forward the interest of conducting cost-benefit analyses of monitoring.**

- **Scales. The workshop recommends that relevant scales and timelines for the integrated assessment need to be clearly defined for the implementation of the integrated assessment.**
- **Aggregation rules. Aggregation rules for the results of monitoring if the GES has been achieved or not need to be clarified.**
- **Guidelines for risk-based approach. The IMAP document recommends applying the risk-based approach for the definition of monitoring procedures. The workshop approves this recommendation but calls for the development of guidelines to apply such an approach.**
- **Empowerment of national task forces. It is recommended to develop a mechanism for expertise and capacity building aiming at establishing operational national task forces to support IMAP.**
- **Filling knowledge gaps with remote sensing. The workshop recommends making use of the results of remote sensing for monitoring physical elements, especially for establishing baseline data for coast and hydrography issues, where no field data is available. However, in some cases, more detailed data will require field work.**

5.2.1. BIODIVERSITY CLUSTER

- **Knowledge need: List of species per ecosystem**. It is put forward that a list of species per ecosystem is still to be completed. In general, a description of the species' interactions under "good environmental status" should be established.
  - **Proposed action: Strengthening the marine station network**. The workshop recommends that the network of marine stations be reactivated and further developed in order to provide knowledge regarding (i) taxonomy/list of and functional role of species (allowing to identify shifts or extinctions), (ii) gene banks for identification of species, (iii) ecosystems functioning, (iv) non-indigenous species, (v) monographs of each group of species, (vi) a shift from a habitat logic to en ecosystem logic. The development of the marine station network needs to be animated by a taxonomist. Capacity building and funding for equipment is required for non-European countries.
  - **Proposed action: Include pelagic and benthic realms into monitoring and assessment**. It is recommended to move to a more holistic approach of the marine environment and include pelagic and benthic realms (not only large-top food chain predators), along with linked threats and pressures into IMAP.

- **Knowledge need: Baseline/ reference conditions for biodiversity.**
  - **Proposed action**: Identify reference conditions on the basis of the existing MPAs network. The workshop suggests that the marine stations use well managed MPAs to contribute to the definition of baseline conditions with regards to the different elements mentioned (above points (i) to (vi)).

- **Knowledge need: Develop a cross cutting perspective.**
  - **Proposed action**: The working group mentions that it would be useful to develop links between (i) physicochemical oceanology, (ii) ecosystems functioning knowledge and (iii) threats and pressures considering connectivity effects and processes, not areas but volumes, and overcoming political barriers.

5.2.2. POLLUTION AND LITTER CLUSTER

- **Knowledge need, EO5 Eutrophication: Definition of eutrophication and its ecological impact**. The working group concludes that the observation of chlorophyll-a is not sufficient to characterize eutrophication. In order to assess the natural variability of the basin, long time series are required.
  - **Proposed actio**n: Further use of satellite data and validation with the help of field observations can be useful here. Also, the working group points out that a standard common assessment methodology with more than two indicators should be developed. Thresholds need to be defined for different ecological areas. The scale of sampling needs to be targeted.

- **Knowledge need, EO5 Eutrophication: Concentration of nutrients in water column**. The working group highlights a need to further detail the assessment of the concentration of nutrients in the water column. They also mention that additional information about sources of nutrients such as aquifers and ground water may be useful.
  - **Proposed action**: Establish guidelines for hydrographic parameters

- **Knowledge need, EO9 Contaminants: Further development of monitoring and assessment of EO9**.
  - **Proposed action**: Participants of the working group advise that the relationship between inputs, concentration and effects needs to be further investigated and taken into account.
  - **Proposed action**: The working group advises to cross-enhance the contaminant reference list with the MEDPOL list and suggest additional priorities for each area.
  - **Proposed action**: It is recommended to add observation of pathogens not only in bathing waters but also in shellfish. This issue has been identified by the working group to be of cross-cutting interest and should be further discussed.
  - **Proposed action**: The working group questions if research data for the extension of monitoring strategies beyond coastal areas, in application of the risk based approach, is needed and suggests to discuss this further.
  - **Proposed action**: Participants advocate for a further development of data management at the basin scale.

- **Knowledge need, EO10 Litter: Further development of monitoring and assessment of EO10**
  - **Proposed action**: The working group advises to develop a common approach for the definition of baselines at Regional Seas scale.
  - **Proposed action**: The working group recommends to make use of modelling to define where exactly monitoring should take place (accumulation areas, hotspots, sources). In the medium term, a GIS platform with all information stemming from models and the collected data should be envisaged.
  - **Proposed action**: It is suggested to develop and harmonize sea floor monitoring including through fish stock assessment programmes and remotely operated vehicles for remote areas. .

5.2.3. COAST AND HYDROGRAPHY CLUSTER

Identification of indicators. The working group has discussed the three indicators for EO7 and EO8 and identified some gaps, namely (i) the length of coastline influenced by manmade structures, its division into functionally homogenous units for assessment and the definition of critical thresholds, (ii) the location and extent of habitats directly impacted by hydrographic alterations and (iii) the candidate indicator land use change, as a tool for identifying hot-spots.

- **Knowledge need, EO8 coast: Length of coastline influenced by manmade structures.**
  - **Proposed action**: The working group puts forward that, for a baseline assessment, existing data should be used to generate an indicator at country level; this data generally exists or can be retrieved from satellite data. For example, Copernicus (the European Earth observation programme) has developed a specific initiative on coastal areas (setback area, 100m) with a good level of detail which can provide a useful source of data.
  - **Proposed action**: The working group mentions that it could be beneficial to evaluate cultural attitudes of populations to coastal zones and values attributed to developments in the coastal zone.

- **Knowledge need, EO7 hydrography: Location and extent of habitats impacted directly by hydrographic alterations**
  - **Proposed action**: The working group highlights that the mapping of habitats which is made for other indicators (biodiversity cluster) should be coordinated with the issues linked to this objective for economies of scale and consistency. Mapping of existing man-made structures will provide a baseline for the assessment of future measures and their impacts.
  - **Proposed action**: It is pointed out that future measures need to be assessed on the basis of (hydrological) modelling (present indicator) and investigation on potential interruptions of connections between ecosystems (subsequent indicator) in order to minimize negative impacts. Participants mention that DELTARES (a well-known NL independent institute for applied research in the field of water) can provide guidelines for modelling and impact assessment and that in France approaches for estimation of losses caused by coastal structures are available.

- **Knowledge need, EO8 coast: Candidate indicator: Land use change**. The working group indicates that this indicator has been tested in the Adriatic region (refer to documentation on PAP RAC website). It provides a good insight into spatial dynamics in order to detect hot spots for further investigation. Furthermore, the ClimVar & ICZM project has made an assessment for 11 countries based on data from Google earth.
  - **Proposed actio**n: It is recommended to implement the monitoring with the help of satellite data (COPERNICUS, CORINE Land Cover). The assessment should be done by country experts and should associate socio-economic and other cultural characteristics of each country. Participants advise that the online working group established for the definition of IMAP should assist in the process and that further assistance should be envisaged for interpretation of satellite data which requires specific knowledge.
  - **Proposed actio**n: In terms of communication, the working group highlights that the indicators need to be communicated not in terms of potential future restrictions, but rather as a tool that assists authorities in decision making aiming at coastal safety (climate change, adaptation, tsunami, reducing land losses from erosion).

5.3. RECOMMENDATIONS – CONCLUSIONS

In conclusion, the workshop made it clear that the relationship between science and policy in support of the implementation of IMAP is currently lacking effectiveness despite efforts made in the recent past mainly on scientific research project basis. The workshop made the observation that scientific research and other valuation techniques could be used more effectively in marine environmental policymaking; and that, on the other hand, policy makers do not always effectively inform scientists about their needs for scientific knowledge.
As pointed out during the workshop, well-functioning SPI should be based on a formally recognized structure with defined objectives, indicators and resources.

In addition, the workshop has moved forward with the identification of knowledge gaps to be filled and actions to be taken to address these gaps. It has also discussed ways in which scientific "language" can be made comprehensible and useful for decision makers.

Overall, it can be said that the workshop succeeded in engaging into a constructive reflection process about the methods and concrete actions to be implemented to strengthen the interface between science and policy in view of adopting an adaptive process of science-supported policy making for reaching the goal of achieving the good environmental status of the Mediterranean Sea and coast. The event initiated a series of workshops which will aim at providing a maximum of answers to the scientific questions identified for the implementation of IMAP.

In this context, it is suggested that these workshops be used to further develop the list of knowledge gaps and to precisely define the actions to be taken while identifying the actors and resources to be mobilized. These workshops could focus on specific topics, for example the EcAp clusters (biodiversity, pollution and litter, coast and hydrography).

The network of scientific experts who supported the development of IMAP has been expanded. The next workshops should also identify ways to sustain and if necessary expand this network so that it is effectively and easily mobilized. A reflection will be conducted on whether to establish a Scientific Council to monitor the implementation and developments IMAP or to strengthen and make more operational links between MAP and regional scientific institutions such as CIESM GFCM and ACCOBAMS, as well as scientific NGOs.

6. ANNEXES

ANNEX 1 : WORKSHOP AGENDA

Tuesday 15th December 2015	
12:00-13:00	Welcoming participants- Lunch offered by Plan Bleu
13:00-13:30	Registration
13:30-13:50	Agenda Item I: Opening of the meeting – Hugues Ravenel, Director of Plan Bleu Agenda Item 2: Election of officers Agenda Item 3: Presentation of the meeting and its objectives, adoption of the agenda and roundtable presentation of participants
13:50-14:15	Agenda Item 4: Mediterranean Action Plan working framework Virginie Hart, Monitoring Assessment Officer, UNEP/MAP
14:15-14:35	Agenda Item 5: Presentation of Science-Policy Interface (SPI) issues and methods • Presentation of SPI issues in CIESM-Frédéric Briand, Director General of the Mediterranean Science Commission-CIESM • Presentation of SPI issues in STAGES project -Rosa Fernandez, Technology Promotion and Transfer- CETMAR
14:35-14:50	Discussion
14:50-15:00	Agenda Item 6a): EU PERSEUS Project activities to strengthen marine environmental SPI in the Mediterranean-Vangelis Papathanassiou, Coordinator of PERSEUS
15:00-15:40	Agenda Item 6b): Presentation of EU research or pilot projects 'experiences related to SPI • Presentation of SPI issues in CoCoNET project-Ferdinando Boero, Coordinator of CoCoNET • Presentation of SPI issues in DEVOTES project -Angel Borja, Coordinator of DEVOTES • Presentation of SPI issues in IRIS SES project-Kalliopi Pagou, Coordinator of IRIS SES • Presentation of SPI issues in SEAS-ERA MERMAID project-Eleni Kaberi, Coordinator of MERMAID
15:40-16:00	Discussion
16:00-16:30	Coffee break
16:30-18:30	Agenda Item 7: Presentation of a preliminary list of knowledge needs for the full implementation of IMAP and discussion on how to address these needs Didier Sauzade, Programme Officer "Sea"–Plan Bleu
18:30-19:00	Agenda Item 8: Wrap-up, discussion and agreement on topics to be discussed in working groups the day after-Plan Bleu and the Rapporteur
19:00	End of Day 1
20:30	Dinner offered by Plan Bleu

Wednesday 16th December 2015	
08:30-09:00	Welcome coffee
09:00-09:15	Agenda Item 5: Presentation of Science-Policy Interface (SPI) issues and methods : Presentation of SPI issues in SPIRAL project-Estelle Balian, Co-coordinator of SPIRAL
09:15-09:20	Agenda Item 9: Presentation of the objectives for the working groups 'session Didier Sauzade, Programme Officer "Sea"–Plan Bleu
09:20-10:45	Agenda Item 10a): Working groups' session following the EcAp sub-cluster structure: Pollution and Litter, Biodiversity and Fisheries, Coast Hydrography
10:45-11:15	Coffee break
11:15-12:15	Agenda Item 10b): Working groups 'session-continued / Preparation of the synthesis by the Rapporteurs
12:15-13:00	Agenda Item 11: Synthesis of the working groups discussion by the Rapporteurs
13:00-13:30	Agenda Item 12: Conclusions and recommendations-Plan Bleu and the Rapporteur
13:30	Agenda Item 13: Closure of the meeting-Hugues Ravenel, Director of Plan Bleu and the Chairperson
	Lunch on the spot offered by Plan Bleu

ANNEX 2 : LIST OF PARTICIPANTS

Inception workshop "Implementation of the Ecosystem Approach in the Mediterranean: strengthening the science-policy interface", Sophia Antipolis, 15-16 December 2015

MAP Focal Points				
Mitja	BRICELJ	Ministry for Environment and Spatial Planning	Slovenia	mitja.bricelj@gov.si
Charles-Henri	DE BARSAC	Ministère de l'Ecologie, duDéveloppement Durable et de l'Energie	France	charles-henri.de-barsac@ developpement-durable.gouv.fr
Juxhina	GJONI	Ministry of Environment, Forestry and Water Administration	Albania	Juxhina.Gjoni@moe.gov.al
Tarik	KUPUSOVIC	HEIS Hydro-Engineering Institute Sarajevo	Bosnia and Herzegovina	tarik.kupusovic@heis.ba
Mohamad	SAAYED	Ministry of Environment	Lebanon	saayedmed@hotmail.com ; m.saayed@moe.gov.lb
Mahmoud	SEDEK	Egyptian ministry of environment	Egypt	mahmoudsedek@yahoo.com
MAP RACs				
Hugues	RAVENEL	Plan Bleu	France	hravenel@planbleu.org
Didier	SAUZADE	Plan Bleu	France	dsauzade@planbleu.org
Taos	BOUDINE	Plan Bleu	France	tboudine@planbleu.org
Antoine	LAFITTE	Plan Bleu	France	alafitte@planbleu.org
Juliette	BALAVOINE	Plan Bleu	France	jbalavoine@planbleu.org
Nelly	BOURLION	Plan Bleu	France	nbourlion@planbleu.org
Julien	LE TELLIER	Plan Bleu	France	jletellier@planbleu.org
Anne-France	DIDIER	DREAL PACA, Plan Bleu	France	anne-france.didier@planbleu.org
Virginie	HART	UNEP/MAP	Greece	virginie.hart@unepmap.gr
Marko	PREM	PAP/RAC	Croatia	marko.prem@paprac.org
Franck	LAUWERS	REMPEC	Malte	flauwers@rempec.org
Magali	OUTTERS	SCP/RAC	Spain	moutters@scprac.org
Mehdi	AISSI	RAC/SPA	Tunisia	mehdi.aissi@rac-spa.org
Experts				
Estelle	BALIAN	Belgian Biodiversity Platform	Belgique	estelle.balian@gmail.com
Ferdinando	BOERO	CNR-ISMAR	Italy	boero@unisalento.it
Angel	BORJA	AZTI-Tecnalia	Spain	aborja@azti.es
Margaretha	BREIL	CMCC	Italy	margaretha.breil@cmcc.it
Frédéric	BRIAND	CIESM	France	fbriand@ciesm.org
Olivier	BRIVOIS	BRGM	France	o.brivois@brgm.fr
Rosa	FERNANDEZ	CETMAR	Spain	rfernandez@cetmar.org
Jaume	FONS ESTEVE	Universitat Autònoma de Barcelona	Spain	jaume.fons@uab.es
François	GALGANI	IFREMER	France	Francois.Galgani@ifremer.fr
Franco	GIOVANARDI	ISPRA	Italy	franco.giovanardi@isprambiente.it
Georg	HANKE	Institute for Environment and Sustainability	Italy	georg.hanke@jrc.ec.europa.eu
Barak	HERUT	Israel Oceanographic & Limnological Research / MoEP	Israel	barak@ocean.org.il
Alain	Jeudy de GRISSAC	IUCN	Spain	alain.jeudy@iucn.org
Eleni	KABERI	HCMR	Greece	ekaberi@hcmr.gr
Susan	KHOLEIF	National Institute of Oceanography and Fisheries	Egypt	suzankholeif@gmail.com
Célia	LE RAVALLEC	ACCOBAMS	Monaco	cleravallec@accobams.net
Antoine	MANGIN	ACRI-HE	France	am@acri.fr
Kalliopi	PAGOU	HCMR	Greece	popi@hcmr.gr
Vangelis	PAPATHANASSIOU	HCMR	Greece	vpapath@hcmr.gr
Roberto	PASTRES	University of Foscari Venezia - Department of Environmental Sciences,	Italy	pastres@unive.it
Sofia	REIZOPOULOU	HCMR	Greece	sreiz@hcmr.gr
Cherif	SAMMARI	Institut national des sciences et technologies de la mer	Tunisie	Cherif.sammari@instm.rnrt.tn
Maria	SNOUSSI	Université Mohammed V Agdal	Maroc	ma.snoussi@gmail.com
Chlöe	VINCENT	ACRI-HE	France	cv@acri.fr
Chlöe	WEBSTER	MEDPAN	France	chloe.webster@medpan.org

ANNEX 3 : BACKGROUND: STATE OF THE ART IN SCIENCE-POLICY INTERFACE (SPI) (INFORMATION DOCUMENT)

Why is science important for Environment Policy?

To be robust, environment policy needs to be based on sound evidence, which may be transposed in the environment field as scientific evidence on the state of the environment and trends in environmental indicators (Zamparutti and MILIEU, 2012). In an era of increasing environmental evolution as a result of human activity and climate change – to name just two pressures – policy responses for the future need to be based on as strong a scientific foundation as possible, particularly given increasing public demands for transparency and accountability.

In contrast to other policy areas, environment policy has been generally driven by science (i.e.: side effects of pesticides, thinning of ozone, health effects of mercury, CO2 for climate change).

Over time, environment policies have evolved from being strongly targeted to being more holistic, implying added knowledge demands, in particular to characterize the complexities and uncertainties of integrated issues having potentially long term and irreversible consequences.

Policy impact assessments call for the most up-to-date scientific evidence and economic analysis.

Science is a key factor in generating acceptance and legitimizing policy intervention.

Scientific evidence ensures a greater ability to withstand and counter scrutiny from those who are adversely affected by policy, often quick to challenge the scientific foundations of environment policy.

The judicial system is increasingly faced with litigation cases that present complex issues of science and technology, and increasingly require access to sound science.

Evidence and analysis can play a decisive role in informing policy makers' judgments, and can condition the political environment in which those judgments need to be made.

Solid scientific evidence is needed to underpin sound environment policy. The increasing complexity of environment policy, as well as emerging trends in policy governance and public demand for full and transparent information, all suggest that stronger science policy interfaces for environment policy are necessary (Zamparutti and MILIEU, 2012).

What is a science-policy interface (SPI)?

Science Policy Interfaces have been intensively studied in the EU funded SPIRAL1 project. The focus was on how to identify and address the needs to implement the EU Marine Strategy Framework Directive (MSFD). Considering the similarities between the EU MSFD and the UNEP/MAP initiative, it is worthwhile to present the main results of this project.

According to the SPIRAL Resource book on science policy interface (Young et al, 2013), SPIs are the many ways in which scientists, policy makers and others link up to communicate, exchange ideas, and jointly develop knowledge for enriching policy and decision making processes and/or research. They involve exchange of information and knowledge leading to learning, and ultimately to changed behaviour – doing something differently as a result of the learning – that in turn represents the practical impact of SPIs. SPIs can be very formal structures, such as the Intergovernmental Panel on Climate Change (IPCC), or the newly created Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). Many research projects include a component specifically for improving the interactions between the project, the policy makers and other stakeholders and ways in which results are communicated to policy actors – this is also a SPI. Many SPIs, however, are less formal structures. Discussing a project with funders at the beginning of a piece of work can be a SPI: jointly deciding how to carry out research both to benefit science and to input results into aspects of policy. A workshop with policy makers and scientists, and maybe other stakeholders, can be a SPI, so can a field trip.

So SPIs cover a very wide range of communication forums, situations and methods. They can be formal or informal, driven more by policy demand or by supply of science, long-term processes or one-off events. Their common feature is the potential for exchange of information, joint knowledge development and learning. However some SPIs are more effective than others.

1 http://www.spiral-project.eu/content/about-spiral

What makes SPIs effective?

Following the STAGES Resource book, some forms of communication are unlikely to result in effective knowledge exchange and learning. One-way communication, for example writing a scientific paper or giving a talk at a conference, is usually not enough on its own and they need to be backed up with opportunities for exchange and learning. Similarly planning research without considering the needs of policy, or setting questions for research without involving scientists are unlikely to be successful.

Effective SPI communication is best seen as an on-going deliberate process. This can involve spending time on developing common language, building trust, and developing capacities to understand others' positions, views, needs and constraints. People working in SPIs should remain conscious of these dynamic links and learn from them – for this, formal review and updating procedures may help. Because SPIs are about fostering learning and influencing behaviour, their effectiveness is highly dependent on the people involved and on the policy processes and contexts within which they operate. Though there can be no 'one-size-fits-all' set of recommendations for the 'ideal' SPI, there are some general features that tend to support success. One popular metaphor considers the (perceived) credibility, relevance and legitimacy ('CRELE') of the SPI processes and the information exchanged.

- Credibility is the perceived quality, validity and scientific adequacy of the people, processes and knowledge exchanged at the interface;
- Relevance is the perception of the usefulness of the knowledge brokered in the SPI, how closely it relates to the needs of policy and society, and how responsive the SPI processes are to these changing needs;
- Legitimacy is the perceived fairness and balance of the SPI processes.

These CRELE attributes are widely accepted and used, and can explain an SPI's influence.

It is important to acknowledge possible pitfalls of SPIs. Common pitfalls of SPIs can include unclear or poorly thought-through SPIs, power influences, negative interactions with the media, over-reliance on key individuals, and lack of necessary resources. These aspects are developed in the SPIRAL Resource book (Young et al, 2015)

Key features of SPIs

The SPIRAL Resource book develops what are the key features of a deliberate SPI: goals, structure, processes, outputs and outcomes (see Fig 1.)

Fig. 1 Key features of SPI

Goals.
The goals of the SPI are central to understanding how and why it operates, why people participate. Make explicit the goals help to build the foundations of credibility, relevance and legitimacy (CRELE) of the SPI and the knowledge exchanged.

Structure.
The structural features of SPIs describe how they are set up and the constraints within which the processes are defined. This may include the role of different bodies or individuals in the SPI and how they work, for example via meetings and other ways of exchange.

Processes.
The processes of SPIs define the way in which the key functions are actually carried out. Again, there are important trade-offs and SPIs need to decide how to allocate scarce resources (financial, time and human effort) across different activities.

Outputs.
The outputs of SPIs (e.g. briefs, reports, papers, presentations) can be characterised by a set of features describing how and when they are prepared and presented.

Outcomes.
The main outcomes associated with SPIs are the learning, behavioural and policy changes they foster. These are not fully within the control of the SPI and do not follow directly from design or operation choices in the way that the other features do.

ANNEX 4 : LIST OF ECAP ECOLOGICAL OBJECTIVES

1. Biodiversity is maintained or enhanced.
2. Non-indigenous species do not adversely alter the ecosystem.
3. Populations of commercially exploited fish and shellfish are within biologically safe limits.
4. Alterations to components of marine food webs do not have long-term adverse effects.
5. Human-induced eutrophication is prevented.
6. Sea-floor integrity is maintained.
7. Alteration of hydrographic conditions does not adversely affect coastal and marine ecosystems.
8. The natural dynamics of coastal areas are maintained and coastal ecosystems and landscapes are preserved.
9. Contaminants cause no significant impact on coastal ad marine ecosystems and human health.
10. Marine and coastal litter does not adversely affect coastal and marine ecosystems.
11. Noise from human activities cause no significant on marine and coastal ecosystems.

Note: While EO3, EO4 and EO6 Ecological Objectives and common indicators are not included in the initial phase of IMAP implementation they are partly being addressed by the EO1 related common indicators. EO3 related candidate/ common indicators are currently being developed by GFCM, in close cooperation with UNEP/MAP Secretariat with the aim of their introduction to IMAP by its next update, possibly by COP20.

ANNEX 5 : LIST OF COMMON INDICATORS

The Common and candidate indicators agreed upon, which are at the core of IMAP, include:

1. Habitat distributional range (EO1) to also consider habitat extent as a relevant attribute;
2. Condition of the habitat's typical species and communities (EO1);
3. Species distributional range (EO1 related to marine mammals, seabirds, marine reptiles);
4. Population abundance of selected species (EO1, related to marine mammals, seabirds, marine reptiles);
5. Population demographic characteristics (EO1, e.g. body size or age class structure, sex ratio, fecundity rates, survival/mortality rates related to marine mammals, seabirds, marine reptiles);
6. Trends in abundance, temporal occurrence, and spatial distribution of non-indigenous species, particularly invasive, non-indigenous species, notably in risk areas (EO2, in relation to the main vectors and pathways of spreading of such species);
7. Spawning stock Biomass (EO3);
8. Total landings (EO3);
9. Fishing Mortality (EO3);
10. Fishing effort (EO3);
11. Catch per unit of effort (CPUE) or Landing per unit of effort (LPUE) as a proxy (EO3);
12. Bycatch of vulnerable and non-target species (EO1 and EO3)
13. Concentration of key nutrients in water column (EO5);
14. Chlorophyll-a concentration in water column (EO5);
15. Location and extent of the habitats impacted directly by hydrographic alterations (EO7) to also feed the assessment of EO1 on habitat extent;
16. Length of coastline subject to physical disturbance due to the influence of man-made structures (EO8) to also feed the assessment of EO1 on habitat extent;
17. Concentration of key harmful contaminants measured in the relevant matrix (EO9, related to biota, sediment, seawater);
18. Level of pollution effects of key contaminants where a cause and effect relationship has been established (EO9);
19. Occurrence, origin (where possible), and extent of acute pollution events (e.g. slicks from oil, oil products and hazardous substances) and their impact on biota affected by this pollution (EO9);
20. Actual levels of contaminants that have been detected and number of contaminants which have exceeded maximum regulatory levels in commonly consumed seafood (EO9);
21. Percentage of intestinal enterococci concentration measurements within established standards (EO9);
22. Trends in the amount of litter washed ashore and/ or deposited on coastlines (including analysis of its composition, spatial distribution and, where possible, source.) (EO10);
23. Trends in the amount of litter in the water column including microplastics and on the seafloor (EO10);

Candidate indicators

24. Trends in the amount of litter ingested by or entangling marine organisms focusing on selected mammals, marine birds and marine turtles (EO10);

25 Land use change (EO8)

26. Proportion of days and geographical distribution where loud, low, and mid-frequency impulsive sounds exceed levels that are likely to entail significant impact on marine animals (EO11)
27. Levels of continuous low frequency sounds with the use of models as appropriate (EO11)

During the implementation of the initial phase of IMAP, the CORMONs will further develop the candidate indicators towards common indicators as well as to further refine the specifics of agreed common indicators, in particular on geographical scale, in light of the ongoing implementation experience of IMAP.

ANNEX 6 : THE INTEGRATED MONITORING AND ASSESSMENT PROGRAMME (IMAP) OF UNEP/ MAP (INFORMATION DOCUMENT)

Monitoring and assessment, based on scientific knowledge, of the sea and coast is the indispensable basis for the management of human activities, in view of promoting sustainable use of the seas and coasts and conserving marine ecosystems and their sustainable development. The Draft Decision IG.22/7 Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria (UNEP/MAP, 2015a), prepared to be endorsed by the next Convention of Parties, describes the strategy, themes, and products that the Barcelona Convention Contracting Parties are aiming to deliver, through collaborative efforts inside the UNEP/MAP Barcelona Convention, over the second cycle of the implementation of the Ecosystem Approach Process (EcAp process), i.e. over 2016-2021, in order to assess the status of the Mediterranean sea and coast, as a basis for further and/or strengthened measures.
Please report to the Draft Decision for additional information.

Background
IMAP builds on the monitoring and assessment related provisions of the Barcelona Convention and its Protocols, previous Decisions of the Contracting Parties related to monitoring and assessment, and to the EcAp process, including on Decision IG. 21/3 and the expert level discussions mobilized based on this Decision, such as the ones taking place in the Correspondence Groups on Good Environmental Status (COR GEST) and Monitoring (CORMON), the On line Working Groups (Eutrophication, Contaminants, Marine litter, Biodiversity and Non-invasive species and Coast and hydrography) as well as the EcAp Coordination Group.
In addition, the development of IMAP took due account of the Contracting Parties" existing monitoring and assessment programmes, practices of other Regional Sea Conventions and other Regional bodies, such as GFCM1 and ACCOBAMS2.

Timeline
IMAP is aiming to deliver its objectives over 2016-2021. It is introduced first however in an initial phase (in line with Decision IG. 21/3, in between 2016-2019), during which the existing national monitoring and assessment programmes will be integrated, according to the IMAP structure and principles and based on the agreed common indicators. This implies in practice that the existing national monitoring and assessment programmes will be reviewed and revised as appropriate so that national implementation of IMAP can be fulfilled in a sufficient manner. The main outputs during the initial phase of IMAP will include the update of GES definitions, further refinement of assessment criteria and development of national level integrated monitoring and assessment programmes. Furthermore, the Quality Status Report in 2017 and the State of Environment and Development Report in 2019 will build on the structure, objectives and data collected under IMAP. The validity of IMAP should be reviewed once at the end of every EcAp six year cycle, and in addition it should be updated and revised as necessary on a biennial basis, based on lessons learnt of the implementation of IMAP and on new scientific and policy developments.

The SPI for IMAP definition phase
As any UNEP/MAP programme, IMAP has been built using available scientific basis. As presented above, IMAP elaboration has been supported by expert advice issued from the Correspondence Groups, themselves complemented by those of the On-line working groups, under the supervision of the EcAp coordination groups. These multidisciplinary groups were composed of technical and scientific experts designated by the Parties to the Barcelona Convention. Their works were facilitated by the dedicated MAP components, supported by contracted experts.

Moreover scientific expertise issued from ongoing research projects were also mobilized for specific question regarding biodiversity. A workshop was co-organized by UNEP/MAP and the EU PERSEUS3 project to follow up the recommendations of February 2014, asking the Secretariat to consult international experts for developing IMAP, especially in relation to biodiversity. This workshop was held on the 28-30April 2014 in Anavissos HCMR4 premises, Greece, with contribution of several on-going research and pilot EU projects, namely PERSEUS, CoCoNet5, DEVOTES6 and IRIS SES7 and was attended by scientific working in the field of biodiversity.
The workshop has resulted in some general and some specific biodiversity and NIS common indicators related scientific recommendations and addressed both overall status or aspects of biodiversity in the Mediterranean, monitoring needs, challenges, methodologies, cost efficiency and feasibility in light of recent scientific developments. As such it provided a key contribution to the development of the draft IMAP.

As stated in the summary of the workshop8, participants and organizers both agreed on the added value of the Workshop, not only in relation to the EcAp process, but also for coordination purposes and proposed further follow-up Workshops to ensure that EcAp related scientific projects are coordinated and feed into the work of the Barcelona Convention/EcAp policy process.
In this sense, this workshop showcases the EcAp SPI action launched by this inception workshop, the aims of which are to extend, make more systematic and sustain the SPI experienced in the definition phase of IMAP.

2. Commission générale des pêches pour la Méditerranée (CGPM)
3. Accord sur la Conservation des Cétacés de la Mer Noire, de la Méditerranée et de la zone Atlantique adjacente (ACCOBAMS)
4. http://www.perseus-net.eu/
5. Hellenic Centre for Marine Research (Centre hellénique de recherche marine), coordinateur des projets PERSEUS et IRIS SES
6. http://www.coconet-fp7.eu/
7. http://www.devotes-project.eu/
8. http://iris-ses.eu/
9. http://planbleu.org/sites/default/files/upload/files/Informal_Summary_EcAp_Biodiversity_Scientific_Expert_Workshop_PERSEUS.pdf

ANNEX 7 : SCIENTIFIC NEEDS FOR ECAP IMAP IMPLEMENTATION IDENTIFIED IN THE IMAP REFERENCE DOCUMENT (INFORMATION DOCUMENT)

Method

It has been chosen to analyse the reference document that presents the IMAP process, namely the draft Decision IG.22/7 "Integrated Monitoring and Assessment Programme of the Mediterranean Sea and Coast and Related Assessment Criteria" The cross cutting issues were analysed from the Draft Integrated Monitoring and Assessment Guidance (2015) where these aspects are more developed.

The introduction of the first document provides indications on what could be considered as knowledge needs, as data or process not available in scientific literature.

The method consisted to first select sections of the documents mentioning any further developments for the implementation of IMAP.

Each selected section was analysed in order to:

- Identify the relevant EcAp Ecological Objective (EO), or cross cutting issues addressing several EO (e.g. scale issues)
- Characterize the underlying gap in scientific knowledge
- Formulate it as a need for scientific development
- If required, address relevant remarks about link with other identified gaps, preliminary characterization of the development

Then these needs were synthetized and sorted according main thematic challenges (Cross cutting issues, EcAp EOs) in a table giving both the needs and the proposed action to meet these needs, displaying the following items:

- Needs formulation
- Proposed action to address these needs,
- Scope or typology of the action
- Level or scale of the action (local, national, regional)
- Estimated duration of the action: Short (less than 2 years) Medium (2-4 years), Large (more than 4 years)
- Opportunities: outputs of research project, partnership with UNEP/MAP, resource of scientific centre …) to develop this action.

Main needs identified from the IMAP reference document

The main needs of scientific support for the implementation of IMAP identified from the analysis of the IMAP draft decision and of the guidance document are summarized here, displayed in cross cutting issues and EcAp clusters and Eos.

Cross cutting issues

- Assessment at national scale, according the four Mediterranean sub-regions, characterization of the pressure EO and of the status of state EO, using the EcAp Common Indicators
- Best use of scientific research results for monitoring, integrated assessment, and IMAP revision
- Contaminants, relationship between inputs, concentration and effects
- Relevant scales for integrated assessment and management
- Guideline to apply the risk based approach
- Aggregation rules, from monitoring environmental status
- Map of the integrated assessment outputs
- Cost benefit analysis of monitoring
- Empowerment of national task forces through expertize and capacity building

Pollution and litter Cluster

Eutrophication (EO5)

- Monitoring and status assessment optimal strategies, taking into account sub regional differences

Contaminants (EO9)

- Harmonization of monitoring programmes, specifically on baseline, targets and contaminants reference list
- Development of monitoring methods based on biological effects, baseline and assessment criteria
- Review of the contaminant monitoring on biota
- GES targets in bathing waters
- Extension of monitoring strategies in open waters, beyond coastal areas
- Assessment of acute events

Litter (EO10)

- Definition of baseline to develop a risk based strategy
- Citizen monitoring
- Specific developments on microlitter and litter ingested or entangling marine organisms, especially turtles

Biodiversity and Fisheries Cluster

Biodiversity (EO1)

- Improved definition of Reference list of species and habitats
- Improved definition of GES, characterization of baseline

and thresholds
- Improved knowledge of the relationship between cumulated pressures and impacts
- Identification and characterization of representative sites and species at national scales

Biodiversity / Cetacean (EO1)
- Abundance and distribution of cetaceans
- Monitoring methodologies

Noise (EO11)
- Characterization of baseline and thresholds
- Development of monitoring programmes based on the two selected candidate common indicators, at national and regional levels

Non-indigenous species (EO2)
- Coordinated development of reference lists, baseline assessment, threshold, IAS hotspots

Commercial fishes and shellfishes (EO3)
- Development of a monitoring and assessment strategy in collaboration with GFCM
- Marine food web (EO4)
- Development of a monitoring and assessment strategy in collaboration with GFCM
- Sea floor integrity (EO6)
- Development of a monitoring and assessment strategy in collaboration with GFCM

Coast Hydrography / Coast Cluster

Coast (EO8)
- Development of a harmonized monitoring and assessment programme based on the Candidate indicator 25, Land use change: baseline, threshold, monitoring

ANNEX 8 : SCIENTIFIC NEEDS FOR ECAP IMAP IMPLEMENTATION IDENTIFIED BY THE EU PROJECT STAGES (INFORMATION DOCUMENT)

The Science and Technology Advancing Governance on Good Environmental Status project or STAGES (Connecting science to policy for healthy seas) aimed to connect science to policy to help achieve GES in the EU marine waters. The project worked towards bridging the MSFD science-policy gap and improving the availability of scientific knowledge to allow Member States to achieve GES (Le Moigne et al., 2014). One of the main objectives of the project was to establishing where further research needs to be conducted to improve the scientific knowledge underpinning implementation of the MSFD. This was performed through a consultative process with a broad range of marine stakeholders including European / International organisations involved in the MSFD Process and national organisations with responsibility to support research and provide advice on the MSFD at Member State level. Three main workshops were organised, one of which being on the identification of research needs with regards to the implementation of monitoring programme (STAGES, 2013).

Objectives and methodologies of this EcAp SPI action and those of the STAGES project are similar, in particular the participative approach, justifying to consider the STAGES results. However, the difference in scope of the two actions should be kept in mind, IMAP covering the whole Mediterranean Sea, including coasts, and the STAGES project being for the marine part of the European Seas.

Synthesis of the STAGES results are presented according the EcAp clusters and on line WG, to ease comparisons.

Pollution and litter / Eutrophication (EO5) Cluster
Short-term
- Develop methods to include other characteristics in addition to Chlorophyll a, such as changes in community composition, occurrence of nuisance and toxic species that result from changes in nutrient ratios, and increased duration and frequency of blooms which result from increases in nutrient loads.
- Develop new phytoplankton assessment tools that account for shifts in species composition and frequency of blooms in the status assessment scoring. Support evolving monitoring strategies aimed at optimal integration of various monitoring tools.

Medium-term or requiring moderate investments
- Develop regional algorithms that reduce the uncertainty in the calculation of satellite chlorophyll from global algorithms.

Long-term research or large investments
- Develop algorithms for phytoplankton composition identification using remote sensing and satellite modelling.
- Develop metagenomics in species identification microarrays.
- Develop biological trait analysis for phytoplankton, species analysis, and analysis of harmful toxins.

Pollution and litter / Contaminants (EO9) Cluster
Contaminants in the marine environment

Short-term
- Develop methods to quantify contaminants fluxes and inputs.
- Develop tools to monitor marine ecotoxicology data, including for emerging contaminants.
- Study bioavailability and effects of emerging contaminants.
- Develop integrated surveillance programmes including, at least, different compartments of the ecosystem for the study of pollutant concentrations and associated biological responses.
- Develop projects to study how to include new groups of contaminants and tissue-level biomarkers, as well as embryo-larval bioassays in sediment pollution monitoring.
- Study higher trophic level contamination.

Medium-term or requiring moderate investments
- Develop new passive samplers to increase pre-concentration of samples at sea.
- Develop adaptation of marine monitoring strategies for ubiquitous' contaminants.
- Better understand the ecological relevance and relationship between early warning signals at molecular level and the alteration of physiological functions like reproduction, immunotoxicity and fitness.
- Better understand how contaminants are transferred across trophic levels.
- Long-term research or large investments
- Develop new genomic and transcriptomics methods in ecotoxicological studies.
- Better understand the links with microplastics and whether this acts as an additional exposure vector for contaminants.

Contaminants in Sea food
- Short-term
- Develop specific and on-going monitoring of the concentrations of contaminants in fishery products traceable to their source.
- Analyse additional contaminants, sampling in a wider range, and including more marine commercial species.
- Medium-term or requiring moderate investments
- Develop monitoring programmes outside coastal area monitoring of seafood contamination.
- Long-term research or large investments
- Study of effects of worldwide pollution and long-range transport

Pollution and litter / Litter (EO10) Cluster

Short-term
- Develop conversion factors number/weight/volume.
- Determine litter degradation rates.
- Microplastics :
- Increase knowledge about them: size to be specified and harmonised, inter-calibration protocols and harmonisation needed.
- Quantify them in the environment (including sediments from submerged substrates and beaches, as well as surface water).
- Optimise information collection networks for impact indicators, to supplement existing scientific and technical bases.
- Develop designs which are statistically powerful enough.

Medium-term or requiring moderate investments
- Develop monitoring plans using video or photo images, to assess litter on rocky and deep bottoms.
- Develop tools to assess the landscape and/or cognitive effects of litter on society, mainly affecting tourism and the development of water activities, in order to assess economic and social damage to affected areas.

Long-term research or large investments
- Develop opportunistic data acquisition for deep areas/ canyons (high cost of data acquisition), allowing long-term monitoring.
- Determine the possible origin of litter and dispersion vectors by studying their distribution and coupling with particle drift models or identifying characteristics of the waste.

Biodiversity and Fisheries/ Biodiversity (EO1)
Short-term Cluster
- Automatic analysis methods for plankton samples, to carry out an objective analysis (not influenced by expertise in taxonomic identification) of certain plankton attributes, such as size structure and taxonomic composition.

Medium-term or requiring moderate investments
- Innovative monitoring tools to provide real-time information such as, e.g., remote sensing for plankton composition, use of ferry boxes, ROV (Remotely-Operated Vehicles), acoustic, and molecular approaches.
- For routine implementation, molecular-based methods for population and species diversity assessment should be developed.
- Studies on population genetics (DNA barcoding/ Metagenetics, Short Nucleotide Polymorphisms)

Long-term research or large investments
- Development of 'business models' for upscaling and operationalisation of biodiversity monitoring.
- Anticipating the development of technologies for next generation sequencing.

Biodiversity and Fisheries/ Biodiversity / Noise (EO11) Cluster

Short-term
- Organise efficient data gathering (recording) for impulsive noise and measuring/data gathering for ambient noise, preferably at EU or regional scale.

Medium-term or requiring moderate investments
- Develop sound maps, integrating acoustic models, source information and environmental parameters to

describe current sound levels and trends.

Long-term research or large investments

- Increase knowledge of direct effects of impulsive sounds (sonar and acoustic deterrents, seismic, piling, explosions). This should address behavioural effects; injury may still be relevant for some activities. Effects of impulsive sounds at population/ecosystem level. There are proposals for frameworks to expand from direct/individual effects of disturbance to population/ ecosystem level effects, e.g. the PCAD-model (population consequences of acoustic disturbance).
- Effects of increased ambient noise level, addressing masking potential but also other stress effects. Assessment of relevance of masking for population/ ecosystem effects.
- Verify the most relevant parameters to describe sound (not restricting to presently used pressure parameters but also velocity parameters/particle motion): ultimately international standards would be needed.
- For future impact assessments/risk assessment, improved knowledge on seasonal presence and abundance of marine life may be needed.
- Mitigation potential, e.g. silencing technologies, including assessment of actual mitigation potential of such technologies:
  - Assessment of mitigation effectiveness, not limited to technological solutions but including evaluation of other current measures and exclusion zones/periods, passive acoustic monitoring, ramp-up, including a cost-benefit assessment

Biodiversity and Fisheries/ Non-indigenous species (EO2) Cluster

Short-term

- Development of tools to achieve faster and more accurate identification of habitat/biotopes present in different marine environments (from shallow to deep sea, soft to hard bottom).

Medium-term or requiring moderate investments

- Studies on the changes in the functioning of marine ecosystems subjected to an impact of invasive alien species.
- Molecular-based methods for routine implementation of NIS identification.

Long-term research or large investments

- Relevant hydrodynamic models for understanding the processes of natural dispersion.
- Studies on mechanisms of this natural dispersion of each invasive species.

Biodiversity and Fisheries/ Commercial fishes and shellfishes (EO3) Cluster

Short-term

- Determining a method to select the scale of monitoring and response to the dynamics of fish populations for all exploited populations, dominant populations and dominant fisheries.
- Impact of discard bans on monitoring.
- Establishment of consistent reference points, as well as the development of additional indicators, related to mixed-fisheries characteristics for examples.
- Studies to obtain information on fishing mortality rates and biomass indices for fish populations for which there is little information, such as deep-sea fish. Shellfish are another group with scarce data.
- Assessment of transboundary monitoring needs to be clarified.
- Monitoring of the exploited invasive species, such as Manila clam, king crab, snow crab or Pacific oysters.
- Improving the collating of information on by-catches.

Medium-term or requiring moderate investments

- Studies must be made on integrating criteria and indicators of biological disturbance from fishing, which are related to the level of fishing pressure, particularly ensuring fishing mortality (F) at or below the MSY, in complex situations such as mixed fisheries and cases of significant ecosystem interactions.
- An analysis should be undertaken to assess whether SSBMSY would be achieved simultaneously for all stocks, taking into account the interactions between them.
- More studies on the impacts of selectivity on stocks are needed.

Long-term research or large investments

- New genomic methods should be developed (e.g. short nucleotide polymorphism (SNP)).
- One way to identify which populations should be surveyed and resources prioritised could be achieved by developing and adapting the "productivity and susceptibility" approach (PSA).

Biodiversity and Fisheries/ Marine food web (EO4) Cluster

Short-term

- Adapt the existing monitoring programmes to food web characteristics.
- Increase the study of energy flows: e.g. between benthic invertebrates and waterbirds, carbon remineralisation by the bacterioplankton, etc.
- Increase the study of marine predators feeding areas and feeding strategies.
- Develop/improve methods to measure or to estimate the productivity of key components.

Medium-term or requiring moderate investments

- Develop indicators:
- To describe communities from a structural point of view: e.g. the size spectrum, or the proportion of piscivores in the community.
- That are integrative for trophic connections and energy fluxes: e.g. productivity of key parts of the food webs, carbon recycling indexes, Primary production required

(PPR), sources or prey quality, etc.

- Improve models of food webs by incorporating new understanding from research in order to improve operationality.
- Use models to optimise monitoring programmes: genetic and isotopic based research to understand trophic position and relationships and to assess group-specific and community specific indicators.

Long-term research or large investments

- Technological development and miniaturisation of sensors are needed to increase the automatic data collection.

Biodiversity and Fisheries/ Sea floor integrity (EO6) Cluster

Short-term

- Define agreement on habitats description (EUNIS).
- Study relations between pressures and microbiology.

Medium-term or requiring moderate investments

- Develop new devices and data transmission means for the observation and study of deep sea habitats.

Long-term research or important investments

- Integrate information from different sources and surveys

Coast Hydrography / Coast /. Hydrographic conditions (EO7) Cluster

Short-term

- Studies are required to develop monitoring methods using remote-sensing satellite techniques, high frequency radar systems, and supports for instrumentation such as tide gauge, oceanographic cruises, uplooking Acoustic Doppler current profiler (ADCP), mooring systems, ships of opportunity, gliders and floats.
- Connection between monitoring and modelling needs to be improved.

Medium-term or requiring moderate investments

- Adapt available methodologies to offshore conditions.
- Determine targets and limits.

Long-term research or large investments

- Develop operating models to characterise the hydrographical conditions on short scales and infer if these can be affected by infrastructure development.
- Develop cumulative effects assessment methodologies for geomorphologically complex situations.
- Study regional scale modelling.
- Develop models of possible anthropogenic activities

ANNEXE 9 : A. NEED ANALYSIS IN THE ECAP DOCUMENTS (WORKING DOCUMENT)

Results from the workshop have been added to this table in green writing.

Cross cutting issues

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
Definition of scales and areas for assessment for each Med country.	Eco regions delimitation, sub delimitation per pressure, coherent for management. Expertise to elicit priority issues, hot spots … Define timelines	Expertise, R&I activities, knowledge transfer	Regional, National, Sub national	Short / Medium	
Assessment at national scale, for each Med sub region (or even at lower scale if relevant): - Each main pressure and its impact (EO2, EO5, EO6, EO7, EO9, EO10, EO11) - Status of each functional group and each predominant habitats, at appropriate ecosystem level (EO1, EO7)	Development of methodologies Scientific support at regional level for coordination Scientific support at national level for national assessment Collection of reliable data	Expertise, R&I activities, knowledge transfer	Regional, National, Sub national	Short/ Medium	Synergy with the MSFD implementation
Display the environment status of the different EO across the Mediterranean waters using suitable mapping tool based on a nested scale system as the HELCOM one's	Development of the mapping tool, building on the HELCOM experience, elaboration of a pilot project, specification of the tool, development, tests and extension to the basin	Expertise, R&I activities, knowledge transfer	Regional, National, Sub national	Short/ Medium	Could at term contribute to the QSR and other environmental reporting
Link the scales of assessment to management issues (the management of pressures via measures, the assessment of cumulative impacts on ecosystem components and its links to decision making processes for licencing new developments)	Development of suitable methodologies to link the scales of assessment to management issues	Expertise, R&I activities, knowledge transfer	Regional, National, Sub national	Short/ Medium	Build on the results of the PERSEUS project, including the Adaptive Marine Policy Toolbox
Refine aggregation rules enabling to use fine-scale data (individual samples) to assess the environmental status of broad ecosystem elements for an entire (sub)region	Specification of the rules to define if GES has been reached, test on pilot areas	Expertise, R&I activities, knowledge transfer	Need analysis	Short/ Medium	Methodologies have been developed for the MSFD: Aggregation rules are not yet determined but aggregation is likely to be required across indicators within each criterion

a method for integrated assessment based on the common indicators	Develop in detail a method for integrated assessment based on the common indicators and results of the scientific projects, following this sequence: a. Map the distribution and intensity of human uses and activities (identifies main areas of activity, potential for use as proxy pressure assessment, supports later identification of measures; b. Assess the pressures – spatial distribution and intensity (and temporal aspects, where necessary) of each pressure; c. Assess the impacts – extent of impacts in relation to the elements to be used for the state-based assessments. Appropriate scales for this sequence should be critical. Will probably require pilot projects to develop and test this method d. Assess the state – bringing together the relevant impact assessments from (b) and leading to an overall assessment of status using a specified assessment methodological standard.	Expertise, R&I activities, knowledge transfer	Regional, National	Short, Medium	
Assess cost efficiency in relation to socio-economic benefits of monitoring	Develop Cost Benefit Analysis (CBA) practice of monitoring, and more generally of Environmental Impact Assessment of monitoring. Will require pilot project.	Expertise, R&I activities, knowledge transfer	Regional, National	Short, Medium	

Make best use of available duly validated scientific assessment tools (modelling, remote sensing and progressive risk assessment strategies)	Identify, and assess these tools in cooperation with their developers. Test them through Pilot Case projects. Remote sensing especially for establishing baseline data for coast and hydrography issues, where no field data is available.	Expertise, R&I activities, knowledge transfer	Regional, National	Short, Medium	
Need to carry out research, especially on relationships between inputs, concentration and effects, in order to develop QA/QC practices	Develop collaborations, preferably jointly, research actions necessary to assess the quality of the marine environment, and to increase knowledge and scientific understanding of the marine environment and, in particular, of the relationship between inputs, concentration and effects.	Organization, Expertise, R&I activities, knowledge transfer	Regional, National	Short, Medium	Rooted in the MAP secretariat PoW for the initial phase of IMAP
Consider the results of the scientific research and innovation projects to draft the 2017 Status Report	Development of a science policy interface to contribute to the 2017 Status Report	Organization, knowledge transfer	Regional, National	Short	
Consider the results of the scientific research and innovation projects for the periodic revision of IMAP (biennial update and 6 years cycle)	Development of a sustained science policy interface, including disposition for IMAP periodic revision and update	Organization, knowledge transfer	Regional, National	Short, Medium	
Develop a cross cutting perspective.	Develop links between (i) physicochemical oceanology, (ii) ecosystems functioning knowledge and (iii) threats and pressures considering connectivity effects and processes, not areas but volumes, and overcoming political barriers.	Organization, knowledge transfer	Regional, National	Short, Medium	

Clarify risk-based approach	The IMAP document recommends applying the risk-based approach for the definition of monitoring procedures. Guidelines to apply such an approach should be developed.	Organization, Expertise	Regional	Short	
Coordination at the national level	Empowerment of national task forces. It is recommended to develop a mechanism for expertise and capacity building aiming at establishing operational national task forces to support IMAP.	Organization	National	Short	

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO5 need to be further developed	Development of risk based optimal strategies of Monitoring (frequency, localisation of the stations, acceptable risk)	Expertise, R&I activities, knowledge transfer	Regional, National	Short	
	Development assessment strategies including fact sheets taking into account sub regional differences	Expertise, R&I activities, knowledge transfer	Regional, National	Short	
	Definition of eutrophication and its ecological impact. The observation of chlorophyll-a is not sufficient to characterize eutrophication. To assess the natural variability of the basin, long time series are required. Further use of satellite data and validation with the help of field observations can be useful here. Standard common assessment methodology with more than two indicators should be developed. Thresholds need to be defined for different ecological areas. The scale of sampling needs to be targeted.	Expertise, R&I activities, knowledge transfer	Regional, National	Short	
	Need to further detail the assessment of the concentration of nutrients in the water column. Additional information about sources of nutrients such as aquifers and ground water may be useful. Establish guidelines for hydrographic parameters.	Expertise, R&I activities, knowledge transfer	Regional, National	Short	

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO9 need to be further developed	Harmonization in the different contaminant monitoring programmes existing In particular: - Harmonization of monitoring targets, taking into account sub regional differences. - Harmonization of the contaminant reference list at sub regional scale - Setting of priorities for each area	Expertise, R&I activities, knowledge transfer	Regional, National, sub regional	Medium?	Cross-enhance the contaminant reference list with the MEDPOL list.
	Implementation of Common Indicator 18: Level of pollution effects of key contaminants where a cause and effect relationship has been established. Characterization of baseline and thresholds The relationship between inputs, concentration and effects needs to be further investigated and taken into account.	Expertise, R&I activities, knowledge transfer	Regional, National	Short/ Medium	
	Development of operational monitoring methods based on biologic effects	Expertise, R&I activities, knowledge transfer	Regional, National	Short/ Medium	
	Expertise to prepare recommendation for BAC (background assessment concentrations) Formulation of EAC (environmental assessment criteria) for selected biomarkers in Mediterranean species.	Expertise, knowledge transfer	Regional, National	Short/ Medium	
	Review and critical analysis of the monitored contaminant in biota used for human consumption, considering at least: Heavy metals (lead, cadmium, and mercury), polycyclic aromatic hydrocarbons, and dioxins (including dioxin-like PCBs), with the species selection considerations described in the Integrated Monitoring and Assessment Guidance.	Expertise, R&I activities, knowledge transfer	Regional, National	Short/ Medium	

	Definition of GES targets related to the indicator on pathogens in bathing waters in line with Decision IG.20/9 (Criteria and Standards for bathing waters quality in the framework of the implementation of Article 7 of the LBS Protocol, (UNEP/MAP, 2012)) It is recommended to add observation of pathogens not only in bathing waters but also in shellfish. This issue has been identified to be of cross-cutting interest and should be further discussed.	Expertise, R&I activities, knowledge transfer	Regional, National	Short/ Medium	
	Extension of monitoring strategies beyond coastal areas, in application of the risk based approach. It should be investigated and further discussed if research data for the extension of such monitoring strategies is needed.	Expertise, R&I activities, knowledge transfer	Regional, National	Medium	
	Impact assessment analysis of the acute pollution potential events.	Expertise, R&I activities, knowledge transfer	Regional, National	Medium	
Data at the basin scale	further development of data management at the basin scale	Expertise, knowledge transfer	Basin scale	Short, Medium	

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
Monitoring and assessment specific of EO10 need to be developed	Definition of baseline data from pilot or development projects, in order to develop a risk based approach to litter monitoring and measures	Expertise, R&I activities, knowledge transfer	Regional, National	Medium	
	Develop a common approach for the definition of baselines at Regional Seas scale.	Expertise, knowledge transfer	Regional Seas	Short	
	Make use of modelling to define where exactly monitoring should take place (accumulation areas, hotspots, sources). A GIS platform with all information stemming from models and the collected data should be envisaged.	Expertise, knowledge transfer	Regional, National	Medium	
	Development of citizen monitoring strategies.	Expertise, knowledge transfer	Regional, National, Local	Short/ Medium	
	Development of a specific monitoring of floating litter protocol, on a regional basis.	Expertise, knowledge transfer	Regional, National	Short	
	Develop and harmonize sea floor monitoring including through fish stock assessment programmes and remotely operated vehicles for remote areas.	Expertise, R&I activities, knowledge transfer	Regional, National, Local	Short/ Medium	
	Development of monitoring protocol for marine litter in sea turtles specific to the Mediterranean conditions	Expertise, R&I activities, knowledge transfer	Regional, National	Medium	
	Development of research on ingested litters, as candidate indicator.	Expertise, R&I activities, knowledge transfer	Regional, National	Medium	
	Development of research on micro-litter, including stock taking of on-going research works.	Expertise, R&I activities, knowledge transfer	Regional, National	Medium	

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
Monitoring and assessment specific of EO1 need to be further developed	Improvement of the Reference list of species and habitats (Appendix 1 of the document)	Expertise, R&I activities, knowledge transfer	Regional, National	Short / Medium	
	Quantitative definition of the GES for this EO based on the selected common indicators relevant to this EO (CI 1,2,3,4,5,12,15,16)	Expertise, R&I activities, knowledge transfer	Regional, National	Short / Medium	
	Guidance for the nested approach implementation	Expertise, knowledge transfer	Regional, National	Short / Medium	
	Characterization of baselines and thresholds	Expertise, R&I activities, knowledge transfer	Regional, National	Short / Medium	Identify reference conditions on the basis of the existing MPA network. Marine stations to use well managed MPAs to contribute to the definition of baseline conditions
	Guidance for the application of the risk-based approach. Characterisation of the relationships between environmental pressures and main impacts	Expertise, knowledge transfer	Regional, National	Short / Medium	
	Identification and characterization of representative site and species at national scales.		National	Medium?	

List of species per ecosystem and description of the species' interactions under GES.	Strengthening the marine station network in order to provide knowledge regarding (i) taxonomy/list of and functional role of species (allowing to identify shifts or extinctions), (ii) gene banks for identification of species, (iii) ecosystems functioning, (iv) non-indigenous species, (v) monographs of each group of species, (vi) a shift from a habitat logic to en ecosystem logic. The development of the marine station network needs to be animated by a taxonomist. Capacity building and funding for equipment is required for non-European countries. Include pelagic and benthic realms into monitoring and assessment to move to a more holistic approach of the marine environment and include pelagic and benthic realms (not only large-top food chain predators), along with linked threats and pressures.	Expertise (taxonomist), Knowledge transfer, Provision of equipment for Southern countries	Regional, National	Medium?	Existing network of marine stations to be used as a basis, thus avoiding replication.

Cluster Biodiversity and Fisheries/ Biodiversity / Cetacean (EO1)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO1 / cetaceans need to be developed	Collection of reliable data on abundance and distribution of cetaceans.	Knowledge transfer	National, Regional	Short	In collaboration with ACCOBAMS (2016-2019)
	Development of monitoring methodologies and capacity building	Expertise, R&I activities, knowledge transfer	National, Regional	Short / Medium	With the support of ACCOBAMS

Cluster Biodiversity and Fisheries/ Biodiversity / Noise (EO11)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO11 need to be developed	Development of monitoring programmes on the basis of the two common candidate indicators at national level (CCI 26, 27)	Expertise, knowledge transfer	National	Short/ Medium	UNEP/MAP, ACCOBAMS partnership
	Further development at regional level.	Expertise, R&I activities, knowledge transfer	Regional	Medium	UNEP/MAP, ACCOBAMS partnership
	Definition of monitoring thresholds: a spatial and a temporal threshold concerning candidate indicator 26 - impulsive sounds- and a noise threshold concerning candidate indicator 27 - continuous sounds. - Preliminary desk study for above (C27) - Identification of noise hotspots (C27), Observation of noise, collection of data, definition of baselines - Definition of threshold (C26)	Expertise, R&I activities, knowledge transfer	Regional	Short/ Medium	UNEP/MAP, ACCOBAMS partnership
	Test of the candidate common indicator 27 on pilot areas Identification of noise hot spots	Expertise, R&I activities, knowledge transfer	Regional, Pilot areas	Short /Medium	UNEP/MAP, ACCOBAMS partnership

Cluster Biodiversity and Fisheries/ Non-indigenous species (EO2)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO2 need to be further developed	Elaboration of baseline assessment of the present NIS	Expertise, R&I activities, knowledge transfer	Regional, National	Short / Medium	
	Development of guidance on developing invasive alien species (IAS) list (at national scale)	Expertise, R&I activities, knowledge transfer	National, Regional	Short	
	Characterization of baseline and thresholds	Expertise, knowledge transfer	National, Regional	Short / Medium	
	Identification and characterization of IAS hotspots (at national scale) Assessment of the regional coherence of the national proposals	Expertise, R&I activities, knowledge transfer	National, Regional	Short / Medium	

Cluster Biodiversity and Fisheries/ Commercial fishes and shellfishes (EO3)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO3 need to be developed	Develop the related common indicators, monitoring and assessment strategies in order to asses if populations of commercially exploited fish and shellfishes are within biological safe limits.	Expertise, R&I activities, knowledge transfer	National, Regional	Short / Medium	In collaboration with GFCM. Will contribute to the 2017 SQR

Cluster Biodiversity and Fisheries/ Marine food web (EO4)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO4 need to be developed	Agree on a clear roadmap with relevant partners on the monitoring programme and assessment for EO4	Expertise, knowledge transfer	Regional	Short	With the support of GFCM and other relevant partners
	Development and implementation of an monitoring and assessment programme specific of EO4	Expertise, R&I activities, knowledge transfer	Regional, National	Medium ?	With the support of GFCM and other relevant partners

Cluster Biodiversity and Fisheries/ Sea floor integrity (EO6)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO6 need to be developed	Agree on a clear roadmap with relevant partners on the monitoring programme and assessment for EO6	Expertise, knowledge transfer	Regional	Short	With the support of GFCM and other relevant partners
	Development and implementation of an monitoring and assessment programme specific of EO6	Expertise, R&I activities, knowledge transfer	Regional, National	Medium ?	With the support of GFCM and other relevant partners

Cluster Coast and Hydrography: Length of coastline affected by man-made structures and Land use change (EO8)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
monitoring and assessment specific of EO8 need to be developed	Development on a harmonized baseline at regional scale.	Expertise, knowledge transfer	Regional, National	Very Short	
	Assessment of the current length of coastline affected by man-made structures (data collection) For a baseline assessment, existing data should be used to generate an indicator at country level; this data generally exists or can be retrieved from satellite data. Evaluate cultural attitudes of populations to coastal zones and values attributed to developments in the coastal zone.	Expertise, knowledge transfer	National	Short	Copernicus (the European Earth observation programme) has developed a specific initiative on coastal areas (setback area, 100m) with a good level of detail which can provide a useful source of data.
	Development of thresholds as % and / or m (length?) taking into account the typology of the coast including its ecosystem goods and services related to social and economic benefits, as well as the disturbance that comes from such structures.	Expertise, knowledge transfer	Regional, National	Short/ Medium	

	Development of pilot monitoring programmes based on the candidate indicator on land use change Implement the monitoring with the help of satellite data (COPERNICUS, CORINE Land Cover). The assessment should be done by country experts and should associate socio-economic and other cultural characteristics of each country. The online working group established for the definition of IMAP should assist in the process and further assistance should be envisaged for interpretation of satellite data which requires specific knowledge. In terms of communication, the indicators need to be communicated not in terms of potential future restrictions, but rather as a tool that assists authorities in decision making aiming at coastal safety (climate change, adaptation, tsunami, reducing land losses from erosion).	Expertise, R&I activities, knowledge transfer	Regional, Sub regional, National	Short/ Medium	This indicator has been tested in the Adriatic region (refer to documentation on PAP RAC website). It provides a good insight into spatial dynamics in order to detect hot spots for further investigation. The ClimVar & ICZM project has made an assessment for 11 countries based on data from Google earth.
	Expertise for the support for empowerment of monitoring task forces at country scale. Consultations at sub-regional level.	Expertise, knowledge transfer	Regional, Sub regional, National	Short/ Medium	

Cluster Coast and Hydrography: Location and extent of habitats impacted directly by hydrographic alterations (EO7)

Identified needs	Proposed actions	Scope	Level	Duration	Opportunities
	Mapping of existing man-made structures will provide a baseline for the assessment of future measures and their impacts. Future measures need to be assessed on the basis of (hydrological) modelling (present indicator) and investigation on potential interruptions of connections between ecosystems (subsequent indicator) in order to minimize negative impacts.	Expertise, R&I activities, knowledge transfer	Regional, National	Short/ Medium	Mapping of habitats which is made for other indicators (biodiversity cluster, indicator under EO1) should be coordinated with the issues linked to this objective for economies of scale and consistency. DELTARES (a well-known NL independent institute for applied research in the field of water) can provide guidelines for modelling and impact assessment and that in France approaches for estimation of losses caused by coastal structures are available.

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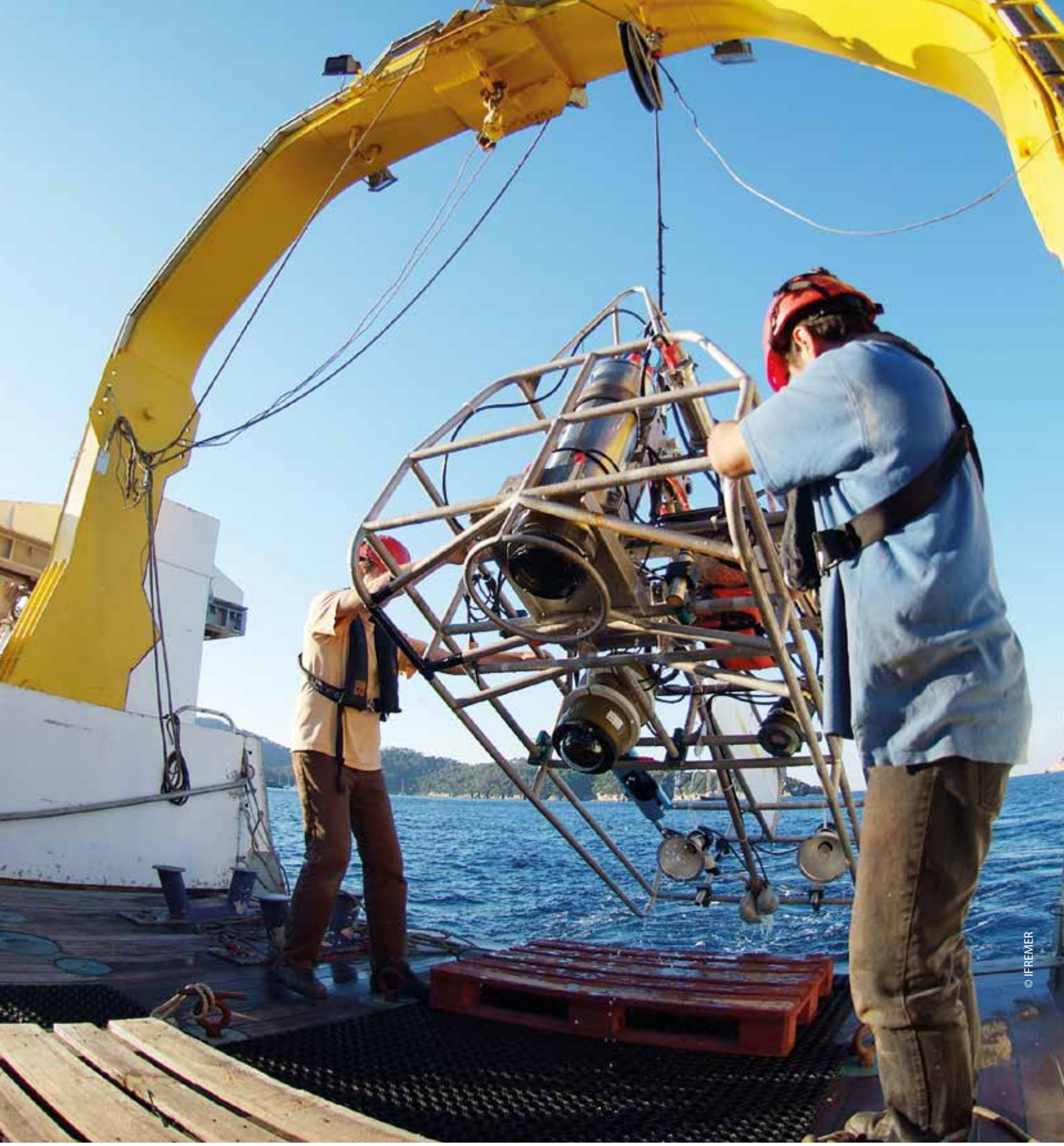

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