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Towards integrated European marine research strategy and programmes

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SEAS-ERA legacy report

2014

Project Beneficiaries

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Foreword

The construction of a European Research Area on marine sciences is a priority due to the transboundary and basin scale nature of most aspects of marine issues, namely biodiversity, ecology, oceanography, natural resources and ecosystem services. Also, the impacts are not limited to a nation as shown by accidental and microplastics pollution, eutrophication, etc.

The coordination of the research Funding Organizations in Europe to contribute to the development of the ERA started in the early 2000's with the development of marine ERA-Nets. Seas-Era has been constructed on this past cooperation, increasing the partnership for developing a European integrated policy oriented structure to promote knowledge and expertise in any marine related area, overarching the previous EU coordination initiatives which only targeted a given area or basin.

The main objectives to be attained by Seas-Era were the definition of a **European Marine and Maritime Research Agenda**, aiming at improving co-operation and co-ordination and promoting harmonisation of national/regional research programmes; foster synergies at national and regional level, mobilising competitive and non-competitive funds for research in a more coordinated way, through **joint calls and common programs**; propose a plan for a better and sustainable use and sharing of the existing **Marine Research Infrastructures**, and a road map for new investments; reduce imbalances among regions through **human capacity building**, setting-up a pan-European training and mobility strategy for human resources; and enhance **public awareness** towards marine and maritime scientific and policy issues in Europe to translate the RTD activities into social, economic and cultural benefits. These general objectives were to be first implemented at the basin scale as a step forward in building-up the overarched pan-European strategy and making progress in establishing a stable and durable structure for empowering and strengthening marine research all across Europe.

Since the launch of the initiative, in 2010, Seas-Era has contributed to:

• Consolidate and expand the network of Marine Research Funding Organisations (RFOs) built on previous FP6 ERA-Net partnerships: AMPERA, MarinERA and MariFISH;

• Delineate a Vision for each of the three Sea Basins studied (the Atlantic, the Mediterranean and the Black Sea), to be developed through mutually agreed Sea Basin Research Strategies / Agendas;

• Set-up an Inventory of European Marine Research Infrastructures, further developed by EurOcean into an on-line database: http://rid.eurocean.org/;

• Identify potential topics for Common Programming in the North Atlantic and Mediterranean Sea, and confirm the ability of the Seas-Era partnership to undertake joint funding (€4.4 million) of collaborative research projects;

• Make recommendations for strengthening Human Capacity Building, in particular by facilitating the completion of PhD fellowships within collaborative projects;

• Enhance public awareness towards marine and maritime scientific and policy issues in Europe, to translate the RTD activities into social, economic and cultural benefits.

Full details of these achievements are given in the following pages of this publication; achievements that would have not been possible without the cooperation of all participating institutions and their representatives and, particularly, the competence and enthusiasm of the WP leaders, to which we are very much indebted.

We hope that the lasting impact and legacy of the Seas-Era project will live on future initiatives, notably on the JPI OCEANS that would incorporate the work done here in its future longer-term Work Programme.

Joan Albaigés (2010-2012) & Beatriz Morales-Nin (2012-2014).

Background

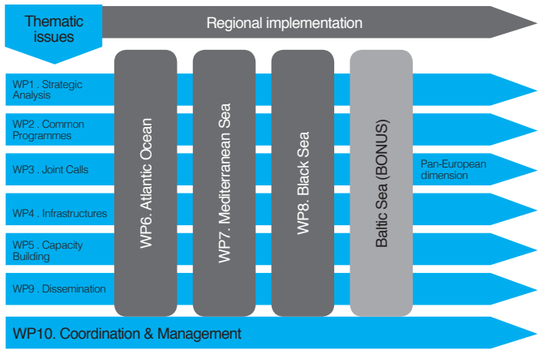
The European Seas and Oceans constitute important assets and contribute to the economic, societal and environmental health and well being of European citizens and those of neighbouring states. Between 3%-5% of Europe's Gross Domestic Product is generated from sea-related activities while 90% of all the external European trade is carried by sea. In this respect, the Integrated Maritime Policy for the European Union (IMP-2007) stresses the need to achieve the full economic potential of oceans and seas, in harmony with the marine environment, on the basis of a concerted definition of research needs and priorities leading to a more effective integration of knowledge and resources and to a more fruitful and evidenced-based undertaking of policy making.

The Strategy, outlined in the IMP draws particular attention to the need to promote new and interdisciplinary skills and innovation capacities, to integrate across marine and maritime research disciplines, to optimise the use of existing research infrastructures, to foster knowledge and technology transfer, to promote synergies at national and regional level and to mobilise national and regional funding to reach a critical mass to address identified marine research challenges and opportunities.

It is in the context of a recognised need for coordination, excellence in research, better integration and the maximization of economic and environmental factors, that the European Research Area (ERA) coordination scheme, in general and in this project, in particular, gets its meaning.

The overarching objective of Seas-Era is to facilitate the establishment of a stable and durable structure for strengthening marine research across European Sea Basins. Therefore, the general objective of Seas-Era is to constitute a platform of research funding agencies for the coordination and integration of national and regional marine research programs with the main goal of developing a European overarching operational structure for marine research, related both to the European sea basins and the pan-European challenges, including the planning and use of marine research infrastructures.

The FP7 SEAS ERA project (2010-2014) is a network of European marine research funding organisations (RFOs) consisting of 21 partners and two third parties from 18 Member and Associated Member States located along the European seaboard in the Atlantic, Mediterranean and Black Sea. The Seas-Era partnership maintains close contacts with the Baltic Sea RFOs through the EU BONUS project (www.bonusportal.org).



Overview of the SEAS-ERA Work Packages.

Countries taking part in SEAS-ERA consortium.

The principle aims of the Seas-Era network are to improve co-operation between national competitive marine research funding programmes, to facilitate better co-operation in addressing shared opportunities and challenges, to ensure better use of existing resources and capacities, to bridge identified gaps, to avoid duplication, to jointly fund strategic projects of mutual interest and in doing so, contribute to the sustainable development of the marine resource and progress the establishment of the marine component of the European Research Area (ERA).

The SEAS ERA project builds on the experience of the previous EU FP6 ERA-Nets: MarinERA (http://marinera.seas-era.eu/) which involved 16 partners from 13 countries and organized a joint €5 million call for proposals; AMPERA (www.cid.csic.es/ampera) which involved 10 partners from 8 countries and organised a joint €2.25 million call for proposals; and MariFish (http://www.cofasp.eu/marifish/) which involved 18 partners from 16 countries and organised a joint €4.1 million call for proposals and common programming within five topics.

For operational and management purposes, the Seas-Era project is divided into three regional "Sea Basins", i.e. the Atlantic, the Mediterranean and the Black Sea, with each region deciding its own priorities, and seven thematic work packages (WP): Strategic Analysis; Common Programmes; Joint Calls; Infrastructures; Capacity Building; Dissemination and Co-ordination and Management.

01.
Improving co-operation and co-ordination and promoting harmonisation of national/regional research programmes

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Atlantic Region

Atlantic Vision: *The European Atlantic Sea Basin Strategic Research Agenda / Marine Research Plan seeks to improve our understanding and protection of the European Atlantic, and its ecosystems, in order to catalyse a dynamic maritime economy, in harmony with the environment, and which has sustainable development at its core. This will be achieved through building on existing good practices and existing science and technology, harnessing new and emerging science, technology and innovation to add value and competitiveness to traditional sectors and create new and dynamic maritime sectors in a spirit of regional partnership and international co-operation.*

As a first step to developing a draft Strategic Marine Research Plan for the European Atlantic Sea Basin, the Seas-Era Atlantic partners contributed to the Seas-Era report (October 2011) "Synthesis Report on existing (sub) National (marine) Science and Technology Strategies" (D.1.1.1) which identified national Marine Research Funding Programmes and Research Priorities. In parallel, the Atlantic partners developed a **Discussion Document** "A draft Marine Research Plan for the European Atlantic Sea Basin" published in October 2011.

The Discussion Document was widely disseminated and was the focus of three Stakeholder Workshops, including 32 written responses. The Workshops included:
• A Science Consultative Workshop: Ostend, February 2012;
• A Governance Consultative Workshop, organised jointly with the Conference of Peripheral Maritime Regions (CMPR): Lisbon, April 2012;
• An East–Meets-West Consultative Workshop, involving invited representatives of the US National Science Foundation (NSF), the Department of Fisheries and Oceans (DFO) and the Canada Foundation for Innovation (CFI): Dublin, July 2012.

The Discussion Document also contributed to the selection of topics for the Atlantic and Mediterranean Joint call 2012 and for Common Programming.

The development of an Atlantic Sea Basin Research Agenda benefited greatly from and contributed to the parallel launch and consultation on the EU Strategy for the Atlantic (EUSA, 2011). Copies of the Discussion Document were made available on the official EUSA website and distributed at these Regional Fora Meetings where Seas-Era has participated.

The Seas-Era Atlantic Partnership made a formal written response to the EU public call for suggestions for key investment and research priorities to be included in the EUSA Atlantic Action Plan (2014-2020).

The final Atlantic report **"Towards a Strategic Research Agenda / Marine Research Plan for the European Atlantic Sea Basin"** was published in November 2013 and presented at the Lisbon Atlantic Conference (December 2013).

In February 2014, the marine research priorities identified for the Atlantic, the Mediterranean and Black Sea Basins were benchmarked in the Seas-Era (2014) Report "A Pan-European Analysis of the Seas-Era Sea Basin Strategic Research Agendas" and presented at the 3rd Seas-Era Forum (Brussels, February 2014).

Mediterranean Region

Mediterranean Vision: *By 2020 the Mediterranean Marine Science should be able to contribute with New Knowledge to efficient Policy Making and sustainable growth of Maritime Economy in response to the societal challenges for Food, Energy, Wellbeing, and a Healthy marine environment following the principles of Ecosystem Approach to Management of Natural Resources.*

A **Strategic Research Agenda (SRA) for the Mediterranean Marine Science** was developed in consultation with the research community and regional stakeholders (February 2012).

To focus on maximizing the impact of the SRA and achieve its Vision and Objectives it is foreseen
- At Regional Level:
• Broad dissemination of the SRA to the various stakeholders;
• Efforts to implement parts of the SRA through national programs;
• Common strategy focusing on observations through sharing ship time and infrastructures (e.g. MED-(GO)-SHIP initiative from CIESM).

- At European Level:
• Include elements at a possible Art185 initiative for the Mediterranean;
• Use by JPI-Ocean initiative;
• Future Horizon2020 calls dedicated to the Mediterranean Sea.

Black Sea Region

Black Sea Vision: *The vision for the Black Sea is to preserve its ecosystem as a valuable natural endowment of the region, whilst ensuring the protection and rational use of its marine and coastal living resources as a condition for Sustainable Development of the Black Sea Coastal States, Well-being, Health and Security of their Population (Ref: BS SAP, 2009).*

This vision can only be achieved by commitments at all levels of society. Clear focused national and joint research programmes and multi-disciplinary projects will form the scientific basis while political vision and commitment, ownership and funding by different stakeholders representing various sectors, regional and pan-European cooperation at all levels, appropriate regulation and governance at national and regional levels will be requirements.

The **Black Sea SRA** was launched in April 2012 as a result of:
• 2 National consultation meetings with Turkish experts (in Ankara) and with Romanian experts (in Bucharest);
• 2 Regional Strategy Workshops in Turkey (Ankara and Istanbul) with participation of:
  • 38 (17+21) experts;
  • Partner's institutions from Georgia, Bulgaria, Romania, Ukraine and Turkey;
  • Regional Organizations (BSEC and BSC).

Black Sea Regional Workshop

RFOs partners discussed the priority marine research themes to be funded at the final inventory meeting. (Brussels, 24 May 2011)

Pan-European level

Analysis
During the early stage of the project, information on (sub) national (marine) science and technology strategies and related strategic priorities in the countries represented in the Seas-Era consortium was collected through a questionnaire survey (2010) and as well as through four sea basin meetings (from Dec. 2010 through May 2011). The synthesis report (October 2011) has informed the development of the sea basin strategic research agendas and the development of Common Programmes and Joint Calls.

Coordinate
Strategic Research Agendas (SRAs) for the Atlantic, Mediterranean and Black Sea identified some of the key scientific and societal challenges within these sea basins and provided high-level recommendations on research priorities. In order to facilitate the identification of emergent disciplinary and interdisciplinary marine scientific challenges and priorities of strategic importance for each sea basin, partners worked in collaboration and developed a common structure for the three sea basin research strategies to promote harmonization of national/regional research programmes.

Synthesis
Based on the commonalities and differences among the three regional seas, a synthesis report “Pan-European Analysis of the Seas-Era Sea Basin Strategic Research

Agendas” (February. 2014) was delivered. This report has identified priorities that have relevance at sea basin and/or at pan-European level from Seas-Era publications and Strategic Fora. The report will facilitate the uptake of the recommendations of the sea basin research strategies and the alignment between national agencies and with European coordination frameworks such as Joint Programming Initiatives (e.g. JPI Oceans).

02.
Establishing an European overarching platform for implementing the EMMRA (European Marine and Maritime Research Agenda)

Three **Strategic Fora** were held throughout the project and served as a platform for research funding organizations to support and foster interaction between regional nodes on strategic analysis matters, identification of common research priorities and engagement with relevant initiatives and stakeholders.

Panel discussions at the 1st and 2nd Seas-Era Strategic Forum. The discussions of each forum was designed for various purposes: synergies with ERA-Nets and JPIs; short/long-term perspective of Seas-Era, and the vision after Seas-Era.
[Source] European Marine Board

Each work package of the Seas-Era project presented their key outputs at the 3rd Seas-Era Pan-European Strategic Forum (Brussels, 25 February 2014).
[Source] European Marine Board

Presentations	Achievements	Participation/ Output
1st Forum (07 September 2011) Seas-Era & JPI Oceans: commonalities and synergies		
JPI Oceans EC DG R&I MARCOM+, ERA-Nets: MariFish, BiodivERsA 2, Circle 2, MARINEBIOTECH, Black Sea ERA-Net	Updates and exchange of information between the Seas-Era project and JPI Oceans; Interaction and exchange amongst marine and environmental ERA-Nets; Interaction and exchange between the marine and environmental ERA-Nets and JPI Oceans.	40 participants Report

The outcome has been a relevant contribution to the process of implementation a durable structure to support EU marine/maritime research:

• Useful updates were presented on different related initiatives;

• Crucial issues where flagged some of which will be brought to the attention of the JPI Management Board;

• The need for improved communication amongst marine and environmental ERA-Nets, at the very least amongst their coordinators, was identified.

Presentations	Achievements	Participation/ Output
2nd Forum (06 February 2013) Challenges and Priorities in European Sea Basins		
Seas-Era regional sea basin WP leaders BONUS DG ENV DG R&I DG MARE JPI Oceans	Present the SRAs of the three regional sea basins in the Seas-Era projects; Promote interaction between the Seas-Era sea basin strategies and the Baltic Sea via the BONUS initiative; Interact with stakeholders to gain their perspectives; Identify some key research priorities at the pan-European level.	61 participants Report

The event allowed an open discussion of the three SRAs among partners, corresponding Baltic Sea initiative (BONUS), the European Commission, JPI Oceans and various stakeholders with remarks highlighting:

• The Seas-Era project has accumulated valuable experience in developing regional SRAs, marine research infrastructure management roadmap, cooperation between research funding organizations of different countries and funding network initiatives with other ERA-Net projects. These outputs can also be further taken up by high-level science policy structures.

• In the case of the Mediterranean Sea that is shared by both EU and non-EU countries, it is highlighted that science plays an integrating role and more coherent joint initiatives from funding organizations are necessary.

• The Discussion Document of the Atlantic sea basin continues to have impacts on European and regional policy initiatives, such as the European Union Strategy for the Atlantic (EUSA) and the Trans-Atlantic Cooperation of the European Commission.

• More dialogues with the JPI Oceans are encouraged to transfer the added value from Seas-Era project.

• The change in the economic situation has altered the priorities of the agendas. It is emphasized that the SRAs need to be an on-going process that is relevant to the current needs.

• In order to represent an important contribution from Seas-Era at European level, it is important to identify the commonalities among regions. Examples that were highlighted during the Forum were: ocean observation and forecasting, marine socio-economic database and technology foresight.

Presentations	Achievements	Participation/ Output
3rd Forum (25 February 2014) Seas-Era Legacy & Vision		
Seas-Era 10 WP leaders	Present the key outputs of the Seas-Era project to external stakeholders; Discuss the legacy of the project; Exchange on future mechanisms and next steps for cooperation in support of better alignment of national marine research programming.	60 participants Report

The presentations of key outputs from each work package in this last Forum led to discussions on the future steps beyond the Seas-Era project, including:

• A full support to sustain this network, which partners agreed to meet regularly from their own budget with logistical support from JPI Oceans;

• Continuation of research funding agencies network at regional level to bring together research communities;

• Liaise the Seas-Era vision with existing ERA policies and research strategies;

• Strengthen collaboration with industrial stakeholders;

• An innovative, flexible and self-sustaining RFOs mechanism to support coordination and to achieve ERA.

03.
Foster synergies, mobilizing non-competitive funds for research through common programs

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Atlantic Region

In order to identify and select the topics for Common Programmes in the Atlantic Region, a Workshop (Reykjavik, May 2012) was organized with special focus on currents and the thermohaline circulation in the Atlantic Region, issues of major importance for the whole climate system of the Region. The workshop concluded with a report (November 2012). No decision has been made on the follow up within the Seas-Era partners but on both sides of the Atlantic there are numerous efforts ongoing through research on the climate change in the ocean, both EU FP7 projects and cooperation of research institutes between US/CAN and Europe.

Seas-Era "common program" played an important role in the Galway conference (and declaration) to push the priority of **"long term monitoring of climate change impacts"** that requires close cooperation between the Members states and their relevant funding agencies. The common program proposes to optimize the transects across the Atlantic between the countries on both sides of the Atlantic, including the European Union, Canada and USA. An international scientific program has been proposed. Formal agreements between the funding agencies are now required and suggests that this collaboration will be part of the task of the new Global Trans-Atlantic Alliance network (Horizon 2020 calls) to continue the joint long-term monitoring effort.

Mediterranean Region

Seas-Era established a Mediterranean partnership that initiated a common program in the Mediterranean region on ***"Climate change impact on physical circulation and biogeochemical consequences"***. This topic has been previously identified by the Mediterranean partners (Ministries and funding agencies) as their first priority (September 2013).

The impact of climate change on the whole circulation in the Med is of major interest and the studies on consequences for the biochemistry cycle are important. It is definitely a resource for a number of workshops and projects. Within a workshop with experts in charge of their national programs (Toulon, September 2012), it was proposed to focus on the coordination of national efforts in the EU countries of the area. Following the CIESM work on "*Designing Med-Ship: a program for repeated oceanographic surveys*", the expert group has produced recommendations for maintaining or increasing long time observations in the area, which have been addressed to the relevant Ministries and national funding agencies.

How to share common facilities and data to build a long term network of scientists for best use of resources?

To achieve the construction of a comprehensive approach at the pan Mediterranean Sea, the approach of alignment of the different national projects/programs, the identification and analysis of convergences, gaps have been carried out.

In collaboration with Seas-Era "Common Programmes" and relevant experts, the content of a long term monitoring program, coupling physical, geochemical and biological observations to follow and to model the impact of climate change has been identified. A common proposal for a Mediterranean Alliance Network has been proposed to the member States in the H2020 work programme (2016), to go further on the implement of this common program between all the countries on both sides of the Mediterranean Sea.

Black Sea Region

The Report on the Black Sea Common Research Program was launched in December 2013.

Current joint programmes, implemented projects targeting the Black Sea and main framework of a possible common programme together with the possible implementation tools were identified in the document. According to the results of the studies, ***"Marine Research Infrastructure"*** was the top-rated possible theme for a Common Marine Research Programme in the Black Sea.

From the perspective of the Black Sea some critical points were made about the Common Program approach. There is an important institutional problem as Common Program approach absolutely requires working in close connection between the management actors, funding agencies and research organization which are not formally involved in ERA-Nets. Innovative research is often independent from the Ministries.

Building Common Programmes is anyway a new step by step approach that requires strong commitments and also flexibility from the partners, involving ministries, funding agencies, research operators and experts. The roles of each actor must be well defined in a participative way.

Regardless of the various ingredients that could be inserted in a possible Common Program for the Black Sea, the most crucial aspect would be to systematically organize Joint Calls for proposals in order to foster collaboration among the scientists in the region.

Pan-European level

Build alignment of national programs and ensuring alignment with national strategies to develop common programs is a long process that Seas-Era and JPI Oceans are trying to achieve

In the two reports "General concept of the Common Program" and "General concept of the Common Programs and guidelines for implementing Common Program", the difficulties to reach these objectives have been identified. The reports provide good practice guidance which aim at developing common programs.

Based on the experiences of the previous ERA-Net MariFish, it has been decided to develop, into the Seas-era network, the concept of common programs at the regional levels in connection with the regional SRAs. Due to the closer interest of the actors involved, It has been feasible to define common priorities and propose the alignment of national programs between countries bordering the same sea that have expressed an interest to share their programs to benefit from building critical masses and sharing infrastructures.

For the first time, the same priority through the topic "long term monitoring of the impact of the climate change" has been identified in the Atlantic as well as in the Mediterranean Sea. Three regional workshops were organized with the support of Seas-Era "Common Programmes" to initiate and monitor the process of developing joint programs.

04.
Foster synergies, mobilizing competitive funds for research through joint calls

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Seven Seas-Era partners from the Atlantic and the Mediterranean regions joined efforts to mobilize competitive funds from national research funding programmes (RFOs) to launch a joint call for trans-national research proposals in the Atlantic and Mediterranean regions in 2012. The initial committed national budget was 4.4 M€ and not all RFOs supported the same or all topics.

- Agence Nationale de la Recherche (ANR), France
- Belgian Federal Public Planning Service Science Policy (BELSPO), Belgium
- Fundação para a Ciência e a Tecnologia (FCT), Portugal
- Geniki Grammatia Erevnas Kai Technologias, Ypourgio Paidias, Dia Viou
- Mathisis & Thriskevmaton (GSRT), Greece
- Norges Forskningsrad (RCN), Norway
- The Icelandic Centre for Research (RANNIS), Iceland
- Turkiye Bilimsel Ve Teknolojik Arastirma Kurumu (TUBITAK), Turkey

By combining the Mediterranean and Atlantic research priorities, the joint call for trans-national research proposals could cover one of the three following topics:

A - Ecosystem approach and ecosystem models for the North Atlantic Ocean
B - Risk assessment of invasive alien species - changes in marine biodiversity
C - Development of indicators and science support and management tools for the determination of Good Environmental Status in the Mediterranean Sea

There were 12 submitted applications, evaluated by 24 independent international evaluators (minimum 3 evaluators per proposal) and none of them was from countries participating in the call (http://www.seas-era.eu/np4/20.html).

Nine assessment criteria were used to evaluate the proposals and scientific quality was considered above all other criteria including the trans-national added value to national research projects (September 2012).

Five trans-national collaborative R&D projects were selected for funding (two in topic A, one in topic B and two in topic C) involving total public funding of around 4.26 M€ (for more information see http://www.seas-era.eu/np4/20.html).

List of projects selected for funding in Call 2012

Call topic	Project acronym/ website	Project title /Summary	Coordinator Institution	Participating Institutions
A	SEAMAN	Spatially resolved ecosystem models and their application to marine management	University of Bergen (**Norway**)	Institute of Marine Research, Bergen **(Norway)**; Nansen Environmental and Remote Sensing Center, NERSC **(Norway)**; IFREMER **(France)**; University of Iceland **(Iceland)**; Hellenic Centre for Marine Research **(Greece)**
	EMoSEM	Ecosystem models as support to eutrophication management in the North Atlantic Ocean	RBINS-MUMM (**Belgium**)	Free University of Brussels, ULB **(Belgium)**; IFREMER **(France)**; Pierre and Marie Curie University, UPMC **(France)**; Institute of Marine Research, IMAR **(Portugal)**
B	INVASIVES	Invasive seaweeds in rising temperatures: impacts and risk assessments	University of Bergen (**Norway**)	Centre of Marine Sciences, CCMAR **(Portugal)**; University of Western Brittany, UBO **(France)**; AD2M-CNRS Roscoff **(France)**; Ghent University **(Belgium)**; Marine Research Institute **(Iceland)**; Institute of Marine Research, IMR **(Norway)**
C	MERMAID	Marine environmental targets linked to regional management schemes based on indicators developed for the Mediterranean	Hellenic Centre for Marine Research, HCMR **(Greece)**	IFREMER **(France)**; Middle East Technical University **(Turkey)**; University of the Aegean **(Greece)**
	CIGESMED	Coralligenous based indicators to evaluate and monitor the "good ecological status" of the Mediterranean coastal waters	CNRS *Délégation Provence et Corse* **(France)**	Ege University **(Turkey)**; LIGAMEN **(France)**; IFREMER **(France)**; Hellenic Centre for Marine Research, HCMR **(Greece)**; National Marine Park of Zakynthos, NMPZ **(Greece)**

- The summaries and weblinks of the 5 projects funded under Seas-Era 2012 are available in Annex II.

- A mid-term workshop with the coordinators of the 5 Seas-Era funded projects was organized at Seas-Era Final Conference (Palma de Majorca, April, 2014) to discuss the results of the first year and to promote the mutual knowledge and cooperation between funded projects.

The Seas-Era project was developed as an heir of previous Marine ERA-Nets (AMPERA, MarinERA and MariFish). With the objective of following-up the trans-national projects funded through previous Marine ERA-Nets joint calls several initiatives were successfully implemented:
- The final reports of the 14 trans-national projects of AMPERA (2007), MarinERA (2008) and MariFish (2008) were made available at Seas-Era portal (see Collaborative Projects funded under Joint Calls of previous marine ERA-nets).
- A Workshop for the final evaluation of these projects was organized and the final reports were positively peer-reviewed by an international panel (see Seas-Era workshop "Marine Research Strategy" (Madrid, 29 October 2013). It was recommended to organize joint workshops with the researchers during the life of the projects, as well as to include joint human capacity formative programs in future ERA calls.

05.
Plan for a better and sustainable use of the existing Marine Research Infrastructures

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Atlantic Region

In the Atlantic region at large (incl. North Sea), there is a wide variety of European research infrastructures in capacity to support all marine sciences disciplines and to cover all locations where these disciplines operate (October 2012). These are small to medium size distributed facilities, thus numerous:

~ 140 research vessels (130 m < L < 10 m),
~ 60 underwater vehicles + 20 other large exchangeable equipment:
~ 10 major fixed sites for open ocean observation:
~ a European fleet of 800 oceanic profilers at sea + 9 fleets of gliders (totalling 57)
~ > 250 coastal observation facilities, through about 30 regional or national networks, including buoys, instrumented stations, coastal seabed obs., tide gauges with instrumentation, ferryboxes, HF radars, …
~ 24 satellites (of which 7 specifically designed for ocean observation),
~ 50 marine data providers,
~ 80 land-based facilities for ocean engineering,
~ 22 in situ testing sites for ocean energy,
~ 29 marine biology stations,
~ 45 research aquaculture facilities and 12 marine mesocosms.

Networks of infrastructure operators have also been initiated over the past years:
~ 20 consortia have been constituted in the past 5-7 years in the form of ESFRI, I3 or similar projects,
~ including 3 ESFRI projects:
• EURO ARGO : Euro-argo ERIC is starting early 2013, funded by Member States and an EU support expected by 2015

• EMSO and EMBRC : aim to become an ERIC infrastructure.

From the view points of design and deployment of marine research facilities, Atlantic Region is characterized both by deep ocean zone (up to 4000-6000m water depth) and by coastal/regional areas corresponding to the continental shelf and below 200-400m in terms of water depth. This distinction is also relevant for some scientific issues addressed:

In the deep ocean area, main drivers for MRI are:
- Better knowledge of the ocean circulation, to enhance the diagnosis of global change:
• extend the measurement capability in the water column beyond 2000 m water depth (sub-sea area still too poorly documented), and under the ice cover (modelling continuity in this arctic area very affected by climate change)

• with instrumentation including new sensors for CO_2 (its uptake by ocean) and for pH (detection and quantification of ocean acidification), having the necessary accuracy and suistainability for mounting on autonomous mobile platforms, ocean moorings and sea floor stations,

• to sustain long term series of data acquisition thanks to automated instruments, in order to deal with ocean temporal and spatial variability,

- Better knowledge of the seabed and its geology, for a sustainable exploitation of deep mineral resources:
• expand accurated bathymetry capacities for the deep ocean,
• expand and strengthen the capacity of ROVs in terms of autonomy, manoeuvrability, embedded instrumentation,

• to develop specific sensors and samplers to observe/measure/capture gas hydrates, massive sulphides, polymetallic nodules, …

• to maintain deep ocean drilling capacity through European & International cooperation for instrumented bore holes (ECORD follow-up).

- Better knowledge and characterization of deep ocean biodiversity, to develop the exploitation of biological resources:
• develop automated sea-floor stations for continuous observation over the long term of fragile ecosystems (cold corals, hydrothermal vents, …)

In coastal waters and regional seas of the Atlantic region, corresponding to the continental shelf areas, human activities are multiple (fisheries, aquaculture, maritime transport, tourism, marine renewable energies,…), but they are also most vulnerable to global change, and special attention should be given to the ability to monitor and maintain good ecological status:
• To sustain and develop coastal networks of fixed and mobile automated facilities, marine biology stations, research facilities for aquaculture and marine mesocosms.

Shared use of infrastructures, trans-national access
For sea cruises, the Atlantic region shows two very different cases:
• To access deep ocean hot spots need transit periods of several days (typically more than 3), for global/ocean multi-purpose vessels with on board underwater vehicles able to operate up to 6000 m water depth.

• To access the continental shelf seas, less than one day's sailing is usually sufficient and observation instrumentation and deployment devices on board could be much lighter.

Consequently, the fleets of research vessels are different for these two cases, and in particular the joint programming that could be implemented either for open ocean zone (large vessels) or for regional areas (smaller vessels). This differentiation is also relevant to the vision of new investments that could be shared.

Ocean renewable energy is a specific and important issue for the Atlantic region, due to waves, winds and tidal currents potential resources. The shared use of research facilities and skills, already existing for ocean engineering (basins equipped with wavemaker, water circulation canals, …), as well as for the rational development of operational in situ testing sites for scale one experiments, should be aimed.

The trans-Atlantic dimension is also a driver for the MRI
Atlantic and Arctic oceans issues, where climate change is particularly scalable, can be addressed more efficiently through a closer trans-Atlantic cooperation. Especially for MRI, the cost of expeditions in remote and hostile regions makes especially relevant international coordination with USA, Canada, and other trans-Atlantic countries to optimize resources.

Mediterranean Region

A wide variety of Marine Research Infrastructures (MRI) exists in the Mediterranean region, necessary to support various marine science disciplines and to cover all locations where these disciplines operate (December 2012).

These are all distributed infrastructures, thus numerous: up to 350 facilities in the Mediterranean region.

The identified MRIs in the Mediterranean region are:
~ 85 research vessels (130 m > L > 10m)
~ 32 underwater vehicles + 6 large exchangeable equipment
~ 7 major fixed sites for ocean observation
~ 20 Oceanic profilers in Med sea + 5 fleets of gliders (totalling 31)
~ > 150 fixed coastal observation facilities, through about 15 regional or national networks, including buoys, instrumented stations, coastal seabed obs., tide gauges with instrumentation, ferryboxes, HF radars, …
~ 36 marine data providers,
~ 60 land-based facilities for ocean engineering,
~ 14 marine biology stations,
~ 19 research aquaculture facilities and 7 marine mesocosms,

Networks of infrastructure operators have been initiated over the past years, relevant for Mediterranean Sea as for Atlantic region:
~ 20 consortia have been constituted in the past 5-7 years in the form of ESFRI, I3 or similar projects,

~ including 3 ESFRI projects:
• EURO ARGO : Euro-argo ERIC is starting early 2013, funded by Member States and an EU support expected by 2015

• EMSO and EMBRC : aim to become an ERIC infrastructure

All these consortia cover quite well all elements of marine sciences and probably it is not necessary to create new consortia anymore but rather to strengthen existing ones.

MRI evolution in Mediterranean Sea to address scientific challenges and societal needs
– The ocean observation issue
Mediterranean Sea is a "hot spot" region of climate change and biodiversity facets, dealing with considerable and rapidly growing human pressure that could strongly influence their functioning. The sustainable exploration, exploitation and protection of this marine domain require a knowledge base and predictive capabilities which are

currently fragmented or not yet available especially in the Southern part of the Mediterranean. The creation of this capability requires systematic collection of multi-platform ocean observations, including those emerging from MSFD implementation, recorded both remotely using Earth observation satellites and in-situ, at the coastal and offshore scales, in order to fill out the existing observational gaps and contribute to enhance model forecasting capabilities. Applications based on the Copernicus Marine Monitoring service, the European Marine Observation and Data Network (EMODNET) and others, may enable addressing this challenge. Some efforts are already performed during FP research projects such as the on-going FP7 PERSEUS.

Mediterranean region (including the Marmara Sea) is also a region of strong seismic risks and potential tsunamis, which justify a network of operational deep seabed stations and other offshore warning systems, cabled to shore for real-time measurements. These platforms can be equipped with multi-disciplinary sensors and so contribute to other sea-floor/water columns observation issues.

Mediterranean aquaculture, due to the specific environmental conditions and strong competition from third countries, need dedicated experimental facilities to foster a greater diversification of species and to contribute maintain the profitability of the sector in this region.

The geographical proximity of countries sharing the same sea basin in Mediterranean is naturally a factor facilitating the shared use of research facilities, including research vessels common programming, underwater vehicles interoperability, observing systems deployment and maintenance. In complement to these opportunities is sharing a common vision for new strategic investments and developing capacities with an emphasis on north-south convergence.

Black Sea Region

A Report on “Existing or/and New MRIs in the Black Sea Region and Procurement Strategy and Recommendations for their use and Sharing” was launched in March 2013.

In order to be sustained, the Black Sea region would need the political backup by Black Sea Economic Cooperation (BSEC) and its members, the EU MS and the European Commission. The Programmes’ activities should be rooted in the objectives of the existing policy initiatives and documents and therefore, the Programme should be seen as the implementing tool of the agreed policies.

Better coordination of policies and programmes is one of the key aspects toward achieving this ultimate goal. Various problems are accumulated within the region during last decades, however science, research and competitiveness stay or should stay beyond any political, cultural and historic disparities. Though, prosperity of each country and region are determined via their excellence and in order to progress in research and innovation activities.

Countries from the region have to use existing opportunities to cooperate in the field of research and innovation through open/shared Marine Research Infrastructures.

Pan-European level

The MRI European landscape showcases a wide variety of facilities like research vessels and their underwater vehicles, *in situ* observation systems, satellites for ocean observation, *in lab* “…omics” equipment, experimental facilities for aquaculture or for ocean engineering, data storage and access services, etc … together addressing the marine sciences and their multi-disciplinary nature. It is a challenge as well as a necessity to describe this complex landscape, to give a comprehensive view despite the wide range of technology and inter-addressed scientific disciplines, to show the consistencies and the complementary needs to which they respond.

An updated and “comprehensive” overview of the marine research infrastructures was proposed (D4.1.1), using 6 categories covering all usual marine sciences, and including also the European RI projects which are in the integration efforts:

• Research vessels and their underwater vehicles;
• In situ data acquisition systems;
• Satellites;
• Marine data centres:
• Marine land-based facilities for ocean engineering;
• Experimental facilities for biology and ecosystem studies.

A repository with information collected for about 800 facilities in Europe and open access for joint activities was developed in continuity within JPI / CSA Oceans

• Creation, in collaboration with EUROCEAN, of a MRI database, now open: http://rid.eurocean.org/

• Planned interface with the JPI Oceans web platform

• Targeted users: Scientists, Operators, Engineers and Technicians, Policy makers, international, media, public

MRI Database

Mapping of the EU projects directly dealing with and operating Marine RI

About 20 consortia have been constituted in the past 7 years, with operational goals and sustainable perspective, including 3 ESFRI, 7 FP7-I3 and 4 e-infrastructures:

Open non exclusive list:
• For research vessels and underwater vehicles:
EUROFLEETS
• For open ocean mobile platforms:
EURO ARGO, GROOM
• For open ocean fixed point observatories:
EMSO, FIXO3
• For ocean research drilling:
ECORD
• For other open ocean in situ measurements:
CORIOLIS
• For satellites:
My Ocean (Copernicus core service)
• For costal/shelf seas observatories:
JERICO
• For data storage and standards:
SEADATANET
• For data assembling, mining, access:
SEADATANET, CORIOLIS, My Ocean, EMODNET, WISE Marine, i-Marine
• For marine biology , “omics” and bio-informatics:
ASSEMBLE, EMBRC
• For marine mesocosms:
MESOAQUA
• For research on aquaculture:
AQUAEXCEL
• For ocean engineering:
HYDRALAB IV, MARINET

These MRI consortia can also provide the marine components of some other ESFRI projects of the Environmental theme, like:
• ICOS : *Integrated Carbon Observation System*SIOS : *Svalbard Integrated Artic Earth Observing System* EPOS : *European Plate Observing System*

These MRI “operational” consortia could be guided in their development by existing European overarching associations, users and expert groups, such as:
• EUROGOOS
• Copernicus Marine Service and its applications
• ESONET-Vi
• EUROMARINE+
• ERVO
• EGO
• MODEG
• MARS
• EFARO
• IODE

These MRI consortia can also fruitfully connect with their international equivalents.

Open and trans-national access to MRI
Marine Research Infrastructures operators and their host organisations (called “MRI operators”) play a complementary role to the RFOs for the implementation of scientific programmes. On the one hand, RFO orient their budget on research targets, propose calls and select projects and scientific teams. On the other hand, MRI makes available access capacities for the teams selected to perform a given research. MRI Operators have an access provider role.

Trans-national access activity as implemented in the frame of the FP7-I3 projects:
• The advantage to cover up to 100 % both the access costs and also the travel and subsistence of the scientific teams (up to a certain ceiling);

• Bottom-up calls, excellence being the main criteria for the evaluation/selection of the applicants;

• Budget constraints limit its scope to only few % (<<20%) of the available resources.

Trans-national access can also be implemented within the frame of a joint programme:
• Agreement on a joint scientific programme with multi-annual objectives;

• Identification of the core MRI needed, and their multi-annual planning;

• Selection of the scientific teams and organisation of the access.

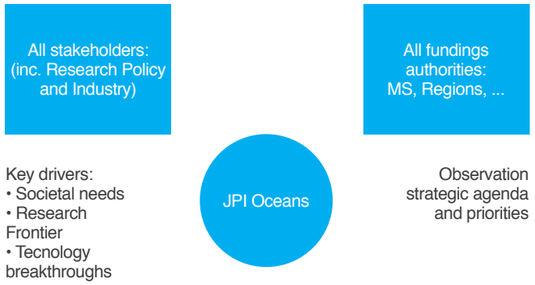
Other specific access with trans-national opportunities:
• OFEG battering process (Ocean Facilities Exchange Group): TNA to research vessels as a consequence of a logistic first motivation.

• MRI operator to rent its facility for a few months per year to another research institute of a nearby country.

MRI complementary uses for both monitoring and research => the EOOS issue (European Ocean Observing System)
Seas and Ocean monitoring and research are part of the same knowledge acquisition process and need sustainable long-term series of data. To deal with this issue, the EOOS concept (European Ocean Observation System) was proposed and validated by the stakeholders during the EUROCEANS Conference in Ostend on Oct. 2010.

Since then, the detailed analysis of needs, expectations, current initiatives (numerous, complex and often fragmented), showed that there is a need for a common strategic vision to be permanently assured, as a necessary prerequisite for a coordination at European level. This supervision could be provided by an “EOOS strategic vision board”, overarching the existing consortia (ESFRI, I3 and e-infra projects) which, each in their field of expertise and technical skills, are already developing their own vision and implementing concerted actions of operational nature.

This board should embody the EOOS concept and give the “one voice” vision of the future.



Note : open non exclusive list of MRI consortia…

Set-up common procurement strategies, develop common business models
Common procurement strategies and business models are really underdeveloped when we consider all the potential advantages that one could extract from it.

New investments are still mostly a national affair without real connection with a European vision, with the recent exception of the ESFRI approach.

A strong recommendation is: Member States should consult each other at the Regional / European level before investing at the national level, in order to adopt a common rhythm to update the national roadmap.

Regarding regional vessels issue the recommendations are:
• Towards **less but modern, multi-purpose and standardised vessels** together with mutual programming and use processes at regional level;

• An advisory committee for the procurement of common strategy, one per region typically, within EUROFLEETS and ERVO (European Research Vessel Operators).

An important opportunity for adjacent countries sharing the same sea basin.

The European dimension could also be relevant for small/medium investments of distributed MRI (Observing systems: oceanic profilers, gliders, coastal observatories, etc; Laboratories equipment: marine biology laboratories, experimental facilities for aquaculture; Testing facilities for ocean engineering: ocean energy, etc).

From coordination to integration of distributed MRIs into networks
MRI, like all RI for environmental and life sciences, are distributed into networks. Each European (ESFRI-like) infrastructure could materialize at first by the addition of *a light «Central Office» which head up the national components to bring the degree of European coordination which will is suited,* to implement and check adopted decisions and programmes.

The 3 existing ESFRI projects specifically devoted to support marine sciences (EURO ARGO, EMSO and EMBRC) are in this process aiming the creation of an ERIC structure.

The I3 projects of particular relevance for the marine sciences, beyond their current EC support, could as well sustain their consortium for coordination and common actions through a similar approach. As typical example: EUROFLEETS for research vessels and underwater vehicle.

The recommendations are:
• to share best practices and common vision for governance and missions of such Central Office, by being inspired by the 3 ESFRI infrastructures (EURO ARGO, EMSO, EMBRC) already committed in this process;

• to mobilise the funding authorities in supporting the development, the strengthening and the clustering of every relevant MRI consortia in this approach, in the perspective of future joint scientific programmes to implement.

Public-Private collaboration on MRI
Considering the undeniable benefits of a public and private sharing of marine and maritime research infrastructures and the upcoming framework opportunities for collaboration (e.g. *Horizon 2020 & JPI Oceans*), *we should actively foster p-p collaboration and mutual access*. Three types of recommendations are proposed:

- Improving information of the industrial sector through a dedicated portal:
• For information on opportunities and potential of access;

• For information on current and expected MRI development and their technological challenges.

- Designing the appropriate (co-)financing framework:
• More open access to public RI at regional level for the industrial sector (particularly SMEs) through the instrument of structural funds to stimulate the innovation process;

• More use of private infrastructures by public research on two main tracks:
- (i) ocean extended observations; (ii) aquaculture purposes;
- through dedicated FP calls in order to fill sample gaps, make companies’ attitude ‘greener’, commercially test products.

- Adopting the proper managing framework to foster mutual p-p access:
• Providing MRI with a Liaison Office, acting like a valorisation service;
• Offering incentives and/or adopting directives (e.g. mixed directive/incentive approach);
• Adopting clear methodology according to the different scope of an MRI, including performance indicators (for p-p collaboration on MRI) and a method to “anticipate the future” together.

An extended overview and discussion of the MRIs common management guidelines for joint research activities is shown in the report (March 2013).

06.
Reduce imbalances among regions through human capacity building (HCB)

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The HCB issue has been addressed at regional level both by the analysis of the answers to the survey on HCB referred to also as 'HCB questionnaire', and by the regional strategic research agendas.

Atlantic Region

Results from the HCB survey
Following the collection of data through the Seas-Era online questionnaire, more than 90 initiatives among training courses, internships, PhD training, workshops, etc. were reported. The Atlantic two main priorities pointed out to advance HCB were '*increased collaboration with industry'* and the *'creation of common policies'*, whether '*lack of funds'*, '*lack of collaboration with private sector'* and '*lack of coordinated strategies'* were identified as the main problems.

Inputs from the SRA
The HCB aspects of the Basin strategy as expressed in the SRA include the following approaches:
• Map existing European Atlantic Sea-Basin Centres of Excellence and their specific capabilities;
• Establish mechanisms to better link industry and academia to support innovation and technology transfer (business incubators; reception business centers; consortia between universities, research centres and governmental research institutions; clusters).

Other relevant actions
Mobility of researchers (scientific interchange program) has been included as a requirement in the full proposal application form submitted to the Seas-Era Joint Call in the Atlantic and Mediterranean regions-2012. From the analysis of the funded projects it is foreseen the recruitment of post-docs, masters, researchers, PhD and master students and technicians besides the key personnel. Regarding the follow-up of the funded trans-national R&D projects, it has been proposed to include researcher mobility as an output indicator of the project impacts.

Mediterranean Region

Results from the HCB survey
Human Capacity Building is a key cross-cutting issue for the development of the marine and maritime sectors and of the Mediterranean region at large, to be enhanced particularly through training and mobility actions.

Inputs from the SRA
The Seas-Era Med SRA pointed out as transversal objective the necessary alignment of the efforts on training new capacities and promote the convergence between Mediterranean countries with regard also to the cooperation with Southern and Eastern ones. In particular, Seas-Era reports highlighted three different levels encompassed by HCB: governance; higher education, research and innovation; and development of infrastructures. The improvement of researchers, technicians and operators career should be favoured by *ad hoc* training programmes adapting to new research themes and societal needs and possibly conducted in cooperation with the private sector, also through the appraisal of mobility and the sharing of infrastructures as well as knowledge.

HCB long term actions
Specific capacity building initiatives are foreseen as part of the Med Common Programme on "*Climate change impact on physical circulation and biogeochemical consequences*": (i) master courses/workshops for researchers to implement long-term climatological models; (ii) training courses for technicians to routinely perform oceanographic data analysis; (iii) internships for technicians/operators to build a team to specifically manage oceanographic campaigns for the purposes of the Common Programming.

An Action Plan for new mobility mechanisms in the Mediterranean Region is delineated in a report (October 2012). In any case, the possible implementation of activities targeting new human capacities asks for the involvement of non-EU Med countries.

Black Sea Region

Results from the HCB survey
Seas-Era analysis of HCB programmes, including National Programmes, EU funded projects, and main ongoing HCB activities, has confirmed that HCB is increasingly becoming part of marine research programmes at national level within the Black Sea Countries (Seas-Era Partners), mainly with HCB as part of main research funding schemes/programmes. Among the EU funding schemes for research excellence involving Black Sea Countries (Seas-Era Partners), FP7 RTD projects include for different scientific themes the following types of HCB actions:
• Specific work packages of projects dedicated to HCB or to training and dissemination (even if the activities have not been carried on at the timing of the present survey);
• Open access to laboratories and marine infrastructures.

A Report on existing HCB schemes in the Black Sea region, and new mechanisms and programmes to be implemented has been published (October 2012). At basin level the neighbourhood co-operation is more emphasized. Seas-Era 'HCB questionnaire' results show that in the marine field researchers, technicians and technologists are high-priority profiles while (basic) research, environment sector and fishery and sea resources are high-priority sectors; finally training internships and mobility are high-priority initiatives to be implemented.

Inputs from the SRA
Seas-Era Black Sea SRA clearly appoints the building of human resources among the priorities under the theme "Research support and cross-cutting issues for fundamental and applied research", and suggests the creation of a young scientists platform as first attempt to fill the gap between the old and young generation of scientists. Moreover, it provides indications for HCB needs of creating and training a new generation of marine scientists in order to adequately support emerging multi-disciplinary topics like marine biotechnology, marine renewable energy sources, marine spatial planning, deep sea exploitation techniques, and fisheries investigations including the analysis of socio-economic impacts.

Pan-European level

The analysis of needs and gaps in HCB has been carried out based on information collected through the 'HCB questionnaire': 57 filled forms have been analyzed and 196 initiatives collected. Results indicate a high priority for building new researchers, technologists, and technicians, in the sector of basic research, fishery and sea resources; focusing on disciplines like environmental science, engineering and technology, and biology. An integrated HCB advancement can be pursued by creating, coordinating, or at least collaborating on common training programs, funding schemes, and policies with an interdisciplinary approach; and by internationally recognizing the training courses. A strong emphasis has been addressed towards mobility actions, being an instrument of cohesion (north towards south, west toward east) as well as knowledge transmission vehicle. At the same time it is recognized the need to overcome some barriers, mainly due to a lack of: funds, acknowledgement of HCB activities as strategic for country development, collaborative approach between private and public sector and coordinated strategies.

As resulted from the desk survey on national, EU and international programs, the enhancement of human potential is increasingly becoming part of marine research programs at national level. Moreover, besides EC schemes specifically dedicated to capacity building like those of the People programme, many concerned actions are embedded in EU funding schemes for research excellence (323 FP7 projects mapped). The overall framework is completed by best practices and methodologies that come from established institutions/consortia at international level (e.g. ICES, Euromarine+, European Marine Board, IOC, BONUS, …). Some of their experiences have been shared during the HCB Workshop held in Rome on October 2011.

Seas-Era achievements resulted in the following recommendations: a common marine HCB roadmap shall be implemented to set-up targeted mobility and training actions (e.g. staff exchanges on RI, research-to-industry mobility activities); and finally to launch a dedicated call on human capacity building in marine science.

Single mobility actions within projects/consortia/joint initiatives shall therefore be integrated in a more consistent marine capacity building scheme to be part of the ERA.

Preliminary guidelines for a training and mobility strategy for human resources in marine science have been proposed as part of this roadmap, including: information collection to depict the present scenario; identification of the implementation steps; and monitoring of the impacts.

A platform of reference on marine and maritime HCB, can be useful to jointly collect and advertise on relevant initiatives, monitor results and propose/discuss schemes of reference and innovative actions, exchange practices.

07.
Enhance public awareness towards marine and maritime scientific and policy issues in Europe, to translate the RTD activities into social, economic and cultural benefits

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2014

The Seas-Era “Information Portal”, accessible through the domain (URL): **http://www.seas-era.eu**, has been the basic instrument of the Seas-Era dissemination strategy to support the activities and results of the Seas-Era project to a larger audience and to be a vehicle of communication both internally and externally.

Seas-Era partners have participated in many Conferences/workshops/meetings where Seas-Era activities have been promoted.

The Workshops and Conferences organized or co-organized by Seas-Era have disseminated the activities between stakeholders in marine sciences ranging from EU officials, leaders of consortia to researchers.

The news and electronic letters on Seas-Era reports and meetings have communicated the activities undertaken. Five electronic Newsletters have been periodically released to around 3000 contacts each.

The public Seas-Era reports are available at our portal (http://www.Seas-Era.eu/np4/19.html).

In addition, Seas-Era leaflets and posters as well as printed copies of the SRAs have been produced and disseminated at several events.

Seas-Era has been able to keep half of its public website visits and at the same time attract a substantial number of new visitors, meaning that the potential growth of the website is huge.

A new common search tool on National and European Funded Projects was developed to facilitate the access to valuable information related to research activities and technological development, in cooperation with the previous initiatives MariFish, MarinERA and AMPERA (See “Common search tool on national and European marine funded projects”).

With the objective of promoting the uptake of research results of marine trans-national projects and its exploitation by end-users to maximize the impact of invested funds in society, a **Seas-Era Knowledge Transfer (KT) strategy** was built on mutual learning between Seas-Era partner’s good practices related to KT, in general and in the particular case of marine sciences and experts and company’s specific experiences on KT presented at a specific dedicated workshop (see Seas-Era workshop “Towards a Marine Knowledge Transfer Strategy” (Lisbon, 17-18th September 2013).

08.
Establish a stable and durable structure for empowering and strengthening marine research all across Europe

Seas-Era gathered the most relevant marine research funders in Europe and some around Europe with the purpose, among others, to foster cooperation and develop common research strategies and programmes for European seas. All these ambitious objectives were achieved. A remarkable effort carried out in an increasingly complex world of structures in the area of coordination of marine initiatives. To note the very significant contribution to marine research and to the policy process of Seas-Era, Strategic Research Agendas for the Atlantic, the Mediterranean and Black Seas, the vision for the investment in new research infrastructures and the development of a pan-European strategy for human resources in marine sciences can be mentioned. It is emphasized the contribution of Seas-Era to the path of further consolidation of the European Research Area.

Regarding the future, as you know, Sea basin strategies received support by consecutive R&D Framework Programmes; this support is expected to continue through the new Horizon 2020 where funding will be awarded through competitive calls around major research priorities addressed to international teams.

From **Ana Teresa Caetano, Project officer of Seas-Era**

The achievements and legacy of Seas-Era

• Consolidated and expanded the Marine Research Funding Organisations (RFOs) Networks started by MarinERA and AMPERA, to constitute a Network of European Marine RFOs based on regional "networks" for the Atlantic, Mediterranean and Black Sea;

• Mutually agreed and detailed three Sea Basin Strategic Research Agendas by the major European Marine RFOs; reflecting both Member State and Regional research priorities/challenges for Atlantic, Mediterranean and Black Sea;

• Identified topics of mutual interest for Common Programming implementing at regional level 2 cases studies for Atlantic and Med regions:
- Atlantic: Ocean transects in the North-Atlantic Ocean;
- Mediterranean: Joint action for a long term hydrological monitoring in the Mediterranean Sea.

• Defined common research topics in the Atlantic and Mediterranean regions to be addressed by collaborative projects under a Joint Trans-national Call 2012 (€4.4 million) thus confirming the ability to coordinate national research funding programmes to undertake joint funding:
- Five trans-national collaborative R&D projects with a total public funding of around 4.26 million € were selected for funding based on a centralized international peer-review assessment of proposals.

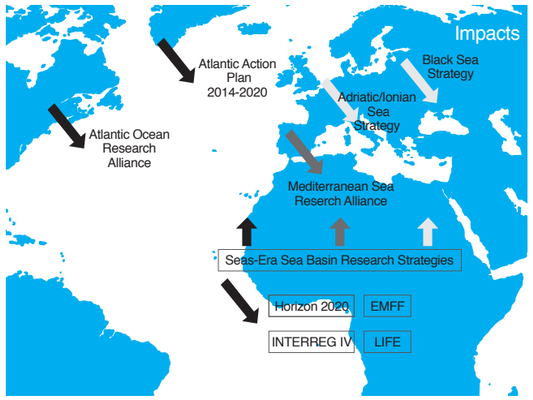
• Inventoried European Marine Research Infrastructures and launched the Marine Research Infrastructures Database (EurOcean_RID) that will run after the end of the Seas-Era project.

• Recommendations for Human Capacity Building at regional and pan-European level.

• Increased the level of understanding of national programmes on how to carry out KT in the marine area and identified the KT practices/tools (national and EU) that could be useful and applicable to trans-national marine research funding programmes through the Seas-Era Knowledge Transfer (KT) strategy.

• The Marine Research Plan for the European Atlantic Sea Basin contributed to the development of the EU Atlantic Action Plan (2013); to the Galway Statement on Atlantic Ocean Cooperation (2013) which launched the European Union-Canada-United States of America Atlantic Ocean Research Alliance.

In the Seas-Era final Conference (April 2014) it was estimated that the Seas-Era impacts of the ERA will be implemented in actions which are summarized in the figure on the right:



It was also stated that for the future the network marine-RFOs established with Seas-Era can continue to meet after the end of Seas-Era project with the support of JPI Oceans by hosting meetings for common exchange of view.

For the follow-up of Seas-Era funded projects it was agreed to invite coordinators to make annual presentations on project's progress at workshops organized back to back with other initiatives (i.e. JPI Oceans meetings).

In the future, the recommendations of Seas-Era to promote marine KT could induce improvements on the KT practices of the national funding programmes and also could be useful and applicable to other thematic areas.

"Seas-Era is an important step in the creation of a European *Marine* Research Area and contributes to the IMP-EU Regional Sea Basin Strategies"

Sea Basin Vision Statements - aspirations

Atlantic Ocean
The European Atlantic Ocean Sea Basin Strategic Research Agenda/Marine Research Plan seeks to improve our understanding and protection of the European Atlantic, and its ecosystems, in order to catalyse a dynamic maritime economy, in harmony with the environment, and with the sustainable development at its core. This will be achieved through building on existing science and technology, harnessing new and emerging science, techonology and innovation to add value and competitiveness to traditional sectors and create new and dynamic maritime sectors in a spirit of regional partnership and international cooperation.

Baltic Sea [BONUS]
An economically and ecologically prosperous Baltic Sea region where resources and goods are used sustainably and where the long-term management of the regions is based on sound knowledge derived from multidisciplinary research.

Sustainable development
Evidence based
Inclusiveness
Cooperation

Mediterranean Sea
By 2020, Mediterranean marine science should be able to contribute with the new knowledge to efficient policy making and sustainable growth of the maritime economy in response to the societal challenges for food, energy, well-being and a healthy marine environment, following the principles of an ecosystem approach to the management of natural resources.

Black Sea
The vision for the Black Sea is to preserve its ecosystem as a valuable natural endowment of the region, whilst ensuring the protection and rational use of its marine and coastal living resources as a condition for sustainable development of the Black Sea coastal states, well-being, health and security of their population.

Sea Basin Strategic Research Agendas by the major European Marine RFOs, reflecting both Member State and Regional research priorities/challenges.

Annex I
Seas-Era partnership

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Partner Organisation	Country	Atlantic region	Med. region	Black Sea region
Ministry of Economy and Competitiveness (MINECO) (Project Coordinator.)	Spain	•	•	
Belgian Federal Public Planning Service Science Policy (BELSPO)	Belgium	•		
Ministry of Education, Youth and Science (MEYS)	Bulgaria			•
National Research Agency (ANR)	France	•	•	
Jüelich Research Centre Gmbh (JÜLICH)	Germany	•		
General Secretariat for Research and Technology (GSRT)	Greece		•	
The Icelandic Centre for Research (RANNIS)	Iceland	•		
Marine Institute (MI)	Ireland	•		
Ministry for Education, Universities and Research (MIUR)	Italy		•	
Research Council of Norway (RCN)	Norway	•		
Malta Council for Science and Technology (MCST)	Malta		•	
Foundation for Science and Technology (FCT)	Portugal	•		
Netherlands Organisation for Scientific Research (NWO)	Netherlands	•		
Scientific and Technological Research Council of Turkey(TUBITAK)	Turkey		•	•
Natural Environment Research Council (NERC)	UK	•		
The Department for Environment, Food and Rural Affairs (DEFRA)	UK	•		
Marine Board-ESF(MB-ESF)	-	•	•	•
The Executive Agency for Higher Education, Research, Development and Innovation Funding(UEFISCDI)	Romania			•
Kyiv State Center for Scientific, Technical and Economic Information (Ukraine) (KyivCSTEI)	Ukraine			•
National Science Foundation of Georgia (SRNSF)	Georgia			•
Institut Français de Recherche pour l'Exploitation de la Mer(IFREMER)	France	•	•	
Third Parties				
Consigilio Nazionale delle Ricerche(CNR)	Italy		•	
European Centre for Information on Marine Science & Technology (EurOcean)	-	•	•	•

Annex II
Summaries of Seas-Era funded projects

SEAS-ERA
legacy report
2014

SEAMAN
Spatially resolved Ecosystem models and their Application to Marine MANagement

Contact
Corina Schrum (corinna.schrum@gfi.uib.no)

Summary
The sustainable use of the marine ecosystems set out for example in the Marine Strategy Framework Directive (MSFD) and the Common Fisheries Policy (CFP) an improved knowledge about the processes impacting the environment is needed. Spatially explicit ecosystem models are getting increasingly important to manage the challenges of natural conservation, sustainable use and economic exploitation. They are useful for understanding marine ecosystem dynamics, disentangle the region-specific impact of various ecosystem drivers and form a powerful tool to evaluate different management options in complex systems. However, uncertainties related to process formulations of growth, respiration, mortality and regenerative production, uncertainties related to the zooplankton compartment and conceptual challenges related to trophic coupling and fish behaviour limit the applicability of state of the art 3-d ecosystem models to marine ecosystem management significantly Further limitations for an integrative ecosystem approach to management are lacking model instruments to assess ecosystem stressors such as the advance of invasive alien species or the impact of anthropogenic pollutants throughout the various trophic levels.

SEAMAN will advance spatially explicit marine models into new management tools to address an integrated ecosystem management approach. SEAMAN will focus on currently existing ecosystem model deficiencies, namely the insufficient process oriented calibration of lower trophic level models and the lacking trophic coupling and trophic closure of current state-of the-art ecosystem models. Therefore, SEAMAN will combine observational approaches with model development and application. This includes amongst others observation of primary and secondary production using novel methods and the analysis of various datasets on fish distribution and behaviour. Those new datasets and information will then allow for developing new and advanced modelling approaches to assess the impact of ecosystem drivers throughout the trophic levels. These developments will have significant impact beyond the pure scientific and open up for completely new and advanced approaches in marine management.

The project brings together experts from different countries in Europe, focusing on different parts of the ecosystem from the physical environment, to plankton, fish, invasive species and pollutants. Comparative approaches for the North Atlantic and Mediterranean will be performed and new insights to similarities and differences in both seas will be provided. The comparative approach will facilitate an expansion from purely regional approaches to the benefits of both scientific and societal communities in both regions.

EMoSEM
Ecosystem Models as Support to Eutrophication Management in the North Atlantic Ocean

Contact
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Summary
One of the leading challenges in marine science and governance is to improve scientific guidance of management measures to mitigate eutrophication nuisances in the EU seas. Existing approaches do not integrate the eutrophication process in space (continuum riverocean) and in time (past, present and future status). A strong need remains for (i) knowledge/identification of all the processes that control eutrophication and their consequences, (ii) consistent and harmonized reference levels assigned to each eutrophication-related indicator, (iii) identification of the main rivers directly or indirectly responsible for eutrophication nuisances in specific areas, (iv) an integrated transboundary approach and (v) realistic and scientific-based nutrient reduction scenarios.

EMoSEM aims to develop and combine the state-of-the-art modelling tools describing the river-ocean continuum in the North-East Atlantic (NEA) continental seas, in order to link the eutrophication nuisances in specific marine regions to anthropogenic inputs, trace back their sources up to the watersheds, then test nutrient reduction options that might be implemented in these watersheds and propose consistent indicators and reference levels to assess Good Environmental Status (GES).

To achieve this objective, the research has been organized in 8 connected WPs. WP1 will upgrade existing marine ecological models by including numerical methods allowing to track the river or oceanic origin of nutrients in marine phytoplankton and to evaluate region-specific N and/or P reductions needed to reach eutrophication GES (“distance-to-target”). WP2 will implement and validate a new generic watershed model of the NEA rivers calculating nutrient inputs to the sea under different scenarios of wastewater treatment and agricultural practices.

The river and marine ecological models will be combined in WP3 to propose reference ecosystem-based indicators (GES) for the NEA waters, based on a comparison between phytoplankton bloom simulations performed under pristine and present-day conditions. The agreed indicators will be used as GES targets in the next WPs. In WP4, both the nutrient sources at the origin of eutrophication nuisances in specific areas and the nutrient reduction needed to achieve GES will be assessed making use of the tools developed in WP1. Model simulations in WP5 will further explore how realistic nutrient reduction measures applied to agricultural and urban sources of nutrient in the watersheds might allow to reach GES in some NEA coastal waters. EMoSEM achievements will be synthesized in WP6 and discussed in terms of eutrophication assessment and mitigation. Outreach activities (WP7) will target both the scientific community (publications, conferences) and end-users, especially policy-makers involved in the implementation of the WFD and MSFD and OSPAR recommendations. Networking and project management is described in WP8.

At the end, EMoSEM will deliver coupled river-coastal sea mathematical models that could be used as guidance by end-users (Policy- and decision makers) for assessing and combating eutrophication problems in the NEA continental waters.

INVASIVES
Invasive seaweeds in rising temperatures: impacts and risk assessments

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Summary

Europe is a hot-spot for aquatic introductions with around 600 alien species recorded at present. Introduction of Invasive Alien Species (IAS) is regarded a serious treat to European biodiversity and ecosystems. Alien seaweeds represent one of the largest groups of marine aliens in Europe, and constitute between 20 and 29 % of all alien marine species. Seaweeds are major primary producers in coastal areas, and are extremely important for coastal ecosystems by supporting high biodiversity through structuring complex habitats for associated species.

Large-scale substitution of dominant native seaweeds with alien species will consequently alter coastal productivity and food web structure, and therefore impact ecosystem services. Only a few impact studies on invasive seaweeds have been carried out worldwide, and these have detected a range of negative ecological effects, with reduction in abundance of native biota being most frequently reported. Little is known about how temperature variation influences the relationships between alien and native seaweeds. Facing climate change, species can either move, change their phenotypes to match with the new environment, or adapt through genetic changes to the new conditions. Alien species have been shown to be particularly adaptive through phenotypic changes, but adaptive mechanisms remain to be investigated in seaweeds The aim of the project is to assess present and future impacts of invasive alien seaweeds on the North-Atlantic coastal biodiversity. The project aims specifically at predicting the effects of alien seaweeds under climate variability and rising sea surface temperatures in the North-Atlantic. The following main objectives will be addressed: 1) To assess of the importance of new pathways of alien seaweeds to European coasts, 2) To develop niche models which predict the potential range of alien seaweeds, under present and future climatic conditions, 3) To investigate the ecological processes responsible for substituting native seaweeds with invasive ones, 4) To assess the impact of alien seaweeds on native seaweed-associated fauna and food webs, 5) To study how acclimation and adaptation processes can influence the success of invasive seaweeds, and 6) To study how climatic variation affects the biochemical adaptation of invasive seaweeds.

By using a combination of modeling, field studies, ecological experiments and molecular work, the impact of alien seaweeds on the native biodiversity under variable climatic conditions will be studied. The work is planned for five organized work packages, and case studies of selected seaweeds currently regarded as invasive or potentially invasive will be done. Experiments and field work will be carried out in northern western and southern Europe. The results will be used in risk assessments of range extension, establishment and impacts on biodiversity by invasive seaweeds. One major task of this project will be to establish a clearer understanding of the concept “invasive seaweed”, by examining the differences between processes leading to high or low abundances of alien seaweeds, and to define biodiversity impact levels of alien seaweeds that have recently been established in Europe. Results on new vectors for introductions, spreading, and biodiversity impact of alien seaweeds will provide knowledge which may be used for filling gaps in legislation on environmental protection in the different regions of Europe.

MERMAID
Marine Environmental targets linked to Regional MAnagement schemes based on Indicators Developed for the Mediterranean

Contact
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Summary

The aim of MERMAID project is to provide additional scientific understanding for assessing GES in a coherent and holistic manner by a state of the art methodology that will be developed and applied in three study areas of the Mediterranean Sea (the Gulf of Lions, Saronikos gulf and Cilician basin); set targets for the achievement of GES; and proceed with linking management measures designed for these areas to the targets. Five MSFD descriptors for “Good Environmental Status’ (GES) were selected to be the main focus of this study related to fisheries (D3), hydrology (D7), chemical pollution of the environment (D8) and biota (D9)and marine litter (D10). These descriptors are selected based on the existing knowledge related to the main pressures exerted on the ecosystem of the study areas, on the direct societal impact of these pressures, as well as on already identified data/knowledge gaps that need further scientific support that MERMAID aims to provide.

The project will mainly contribute to advances in the field of environmental protection, providing new knowledge for MSFD indicators, for which data and information are limited in the Mediterranean basin. At the same time the proposed sustainable coordinated research efforts will be made with special attention to locate, fill knowledge gaps and increase the knowledge base, especially with regards to processes and pressures that are relevant to the selected MSFD descriptors. It will also ensure that several steps are taken to propose management strategies and create an impact on policy-makers, from national to international levels, linking these targets with management measures that will provide guidance on how ecosystem considerations can be included in managing human activities of key importance under the MSFD and the MAP perspectives. Finally, MERMAID will reinforce international cooperation and interactions between scientists by providing a framework for knowledge and will strengthen cooperation in the science area particularly through transferring methodologies and promotion of the assessment procedure to a non-EU country.

CIGESMED
Coralligenous based indicators to evaluate and monitor the "good ecological status" of the Me-diterranean coastal waters

Contact
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Summary
CIGESMED will contribute to the Seas-Era's theme C: Development of indicators and science support and management tools for the determination of Good Environmental Status in the Mediterranean Sea. Such an issue is linked to the implementation of the MSFD and other European directives (WFD, habitats directive).

In the Mediterranean Sea, coralligenous and Posidonia meadows are the most important biologically mediated habitats. They are the main milieu generating structural complexity and biodiversity. Coralligenous reefs produce goods and services in several domains. However, pollution, diving, anchors and trawling may cause degradation, whilst traditional fishing as well as angling mainly affects the target species. Coralligenous habitats may also be susceptible to invasive alien species and to the pressures linked to the global warming. This has been suggested as a possible cause of large-scale events involving invertebrates' mass mortalities on coralligenous. If this hypothesis is true, such events might occur again and become more frequent, which would cause profound changes in the specific composition and structure of the coralligenous communities.

The distribution of coralligenous populations in the NW-Mediterranean, their structuring, functioning and threats are important lacunae from the conservation point of view. There are key gaps in the current scientific knowledge of the coralligenous habitat that make it difficult to make recommendations for protecting them. Cryptic species has been found in several marine taxa, making the issue of a reliable identification in the spotlight for conservation and protection purposes. CIGESMED will then develop barcoding. Genetic structuring and effective dispersal potential will also be addressed as a pre-requirement.

The other objectives proposed are (1) to enhance the knowledge on coralligenous populations by deciding on reference states, acquiring long chronological sets and setting up a network of Mediterranean experts, (2) to monitor networks, locally managed and coordinated them on a regional scale (citizen science), (3) to standardize protocols that could be applied to the entire Mediterranean. Species that are indicators of the state of health of these formations will be identified, as well as quality criteria giving information on specific human impacts. A complexity approach will permit to mutualize and visualize large data collections, and to manage knowledge to study ecosystems and test indices and index. A new index, specific to coralligenous will be co-constructed with scientists, marine natural parks and reserves (directly or through national AMP agencies which are linked to CIGESMED via other projects like Index-Cor), representative of the concerned ministries and the general public, through the implementation of a "citizen science" network. An original approach will be the use of trees of knowledge as tools to sort, to organize and to illustrate big heterogenous sets of data.

To make all possible, CIGESMED gathers scientists from France, Greece and Turkey, making it possible to access to four off sites and to work on the same issues in both the Western Mediterranean basin and the Aegean-Levantine one.

Annex III
List of Seas-Era publications

Seas-Era Publications and Workshop powerpoint presentations can be downloaded from:
http://www.seas-era.eu/np4/34/

Strategic analysis

Seas-Era (2011) Synthesis Report on existing (sub)National (marine) Science and Technology Strategies (October), 70pp.

Seas-Era (2011) 1st Seas-Era Strategic Forum Report (October), 113pp.

Seas-Era (2013) 2nd Seas-Era Strategic Forum Report (April), 31pp.

Seas-Era (2014). Pan-European Analysis of the Seas-Era Sea Basin Strategic Research Agendas. (February), 13pp.

Seas-Era (2014) 3rd Seas-Era Strategic Forum Report (April), 16pp.

Atlantic Region
Seas-Era (2011) A *draft* Marine Research Plan for the European Atlantic Sea Basin: Discussion Document (October), 46pp.

Seas-Era (2012) Science Consultative Workshop (Ostend, February) Report (September), 42pp.

Seas-Era (2012) Joint Seas-Era and CMPR-AAC Governance Consultative Workshop (Lisbon, April) Report (September), 38pp.

Seas-Era (2012) Seas-Era "East-meets-West" Workshop (Dublin, July) Report (September), 14pp.

Seas-Era (2013) Towards a Strategic Research Agenda/ Marine Research Plan for the European Atlantic Sea Basin (November), 44pp.

Mediterranean Region
Seas-Era (2011) Strategic Research Agenda for the Mediterranean Sea Basin: Discussion Document (November).

Seas-Era (2012) Strategic Research Agenda for the Mediterranean Sea-Basin (February), 62pp.

Black Sea Region
Seas-Era (2012) Black Sea Strategic Research Agenda (April), 69pp.

Common Programmes

Seas-Era (2011) General concept of the Common Program (October), 28pp.

Seas-Era (2012) General concept of the Common Programs and guidelines for implementing Common Programs (December), 30pp.

Seas-Era (2013) Inventory of Research, Monitoring and Technological programs and identification of the commonalities and gaps (March), 16pp.

Seas-Era (2014) Proposal for a pan-European programme based on juxtaposition of national programmes.

Seas-Era (2014) Proposal for a pan-European programme based on the merger of national programmes.

Atlantic Region
Seas-Era (2012) Common Programmes in the Atlantic Region. Pilot common programme (November), 14pp.

Mediterranean Region
Seas-Era (2013) Mechanisms to address marine research priorities in the Mediterranean Sea using common programming (September), 30pp.

Black Sea Region
Seas-Era (2013) Report on the Black Sea Common Program of the Main Priorities of Marine Research drafted by RFOs and RPOs (May), 69pp.

Joint calls

Atlantic&Mediterranean region
Seas-Era (2012) Joint Call in the Atlantic and Mediterranean regions 2012 – List of funded projects (September), 8pp.

Seas-Era (2013) Report of the results of the supported projects by other Era-Nets and recommendations for follow up activities (November), 14 pp.

Seas-Era (2014) Proceedings of the Workshop on the discussion of the results of the first year of Seas-Era supported projects for Mediterranean and Atlantic calls (April), 19 pp.

Marine Infrastructures

Seas-Era (2012) Marine Research Infrastructures updated overview, European integration and vision of the future (December), 54 pp.

Seas-Era (2013) MRIs common management guidelines for joint research activities (March), 69pp.

Atlantic Region
Seas-Era (2012) Marine Research Infrastructures in the Atlantic Region- Summary (October), 29pp.

Mediterranean Region
Seas-Era (2012) Marine Research Infrastructures in the Mediterranean Region- Summary (December), 23pp.

Black Sea Region
Seas-Era (2012) A report on existing or/and new MRIs in the Black Sea Region and a procurement strategy and recommendations for their use and sharing (October), 131pp.

Human Capacity Building

Seas-Era (2012) Capacity Building: Identifying Needs, specificities and imbalances: Summary Report (March), 11pp.

Mediterranean Region
Seas-Era (2012) New mechanisms for human capacity building in Mediterranean marine research (October), 21pp.

Black Sea Region
Seas-Era (2012) Report on existing HCB schemes in the Black Sea countries and new mechanisms and programmes to be implemented (October), 23pp.

Information and Dissemination

Seas-Era (2011) Public website (.eu domain) (February), 16pp.

Seas-Era (2011) Development of a e-Newsletter automatic tool (February), 12pp.

Seas-Era (2011) Common search tool on National and European Marine Funded Projects (October), 6pp.

Seas-Era (2011) Dissemination materials in accordance with the objectives and timings of each WP and regional group of the project – (Report until July), 7pp.

Seas-Era (2014) Dissemination materials in accordance with the objectives and timings of each WP and regional group of the project – (Report until April), 9 pp.

Seas-Era (2014) Workshop "Towards a Marine Knowledge Transfer Strategy" Report, 28pp.

Coordination & Management

Seas-Era (2011) 1st Seas-Era Periodic Report: May 2010 to October 2011 (November), 12pp.

Seas-Era (2013) 2nd Seas-Era Periodic Report: November 2011 to April 2013, 14pp.

Seas-Era (2014) 3rd Seas-Era Periodic Report: May 2013 to April 2014.

Seas-Era (2014) Report on the Seas-Era final Conference (April), 45pp.

Seas-Era (2014) Report on "Awareness and Wider Societal Implications".

Seas-Era (2014) Publishable final Seas-Era report, 44pp.

SEAS-ERA

legacy report

2014