CSA OCEANS 2
JPI Oceans support action

Jan-Stefan Fritz
John Hanus

4.1

Proposal for Foresight topics to support JPI Oceans

Publication Date: 27.07.2017

A Horizon 2020
funded project

Project full title: **Coordination action in support of the implementation of the Joint Programming Initiative on Healthy and Productive Seas and Oceans**
Website: **http://jpi-oceans.eu/csa-oceans-2**

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 696324
Project start date: 1 February 2016
Duration: 36 months

Deliverable number: 4.1
Deliverable name: Proposals to the Management Board regarding (i) which JPI actions could be supported with foresight mechanisms, and (ii) which relevant bodies could be potentially cooperated with more systematically

WP no: 4
Delivery date: 27 July 2017
Lead Beneficiary: KDM
Authors: Jan-Stefan Fritz and John Hanus
Nature: Report

Dissemination Level:

- CO = Confidential, only for members of the consortium (including the Commission Services)

CONTENTS

INTRODUCTION

Task 4.1 of the CSA Oceans 2 project aims to use foresight to support activities that implement the JPI Oceans Strategic Research and Innovation Agenda (SRIA). Based on the blueprint for a thematic foresight exercise in JPI Oceans developed in the FP7 CSA Oceans 1, this task seeks to conduct foresight processes in areas selected by the Management Board of JPI Oceans. Consisting of workshops and discussion papers, these exercises will produce roadmaps for specific thematic areas with concrete recommendations for JPI Oceans activities in the field. These roadmaps will be developed in an iterative process between the JPI Oceans MB and the holders of expertise in the field (e.g. research, academia, industry, policy-makers or civil society) through workshops, discussion papers, bibliometric studies, technology readiness level, etc. This will ensure that the development of JPI Oceans activities not only draws on the best available knowledge, but also that these activities are embedded both in the wider landscape and in a longer-term strategy.

The aim of this report is to facilitate the selection of thematic areas by the JPI Oceans Management Board in which CSA Oceans 2 should launch foresight processes. As such, the report reflects the ongoing iterative discussions between the CSA Oceans 2 partners and the JPI Oceans Management Board on topic areas and makes concrete proposals to the Management Board for foresight activities.

JPI OCEANS-OECD SEMINAR

In order to start the process of identifying potential topics for foresight, CSA Oceans 2 partners organised a joint forward-looking seminar with the OECD entitled "The Future of the Maritime Economy", held in Brussels on 4 October 2016. The aim of this seminar was (i) to present the main results of the OECD Future of the Ocean Economy report published in spring 2016, (ii) to discuss the report's recommendations with holders of expertise in the field (i.e. researchers, industry representatives, policy-makers) (iii) to address how JPI Oceans and its member countries can take lessons learned forward from the report, and (iv) to explore whether JPI Oceans and the OECD could potentially cooperate more systematically together on future foresight activities related to the maritime economy. The joint seminar provided input to the JPI Oceans workshop the following day (see below) at, thus ensuring that the best available knowledge about the future of the ocean economy is brought into the JPI process as well as that JPI Oceans activities are embedded in the wider landscape and in a longer-term strategy.

The seminar brought together the JPI Oceans Management Board, Advisory Board and key stakeholders and representatives from the OECD to discuss the recommendations of its Future of the Ocean Economy report.

The seminar kicked off with a presentation by Barrie Stevens (OECD) of the main findings of the report: by 2030, many ocean-based industries have the potential to outperform the growth of the global economy as a whole, both in terms of value added and employment. The projections of the OECD suggest that the ocean economy will double its global value added, reaching over USD 3 trillion and providing approximately 40 million full-time equivalent jobs. This economic expansion is driven primarily by developments in global population, economic growth, trade and rising income levels,

climate and environment, and technology. However, it is increasingly being constrained by a deteriorating health of the ocean.

The report makes a number of recommendations in order to boost the long-term development prospects of the ocean economy, while managing the ocean in responsible, sustainable ways. In particular, it highlights two key issues, (i) fostering greater international cooperation in maritime science and technology to stimulate innovation and (ii) strengthening integrated ocean management, making it more effective, efficient and inclusive.

In the first panel session "Lessons learnt for cross-sectoral cooperation - Perspectives from ocean based industries" Karl Almås (SINTEF) highlighted the role of technology as a driver in ocean innovation. In particular, he argued the need to harness the strong cross-over potential in ocean industries as well as to focus on both enabling technologies and disruptive changes in order to drive economic development. Under the moderation of Strategic Advisory Board member Yvonne Shields (Commissioners of Irish Lights), panellists argued that to achieve such cross-sectoral fertilisation, a focus should be on skills and training as people are the best means of transferring knowledge and technology. Clusters could in particular play a role in facilitating this knowledge exchange, as does the design of research programmes to this end.

The second session on integrated ocean management was kicked-off by Sebastian Unger (IASS Potsdam). In his keynote presentation, he highlighted the great political moment for moving towards integrated ocean governance, which could be even further advanced through (a) innovating instruments, (b) complementary strategies at national, regional and global scale, and (c) capacity-building and sustainable finance. In particular, he argued that the regional level could act as a broker for integration, as there are well-established institutions at regional level, where agreement can be reached more easily than at global level and which allows for a meaningful implementation of the ecosystem approach. In the discussion moderation by Management Board member Gert Verreet, discussants pointed out that in Europe, many of the institutions (e.g. at sea-basin level), instruments (e.g. Marine Spatial Planning) and commitment to integrated ocean management were already in place; however, a better implementation was necessary.

Discussing how research and innovation can support such further integration, panellists argued that scientists, industry, and policymakers should be involved in all steps of the governance process from identifying research questions to writing of legislation as this was essential for promoting the sustainable coexistence of ocean-based activities. Moreover, it was suggested that JPI Oceans could provide a forum for such cross-sectoral dialogue for instance on issues such as increased knowledge and data accessibility.

In the last session, JPI Oceans Members discussed the recommendations of the OECD report and the main messages of the two panel sessions and what public research could do in support. Many potential fields of action, for instance around data and knowledge sharing, support to coastal tourism, and a focus on supporting governance process were raised. However, participants pointed to the need and difficulty of prioritising research areas on an evidence-basis, rather than opinion-based, research priorities. JPI Oceans should thus act as a hub of bringing the different Member States and stakeholders to the table to discuss and set priorities for research funding in an iterative manner, as had been done in the process of developing the JPI Oceans Strategic Research and Innovation Agenda.

To close the seminar, Claire Jolly (OECD) outlined that in the next phase of the project 2017-18, the OECD would launch a programme that would focus on fostering innovation in the maritime economy. In particular the analysis will focus on new enabling technologies, new patterns of collaboration, new uses of economic valuation and tools and new policy mix in boosting innovation for greening marine and maritime activities.

FUTURE-ORIENTED MANAGEMENT BOARD WORKSHOP

As a follow-up to the JPI-OECD seminar, a future-oriented JPI Oceans Management Board and Strategic Advisory Board workshop was held the following day, i.e. on 5 October 2016 (Milestone MS 25). At this workshop, which CSA Oceans Partners helped to plan and conceptualise, JPI Oceans Management Board and Strategic Advisory Board deliberated key future challenges and opportunities in marine and maritime research and tried to identify new JPI Oceans activities whose development CSA Oceans 2 may further support.

In addition, the Management Board decided to explore the possibility more systematic cooperation with the OECD in the second phase of the OECD project.

KEY CHALLENGES AND OPPORTUNITIES FOR THE OCEANS

In the first session, the Management Board discusses the challenges and opportunities facing the oceans in the next 15 to 20 years and members were encouraged to also consider the enablers and potential game changers. The Management Board engaged in extensive discussions and put forward a number of ideas. The The Board was then invited to discuss then organised the topics into three discussion: Science, Enablers, Governance. In each of these areas, more targeted discussions were held.

SUMMARY OF NEW POINTS

Out of the discussions, seven key themes emerged, which the JPI Oceans Secretariat has collated and organised into a report. These themes were:

- Enabling growth, jobs whilst fostering health and productivity of oceans & sea
- Awareness, Education, Training and Communication
- Integrated Oceans
- Oceans on the Land (ocean/land interfaces)
- Technologies
- Ocean Observatories
- Models

The Management Board identified in particular technologies as an area that would benefit from a foresight exercise carried out by CSA Oceans 2. The MB thus tasked CSA partners to develop a proposal for a foresight focusing on technologies which would bring about a step change in using and managing the oceans as a first thematic foresight exercises to be implemented in the remit of the CSA.

PROPOSAL TO THE MANAGEMENT BOARD

CSA Oceans 2 partners propose to the Management Board a concrete proposal for a foresight exercise on marine technologies as well potential topics for future thematic foresight exercises.

FORESIGHT EXERCISE I – FUTURE INNOVATIVE AND AUTONOMOUS TECHNOLOGIES TO MANAGE HUMAN IMPACTS AND SUPPORT BLUE GROWTH ON COASTAL AND REGIONAL SEAS

Key question

What technologies and related science should the public sector fund in Europe in future?

Background

Coastal and regional seas around the globe are being degraded. In Europe over 40% of the population lives within 50km of the coast, making coastal areas the most populated and subject to substantial and increased pressures from human activity through e.g. pollution. Human activities are, in fact, altering the ocean domain and, in particular, coastal and regional seas beyond their natural state. Given the increasing intensity of ocean use, society needs to both understand its impact on the oceans to better support knowledge-based decision-making and to have better means to manage concrete challenges.

The foresight exercise will consist of a workshop which aims at identifying groups of integrative emerging technologies which will enable a step-change in the way we manage, and support Blue Growth in coastal waters and regional seas. The focus is on technologies, supported by the public sector, which can help to address the challenges of marine pollution, climate change and the sustainable development of the Blue Economy. These technologies should be cost-efficient, effective and integrative (e.g. autonomous operations; robotics servicing multiple purposes).

This workshop seeks to support and complement the joint actions: Cumulative effects of anthropogenic disturbances; integrated assessment of effects of new pollutants; munition in the Sea; MarTERA; Blue Bio-economy Co-fund; Cross cutting-enablers relevant to the above (technologies, infrastructure, science-policy, capacity building)

The workshop programme will be planned to provoke active discussion and ensure relevance by connecting sciences (various disciplines), industry (providers of technologies and services and industrial users) and managers. The results will be summarized in a workshop report to be presented to the JPI Oceans Management Board.

PROGRAMME

Day 1		
Time	**Activity**	**Lead person**
11:00 – 12:00	Tour of Host Organisation	
12:00 – 13:00	Networking lunch and Registration	

Session 1: Introductions and Keynote Presentations				
13:00 – 13:15	Welcoming remarks			n.n.
13:15 – 13:30	Welcoming remarks and introduction to JPI Oceans			n.n.
13:30 – 13:45	Introduction to workshop: aims, conceptual approach and outputs			n.n.
13:45 – 14:15	Scene-setting talk *The big picture of human impacts on regional seas*			n.n.
14:15 – 14:45	Scene-setting talk *The business economics of new technologies*			n.n.
Session 2: Science and Technology Presentations **What current and emerging human impact challenges and blue growth opportunities can only be addressed with a major step-change in science and technology?**				Moderator: n.n.
14:45 – 15:10	Technologies for measuring and monitoring Marine Pollution			n.n.
15:10 – 15:35	Climate Change mitigation and adaption technologies			n.n.
15:35 – 16:00	Technologies for boosting the Blue Economy			n.n.
16:00 – 16:30	Coffee Break			
Session 3: The Technology Perspective **What specific technological types and developments would most contribute to healthy and productive coastal areas and seas?** *Participants should brainstorm and propose future technologies regardless of feasibility, cost effectiveness, societal benefit, etc.*				
16:30 – 16:40	Introduction and Organizational issues			n.n.
16:45 – 18:15	Parallel Group 1 Marine Pollution Group Leader: n.n.	Parallel Group 2 Climate Change Group Leader: n.n.	Parallel Group 3 Blue Economy Group Leader: n.n.	
19:00	Dinner			

DAY 2		
Time	**Activity**	**Lead person**
08:30 – 09:00	Small breakfast and morning networking	
Session 4: Towards Expert Recommendations **What technologies should be supported by the public sector in the future and why?**		Moderation: n.n.
09:00 – 09:20	Group 1	*Short presentations by rapporteurs of*
09:20 – 09:40	Group 2	

09:40 – 10:00	Group 3	*parallel groups*
10:00 – 11:30	Plenary discussion: What technology groups should be financed by the public sector and why?	
11:30 - 12:00	Coffee break	
Session 6: Closing comments and departure		
12:00 - 12:15	Next steps	n.n.
12:15	Lunch & departure	

POTENTIAL TOPICS FOR FUTURE THEMATIC FORESIGHT EXERCISES

The CSA Oceans 2 project can support the implementation of at least two thematic foresight exercises. CSA partners have identified the following questions linked to ongoing or planned JPI Oceans joint actions, which could be addressed in such an exercise. The MB is invited to advise in which of the following topics, if any, the CSA Oceans project should conduct a foresight exercise and/or propose other topic areas linked to ongoing or planned actions.

A. **Which technologies will allow replacing the use of research vessels?**

Relevant joint actions: Ecological impacts of Deep-Sea Mining, North Sea monitoring.

B. **What technologies will reduce the sea surface congestion?**

Relevant joint actions: Marine Spatial planning, Cumulative effects of anthropogenic disturbances.

C. **What technologies can dramatically impact on mapping marine genomics" or "detecting toxins"?**

Relevant joint actions: Blue Bioeconomy, Oceans and Human health, Microplastics, Integrated Assessment of New Pollutants.

D. **Which groups of integrative technologies will enable a step-change in the quality, effectiveness and efficiency of data collected from the oceans?**

Relevant joint actions: Building an EOOS, Optimization of Transdisciplinary Marine Monitoring, Climate Change and Ocean Acidification, Cumulative effects of anthropogenic disturbances, Integrated Assessment of New Pollutants, Blue Bioeconomy. (See Annex I for workshop concept)

E. **Which innovative and autonomous technologies can bring about a step-change in understanding and mitigating climate change impacts on the seas and oceans?**

Relevant joint actions: Climate Change and Ocean Acidification, Optimization of Transdisciplinary Marine Monitoring, Improved understanding of how climate change can affect ocean processes, ecosystems and the services they provide. (See Annex II for workshop concept)

ANNEX I: PROPOSAL D – WHAT TECHNOLOGIES ARE NEEDED FOR A STEP-CHANGE IN COLLECTING OCEAN DATA?

Our ability to observe the ocean environment and its resident creatures calls for innovation. It has only been within the last 50 years that technology has advanced to a point where we can examine the ocean environment in a systematic and scientific manner. Given the increasing intensity of ocean use, society now needs to better understand the physics, biology and chemistry of the oceans as well as human-ocean interactions as a basis for knowledge-based decision-making.

The scientific community has identified 27 Essential Ocean Variables (EOVs) covering the physics, biogeochemistry, as well as biology and ecosystems of the oceans. If collected in a continuous, long-term and systematic manner, the EOVs will provide the data basis for better understanding ocean, climate and ecosystem interactions as well as human impacts and vulnerabilities. Unfortunately, to date many EOVs are not being collected in a systematic manner either because the technologies don't exist or their use isn't cost-effective or efficient.

The aim of this workshop is to identify groups of integrative technologies which will enable a step-change in the quality, effectiveness and efficiency of data collected from the oceans. These technologies should enable systematic, scientific, (ideally) non-invasive and comprehensive collection of all EOVs.

This workshop supports the implementation of the Strategic Research and Innovation Agenda of JPI Oceans, which brings together ministries, agencies and councils responsible for marine and maritime RTD funding from across Europe. The report of this workshop will provide the basis for further deliberations in JPI Oceans on the types of ocean technologies which public investments may support in the future.

The workshop is structured in three sessions. Session 1 takes a visionary approach to future scientific and societal needs for knowledge about the oceans, and the technologies needed to bring about a step-change in collecting the relevant data. It begins with an introductory talk on the *scientific and technological achievements* in the collection of EOVs. This is followed by three thematically-focused presentations of *scientific and technological visions* for the collection of ocean data in future. Workshop participants are then invited to creatively discuss future scientific and societal needs, and the technologies needed to support these. Session 2 takes a technology focus. Participants are invited to break-out into working groups in order to identify specific technologies which may bring about a step-change in the effectiveness and efficiency of ocean data collection. The results of these discussions will be presented in a plenary session on day two. In Session 3 participants will be invited to discuss what technology groups could best be supported by public or private sectors and why. The results of this workshop will be summarized in a workshop report to be presented to the JPI Oceans Management Board.

Workshop Programme

Day 1				
Time	**Session**			**Speaker**
13:00 - 13:30	**Registration**			
13:30 - 13:50	**Welcoming remarks**			n.n.
13:50 - 14:00	**Aims of workshop**			n.n.
14:00 - 14:30	**Scene setting talk Introduction into the Topic** *Presentation addresses the major scientific and technological achievements & deficits in the collection of Essential Ocean Variables*			n.n.
Session 1: Kick-off presentations address the cutting edge scientific and societal questions about the oceans that can only be answered with a major step-change in technology.				Moderator: n.n.
14:30 - 14:45	**Physical** parameters of the Ocean			n.n.
14:45 - 15:00	**BioGeoChem** parameters of the Ocean			n.n.
15:00 - 15:15	**Biological and Ecosystem** parameters of the Ocean			n.n.
15:15 - 15:30	**Commercial perspective**			n.n.
15:30 - 16:00	**Coffee Break**			
16:00 - 17:00	**Open Discussion** **What observing capacities and associated technologies may bring about a step-change in understanding the ocean?** *Participants should brainstorm and propose future technologies regardless of feasibility, cost effectiveness, societal benefit, etc.*			Moderator: n.n.
Session 2: The Technology Perspective **What specific technological types and developments would most contribute to strengthening observing capacities?**				
17:00 - 17:05	**Organizational issues**			n.n.
17:05 - 18:30	Group 1 Physical parameters	Group 2 Biogeochemical parameters	Group 3 Biological and Ecosystem parameters	
19:00	**Dinner**			

DAY 2		
Time	**Session**	**Speaker**
09:00 – 09:30	**Morning networking**	
Presentation of working group discussions		n.n.

09:30 - 09:50	*Group 1: **Physical** parameters*	
09:50 - 10:10	*Group 2: **Biogeochemical** parameters*	
10:10 - 10:30	*Group 3: **Biological and Ecosystem** parameters*	
10:30 - 11:00	Coffee break	
11:00 - 12:30	**Session 3** **What technology groups should be financed by the public sector and why?**	Double Moderation: MB member & Industry
12:30 - 12:45	**Next steps**	n.n.
12:45	**Lunch & departure**	

ANNEX II: PROPOSAL E – INNOVATIVE AND AUTONOMOUS TECHNOLOGIES TO UNDERSTAND AND MITIGATE CLIMATE CHANGE IMPACTS ON THE SEAS AND OCEANS

Climate change has with no doubt tremendous effects on humankind. Scientists had predicted many of these effects in the past. Now they are occurring. In the oceans, we observe concrete effects on coastal areas, a loss of sea ice, accelerated sea-level rise, acidification as well as changes in ecosystems, physics, biology, and chemistry of the oceans. The extent of climate change effects on individual regions will vary over time and with the ability of different societies and environmental systems to mitigate or adapt to change. However, transdisciplinary and integrative technologies to monitor and later predict the exact extent of climate change effects on the ocean domain are only now being developed.

It has only been within the last 50 years that technology has advanced to a point where we can examine the ocean domain in a systematic and scientific manner. Given the increasing impact of climate change, society now needs to more efficiently and effectively understand the changing parameters which address the health and productivity of oceans as well as human-ocean interactions. The challenge is two-fold. First, we need more cost-effective and efficient technologies focused on monitoring specifically the productivity and health of the seas and oceans. Second, the implementation of these technologies needs to be tied more closely to specific societal services.

The workshop aims at identifying groups of integrative technologies which will enable a step-change in monitoring climate change impacts on the seas and oceans, as well as their potential implementation to help manage the productivity of the oceans and the sustainability of human-ocean interactions.

This workshop seeks to support and complement the following three Joint Actions:

- Climate Change and Ocean Acidification
- Optimization of Transdisciplinary Marine Monitoring to Support Assessment of the Physical , Chemical, Biological and Societal Consequences of Climate Change (Including Ocean Acidification)
- Improved understanding of how climate change can affect ocean processes, ecosystems and the services they provide

The workshop programme will be planned to provoke active and interesting discussion. The results will be summarized in a workshop report to be presented to the JPI Oceans Management Board.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 696324