

EOOS: European Ocean Observing System

Proposal

Draft - not for circulation

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What is EOOS?

EOOS is a coordinating framework designed to align and integrate Europe's ocean observing capacity; to promote a systematic and collaborative approach to collecting information on the state and variability of our seas; and to underpin sustainable management of the marine environment and its resources.

Providing 97% of the earth's water¹ and 95% of its biosphere, the ocean is a crucial source of water, food, energy and raw materials, and acts as a medium for tourism, transport and commerce². Valued at US\$24 trillion³, the global ocean has been termed the world's seventh largest economy. Sustained ocean observing is crucial to understand the oceanic environment, provide data products and services, help mitigate climate change, and drive the Blue Economy in a responsible and sustainably way.

The international ocean observing community has recognized a need for integration and coordination of interdisciplinary ocean observations⁴. Furthermore, studies demonstrate that the economic benefit of the integration of the ocean observing efforts, with the necessary data analysis and product distribution, implemented at the global, ocean basin, and regional scales, generate positive dividends much greater than its costs^{5, 6}.

Internationally, ocean observation has been coordinated through the Global Ocean Observing System (GOOS), a contribution to sustained Earth observations and information (GEO). A lot has been done at pan-European and regional scales (EuroGOOS and ROOSes, EMODnet and CMEMS). There are numerous other programmes and projects working to develop and implement effective ocean observing capacities, albeit adding to the complexity of the current systems. Therefore, this capability, especially in the seaborne (in situ) observations, is highly fragmented. Those fragmented components vary in the degree of coordination or interaction between them and generally suffer from a lack of sustained funding.

There are a number of key drivers (figure on page 4) for a stronger European ocean observing, necessary to underpin our knowledge, the delivery of ocean services and future projections.

An inclusive, integrated, and sustained pan-European framework is needed to link the currently disparate components by an overarching strategy, maximizing the benefits of optimization, infrastructure use, standardization, open data exchange and capacity building.

The European Ocean Observing System (EOOS) will not take ownership or control of ocean observing in Europe. Rather, EOOS will provide a light and flexible coordinating framework to help manage and improve the existing observing effort, making it more efficient and effective at different geographical scales, and for different end-users.

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http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/focus_areas/water_and_ocean_governance.html

² European Marine Board. 2013. Navigating the Future IV. Position Paper 20. Ostend, Belgium. ISBN: 9789082093100

³ Hoegh-Guldberg, O. et al. 2015. Reviving the Ocean Economy: the case for action – 2015. WWF International, Gland, Switzerland, Geneva, 60 pp. ISBN: 9782940529209

⁴ A Framework for Ocean Observing. By the Task Team for an Integrated Framework for Sustained Ocean Observing, UNESCO 2012, IOC/INF-1284 rev., doi: 10.5270/OceanObs09-FOO

⁵ Flemming NC. 2001. Dividends from Investing in Ocean Observations: A European Perspective. EuroGOOS. Southampton Oceanography Centre.

⁶ Woods Hole Oceanog. Inst. Tech. Rept., WHOI-2005-03.
EuroGOOS/October 2015



Specifically, EOOS will:

- Align and integrate existing initiatives to ensure efficiency and value for money and to eliminate duplication of effort;
- Identify gaps in our observing capacity and foster initiatives to fill those gaps;
- Promote standardization of the end-to-end system from observation collection to data management and products;
- Drive capacity building and provide leadership for ocean observation;
- Promote the ocean observing services for multiple sectors including research, policy, management and industry; and
- Promote a common European voice and integration at the international level.

In this way, EOOS will bring a real added value to existing observing efforts, empowering those who are working to advance ocean observing in Europe, catalyzing new initiatives in a strategic way, targeting identified gaps and speaking with a wide range of stakeholders.

The concept of an integrated European ocean observing system has evolved from a number of strategic initiatives and fora over the last couple of decades. The 2010 EuroOCEAN Ostend Declaration⁷ formalized the concept making an explicit call to the policymakers and research community for its implementation. This was further reiterated by the Rome Declaration 2014⁸. In 2015, EuroGOOS and EMB have taken this work forward by organizing a stakeholder consultation and an expert brainstorming workshop (see annex 1). 20 experts acting in personal capacity met in Brussels to conduct a horizon scanning for EOOS in the context of pan-European and international initiatives. The results of this effort have been used to develop an EOOS 'strawman', open for consultation with the wide community.

⁷ <http://www.eurocean2010.eu/declaration.html>

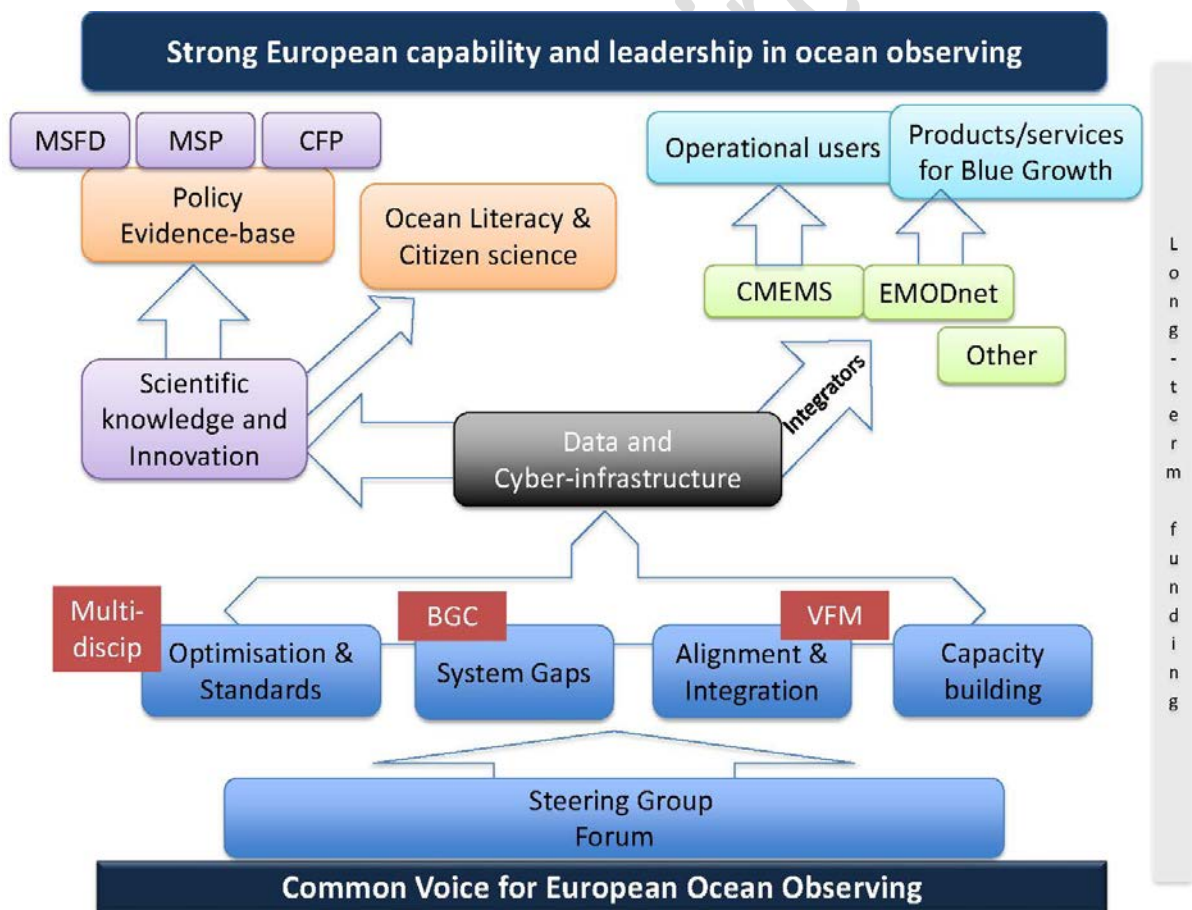
⁸ <http://eurocean2014.eu/declaration/>
EuroGOOS/October 2015

EOOS Coordination

The EOOS framework will be open and inclusive. It will be based on the open data policy. To make it a reality will require support from across the full spectrum of providers and users of marine data. EMB and EuroGOOS want to catalyse a process that will ultimately belong to all those with a role in Europe's ocean observing capacity. Through dialogue and exchange with the ocean observing community, the EOOS steering group will prepare a roadmap and implementation plan which will be open for consultation. The First EOOS Forum will provide a platform to complement and fine-tune the implementation strategy. In line with the existing programmes and initiatives, EOOS pilot projects will start. This community-driven process will represent valuable success stories for potential funders and generate demand from the industry sector.

Forum

EOOS is intrinsically a bottom-up process, elements of which are already taking place at various geographical scales. It is proposed that the main governance body of EOOS is its forum. EOOS Forum will be an open conference bringing together all relevant actors, organized on a regular basis (e.g. annually). The Forum programme committee will have to be established by the EOOS steering group (see below). EOOS Forum will be regarded as the EOOS general assembly.



Steering Group

It is proposed that the steering group gives strategic guidance to the EOOS process. At the start it should be set up by the facilitators of the EOOS process as well as policy and member states representatives. Steering group terms of reference and rules of the appointment of members will be established.

The steering group (SG) will work through dialogue and exchange with the ocean observing community, implemented by means of the EOOS website (see below). The SG will be tasked to define the EOOS Roadmap. The roadmap draft will go through the open consultation process and submitted for finalization to the EOOS forum. Elements for the roadmap are proposed in the document (see annexes 2 & 3), based on the EuroGOOS-EMB brainstorming workshop and relevant existing strategic documents and gap analyses.

EuroGOOS, EMB and JPI Oceans may take the lead in setting up the group and insuring its representativeness. The group should include 8-10 members and the group secretary.

Special Advisory Groups

The EOOS process will require advice on specific implementation aspects, pilot projects and actions. To this end, ad hoc special advisory groups may be formed. Advisory groups may be set up by the steering group in consultation with the EOOS forum.

Secretariat

In the first instance it is proposed to set up a virtual secretariat including in-kind staff time from the organizations leading the process to date or represented on the steering group. EuroGOOS members have approved a budget to start the process, including coordination meetings and communication outputs (see below).

Communication

Communication will be crucial to kick-start the EOOS implementation. Some preliminary work has been done by EuroGOOS on defining the communication plan as well as the branding and website which will be funded from the budget allocated on EOOS activities.

Website will play a critical role as a central hub of information on both the EOOS process and related background documents. It will include an on-line forum for exchange of ideas and provide the platform to collect stakeholders' views on the proposed EOOS roadmap and implementation actions and projects.

Furthermore, the EOOS communication work will be done in liaison with the ocean literacy initiatives – towards developing a strategy to engage the European citizens in the ocean observing system. This process may evolve into a citizen science project where members of the public gather oceanographic data and feed into observing system through relevant portals. The citizen science activities of the EOOS will be developed in consultation with the EMB working group on citizen science.

Implementation steps

STEP	When?
Define: Main messages (What is EOOS?) EOOS Stakeholders Communication strategy and targets	August 2015
Summary report of the brainstorming workshop (May 2015)	September
EOOS strawman and technical annex	September
EOOS terms of reference	October
Consultation with EuroGOOS and EMB memberships	October
Release website and identity: www.eoos-ocean.eu	October
Open consultation on the strawman and technical annex + consultation with targeted stakeholders	October
Set up steering group (ToR, members)	November
1 st steering group meeting	November
Roadmap released	January 2016
Launch / presentations at stakeholder events (agreed slides)	January onwards
1 st EOOS forum	March
2 nd steering group meeting	April
EOOS sessions at stakeholder events (EuroGOOS/EMB GA, EMD, etc)	May
Collect success stories of stakeholder by-in	June
Secure funding for pilot projects	July

Mechanisms to Deliver an Integrated and Sustained *in situ* European Ocean Observing System (EOOS)

Brainstorming Workshop
12-13 May 2015, Brussels

WELCOME AND INTRODUCTION

Annexes 1 and 2: agenda and list of participants

Jan Mees (Chair, EMB) and Erik Buch (Chair, EuroGOOS) welcomed the participants and opened the workshop. EOOS concept has been adapted by the community, this workshop will contribute to developing a vision and a roadmap.

HOW DO WE DEFINE EOOS?

Experts discussed the think piece developed for the workshop.

Three definitions were proposed as a result of a brainstorming:

- Def 1: "EOOS is a sustained and integrated observing system for Europe's seas in order to understand the current state and key processes that underpin the sustainable management of marine resources"
- Def 2: "EOOS is a sustained and integrated observing system that characterises the state of the European seas and oceans providing effective management into the future"
- Def 3: "EOOS creates knowledge to drive sustainable development and blue growth through understanding and predicting the state of the European seas and oceans"

HORIZON SCANNING FOR THE NEXT GENERATION EOOS

A number of key drivers for an EOOS were identified, ranging from research and technology to societal and environmental:

Research Drivers <ul style="list-style-type: none">• System (ocean) variability• Understand past, present• Predict the future; forecasting• European contribution of marine component of GEO	Technology Drivers <ul style="list-style-type: none">• Big data (processing, connectivity)• Multi-use platforms• Cost effectiveness (new sensors, developers, platforms)• Challenges (batteries, housing)• Crowd sourcing, education, training
Societal Drivers <ul style="list-style-type: none">• Security of supply (food, E, transport)• Blue Growth (provides background knowledge, new knowledge, how can we better exploit and negative impacts)• Environmental legislation (MSFD)• Ecosystem services (\$)	Environmental Drivers <ul style="list-style-type: none">• Environmental protection and legislation• Ocean role in carbon cycle• Hydrographic state, pollution

Other drivers	
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- Human resources (lack of + expertise)
- Funding and long term plan for funding
- New economic models
- Population growth

Why should EOOS exist?

- Need bold, clear statement
- Connectivity – value added
- Links/connections between drivers
- Embracing research and building on it
- Data access, standards, training, facilitate funding by demonstrating value and impact
- Need to coordinate and brand current observing landscape
- Environmental and societal drivers put emphasis on research and technology as driving force; EOOS is needed because technology has changed
- Integration – optimizing performance: already existing infrastructure; coordination, unified voice
- We have a common goal:
 - Ocean state and variability
 - Technology to address different scales; making data available
 - Sustained monitoring and synoptic data.

‘WHAT IF ...’ A COMPELLING PURPOSE FOR THE NEXT GENERATION EOOS

An inclusive, integrated, and sustained pan-European framework is needed to link the currently disparate components by an overarching strategy, maximizing the benefits of optimization, infrastructure use, standardization, open data exchange and capacity building. EOOS will provide a light and flexible coordinating framework to help manage and improve the existing observing effort, making it more efficient and effective at different geographical scales, and for different end-users. It was highlighted that EOOS is a bottom-up initiative.

Specifically, EOOS will:

- Align and integrate existing initiatives to ensure efficiency and value for money and to eliminate duplication of effort;
- Identify gaps in our observing capacity and foster initiatives to fill those gaps;
- Promote standardization of the end-to-end system from observation collection to data management and products;
- Drive capacity building and provide leadership for ocean observation;
- Promote the ocean observing services for multiple sectors including research, policy, management and industry; and
- Promote a common European voice and integration at the international level.

EOOS will bring a real added value to existing observing efforts, empowering those who are working to advance ocean observing in Europe, catalyzing new initiatives in a strategic way, targeting identified gaps and speaking with a wide range of stakeholders.

An overarching framework for an end-to-end EOOS will benefit:

Knowledge for society

- Promote a systems approach to characterize the state of European seas and oceans;
- Create knowledge for stakeholders driving economic and societal benefits;
- Provide a knowledge base for sustainable ocean governance and management of marine resources;
- Offer a framework for connecting all the observation we do to society, improving societal awareness of ocean observation and its value.

Optimization and standardization of existing system

- Improve efficiency and cost effectiveness;
- Provide maximum benefit by optimizing, integrating and connecting the existing capacities;
- Provide strategic guidance and coordination of multidisciplinary aspects;
- Promote standardization of the end-to-end system from observation collection to data management and products;
- Data free at point of access (data policy), provide data and knowledge products;
- Provision of real-time and delayed mode data via an appropriate cyber infrastructure;
- Quality assurance, network monitoring;
- An observational infrastructure; harmonized collection of EOVs at spatial and temporal scales.

European leadership and capability

- Contribute to a Europe-wide dialogue for delivering strategy and foresight – promoting a strong European voice for international cooperation;
- Support knowledge generation and drive European innovation and leadership;
- Help transfer innovation into operations, state of the art science and technology;
- Demonstrate value and impact and in turn drive sustainable funding;
- Drive capacity building and provide leadership for ocean observation.

HOW WILL WE GET THERE?

Roadmap and governance were discussed in four breakout groups, results are presented below:

Group 1

1. EOOS Workshop (may 2015)
2. Strawman (June 2015)
3. Consultation with key actors (Autumn 2015)
4. Brochure (End 2015)
5. Conference and Launch (Summer 2016)
6. Handover to EOOS office and team (2017)
 - a. Design website/portal
 - b. Map landscape
 - c. Marketing and impact analysis of EOOS products\Coordinating meetings and activities
 - d. International point of contact

Group 2

1. Sell the Concept/Idea (M3)
 - Briefing Doc and Slides for community
 - Added value advantages
 - Ambassadors

- Influence call text 2016/2017
 - COST Action (network) (M2-4)
 - Current status/optimal design
2. Critical Path Analysis (M1)
 3. Early involvement of key players (M1-3)
 4. Visit stakeholders and interaction (M3-24)
 5. Possible EU project (4 years)
 - Work with EUROFLEET
 - Creates permanent system
 - Use EOOS funds to fund initial effort
 - More detailed roadmap: Use TTs/WGs
 6. Long term knowledge repository

Group 3

1. Report Summary
 - a. Review by Workshop experts to a consensus
 - b. Review by scientific external stakeholders e.g. AtlantOS, JERICO-next, EMSO-Dev
 - c. Final Report disseminated to policy and funding agencies e.g. EC, JPI-O, EEA
2. Online/Remote Consultation
3. Forum (EC Convene) and/or Expert Group on EOOS: EOOS Board sustained
4. Project H2020
 - CSA or scientific research? Gap analysis
5. Oceanobs '19

Group 4

1. Communication; contacting stakeholders
2. Design based on project finding (dynico, MyOcean, che-lo points + Int, CIOSS, IMOS)
 - Who: Independent panel of experts
3. Create EOOS Board
 - Operators + Expert + Stakeholder
4. Propose a Coordination Action
5. Promote CSA (Jan 2017)

RECOMMENDATIONS AND NEXT STEPS

EuroGOOS and EMB to produce a document to engage the stakeholders.

Among specific priorities were mentioned:

- Biological and chemical data, including in regional systems;
- Strong connection to end-users;
- Link with all major players, in addition to the EuroGOOS community, e.g. ICES and EEA.

Based on the workshop discussions, EMB and EuroGOOS will prepare a statement to explain the concept and the process that brought to it, and engage stakeholders. All major marine science and operational oceanography actors will be consulted.

Mechanisms to deliver an integrated and sustained *in situ* European Ocean Observing System (EOOS)

12-13 May 2015, BELSPO, Brussels

Day 1 - Tuesday 12 May 2015

The concept, need and purpose for a future EOOS

- 12.30 Lunch
- 13.30 **Welcome – joint opening**
Jan Mees, Chair, EMB and Erik Buch, Chair, EuroGOOS
What brings us here and purpose for the workshop
Networking introductions and agenda (facilitator)
- 14.10 **How do we define EOOS?**
14.45 Kate Larkin, EMB and Glenn Nolan, EuroGOOS
Setting the scene– *why do we need an integrated EOOS? What would it consist of?* Reflection and feedback on the current concept and definition of a future EOOS
- Horizon scanning for the next generation EOOS**
What are the external drivers that will shape a future EOOS? What's coming down the line that we need to be aware of to help us prepare a fit-for-purpose EOOS?
Discussion to map out the research, technological, societal, environmental and othersignificant drivers
- 15.45 Break
- 16.00 **Horizon scanning for the next generation EOOS** Niall McDonnough, EMB
Highlights from the discussions: *What's this telling us about the opportunities, challengesand possibilities for a future EOOS?*
- 16.30 **'What if ...' A compelling purpose for the next generation EOOS**
Looking ahead – it's 2030 and a fully integrated EOOS in situ component is successfully operating. What is it doing and what impact is it having? What is its core purpose?
Explore, identify and discuss the impacts, benefits, key players and core purpose(s) of a future EOOS – in small groups and plenary.
- 17.50 **Brief review** of the discussions so far
- 18.00 **End of day 1**
- 19.30 Dinner for all participants in Brussels

Day 2 – Wednesday 13 May 2015

Towards building a fully integrated *in situ* component for EOOS

8.30	Coffee available
9.00	Welcome back and agenda for today
9.15	The purpose of a future EOOS Review the EOOS definition, elements of purpose and themes from yesterday
9.30	How will we get there? A road map to develop the EOOS <i>Who are the key players and how would they work together? What are the main (inter-connected) stages in the process? What are the first actions that will get this started?</i> Small groups work in parallel, to map out and propose a process to deliver the EOOS
Coffee available during the group work	
11.45	Plenary: headlines, visuals and insights from the groups
12.30	Lunch
13.45	An emerging vision - brief recap of themes from the morning
14.00	How will we get there? Governance and sustainability <i>What governance/ coordination framework already exist and should we put in place? How do we achieve a science and technical advisory process for EOOS? How do we achieve sustainable funding?</i> Small groups work in parallel on each question, coming out with clear propositions
15.00	Plenary: propositions from the groups and moderated discussion Taking it forward: <i>What key actions now will start to make this happen?</i>
15.45	Break (or when required)
16.00	Recommendations and next steps
17.00	Actions, commitments and timeframe Closing remarks
Close of the workshop	

PARTICIPANTS

Johannes Karstensen	GEOMAR, Germany	jkarstensen@geomar.de
Leonidas Perivoliotis	HCMR, Greece	lperiv@hcmr.gr
Richard Lampitt	NOC, UK	rsl@noc.ac.uk
Paolo Favali	INGV, Italy	paolo.favali@ingv.it pfavali.interimoffice@emso-eu.org interim.office@emso-eu.org
Joaquin Tintoré	CSIC-UIB Spain	jtintore@socib.es
Julien Mader	AZTI-Technalia, Spain	jmader@azti.es

Pierre Testor	CNRS and LOCEAN-IPSL, France	pierre.testor@locean-ipsl.upmc.fr
Jun She	Danish Meteorological Institute, Denmark	js@dmi.dk
Adriana Zingone	SZN, Italy	adriana.zingone@szn.it
Fabien Roquet	MISU, Univ. of Stockholm, Sweden	roquet@misu.su.se
Icarus Allen	PML, UK	jia@pml.ac.uk
Phil Weaver	Seascope Consultants Ltd, UK	phil.weaver@seascopeconsultants.co.uk
Alan Stevenson	BGS, UK	agst@bgs.ac.uk
Jean-François Masset	IFREMER, Brussels office	jfmasset@clora.eu
Per Nieuwjaar	IMR, Norway	per.nieuwejaar@imr.no
Alessandro Crise	OGS, Italy	acrise@ogs.trieste.it
Isabel Sousa Pinto	CIIMAR, Portugal	ispinto@ciimar.up.pt
Gilles Reverdin	CORIOLIS, France	reve@locean-ipsl.upmc.fr
Burkard Baschek	HZG, Germany	Burkard.Baschek@hzg.de
Stein Sandven	NERSC, Norway	stein.sandven@nersc.no
Jan Mees	Flemish Marine Institute (VLIZ), Belgium	jan.mees@vliz.be

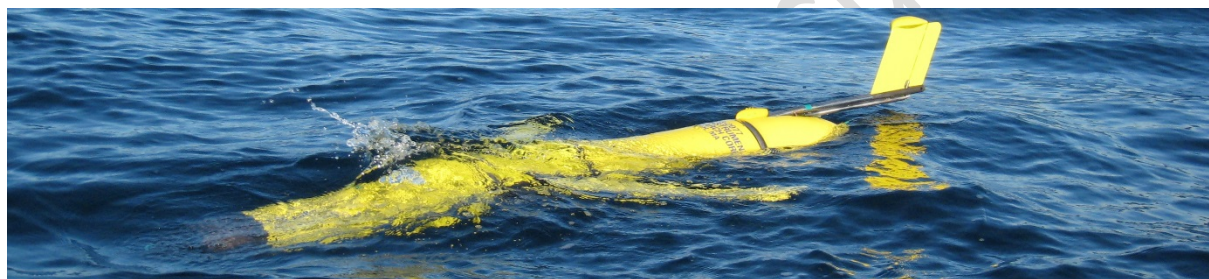
Isobel McConnan	facilitator	isobel.mcconnan@ntlworld.com
Glenn Nolan	EuroGOOS, Belgium	glenn.nolan@eurogoos.eu
Erik Buch	EuroGOOS, Belgium	erik.buch@eurogoos.eu
Yota Antoniou	EuroGOOS, Belgium	yota.antoniou@eurogoos.eu
Niall McDonough	European Marine Board, Belgium	nmcdonough@esf.org
Kate Larkin	European Marine Board, Belgium	klarkin@esf.org
Karen Donaldson	European Marine Board, Belgium	karend@vliz.be

Towards a **European Ocean Observing System (EOOS)**

The [European Marine Board](#) and [EuroGOOS](#) are working together to promote and develop a new framework for advancing Europe's capacity for ocean observation. This framework is referred to as the European Ocean Observing System, or EOOS. We have prepared this short statement to explain the concept of EOOS and to inform stakeholders about the process and how they can contribute.

Why do we need ocean observations?

Recently valued at US \$24 trillion, our global ocean has been called the world's seventh largest economy⁹. The Ocean is a medium for tourism, transport and commerce and provide a crucial source of food, water, energy, raw materials and a range of ecosystem services necessary for supporting human life. However, marine ecosystems are under considerable pressure from global climate change, ocean acidification as well as localized impacts from human pollution and commercial activities. We need to achieve a balance between protecting our marine environment and supporting Blue Growth. Sustained observations of our European seas and global Ocean have never been more important. Data and information on the state and variability of our marine environment can help us to effectively manage it and minimize harmful impacts.



Gliders are autonomous underwater vehicles that can be deployed for long period to collect oceanographic data. They are one of the many components of the *in situ* observing system.

Do we not already have an observing system in Europe?

Yes, there are numerous programmes, projects and initiatives working to develop and implement effective ocean observing capacities. However, this capability, especially the *in situ* (seaborne) component, is highly fragmented and complex. Hence, in Europe we do not currently have an observing "system," rather a fragmented assemblage of components with a varying but limited degree of coordination or interaction between them. These disparate components are not linked by an overarching strategy and generally suffer from a lack of sustained funding. This is necessary to generate the long-term data we need to track and understand changing marine environments and to support projections of future change.

What is EOOS?

EOOS is a coordinating framework designed to align and integrate Europe's ocean observing capacity; to promote a systematic and collaborative approach to collecting information on the state and variability of our seas; and to underpin sustainable management of the marine environment and its resources.

EOOS will not take ownership or control of ocean observing in Europe. Rather, EOOS will provide a light and flexible coordinating framework to help manage and improve the existing observing effort, making it more efficient and effective at different geographical scales.

⁹ <http://wwfintcampaigns.s3.amazonaws.com/ocean/media/RevivingOceanEconomy-REPORT-lowres.pdf>

Specifically, EOOS will:

- Align and integrate existing initiatives to ensure efficiency and value for money and to eliminate duplication of effort;
- Identify gaps in our observing capacity and foster initiatives to fill those gaps;
- Promote observing capacities which can be used by multiple sectors including research, policy, management and industry; and
- Ensure that European ocean observing is integrated into the global system by providing a focal point for interaction with, for example, GOOS, GEOSS and partner initiatives outside of Europe.

In this way, EOOS can help add value to existing observing efforts, empowering those who are already working to advance ocean observing in Europe, and catalyzing new initiatives in a strategic way, targeting identified gaps and communicating progress to a wide range of stakeholders.

EOOS will also build on much of the development work that has already been done to promote better coordination of ocean observations, both in Europe and internationally. The Framework for Ocean Observing¹⁰, for example, a follow-up initiative of the OceanObs '09 conference, provides a useful template for developing a more integrated global observing system based on community collaboration and voluntary adherence to agreed "Framework Concepts," including the use of "Essential Ocean Variables" or EOVs.

The process so far

The EOOS concept is not new. The Ostend Declaration, adopted at the EuroOCEAN 2010 Conference, called for policy makers to "support the development of a truly integrated and sustainably funded European Ocean Observing System." Since then EOOS has been referenced in many policy documents and has been identified as a strategic goal by the Joint Programming Initiative on Healthy and Productive Seas and Oceans (JPI Oceans)¹¹.

In 2015 the European Marine Board and EuroGOOS agreed to work together to move EOOS from a concept to a reality. As a first step in this process, a dedicated workshop was held in Brussels on 12-13 May 2015. Twenty-two experts directly involved in ocean observing from a scientific, technology or management perspective gathered for one and a half days to discuss the basis for developing EOOS and to map the next steps.



The EOOS Workshop jointly organized by EMB and EuroGOOS, Brussels, 12-13 May 2015

It was agreed by all of the workshop participants that for EOOS to be successful, it is crucial to achieve the buy-in of relevant stakeholders. We have produced this short statement to inform stakeholders about how they can participate.

We need your help...

EOOS is still a concept. To make it a reality will require support from across the full spectrum of providers and users of marine data. EMB and EuroGOOS cannot do this in isolation. We want to catalyse a process that will ultimately belong to all those with a role in Europe's ocean observing capacity.

¹⁰ <http://www.oceanobs09.net/foo/>

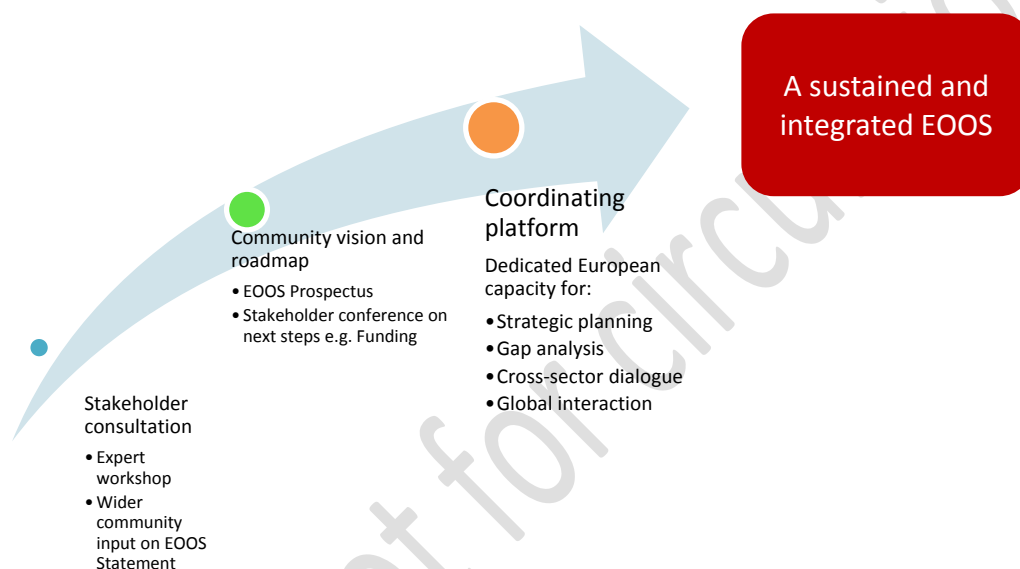
¹¹ <http://www.jpi-oceans.eu/library?refid=246303>

We now call on you as a stakeholder to engage in this process, to ask questions, to send us your views, and hopefully to give us your support in taking this further.

What happens next?

During autumn 2015 we (EMB & EuroGOOS) will engage with ocean observing stakeholders across Europe to seek feedback and gather support. Taking account of the stakeholder inputs we receive, we will produce a more definitive “EOOS Prospectus” which will set out a more detailed vision and roadmap for EOOS. We will outline what are the drivers that will underpin EOOS and address technology, governance and funding issues. In 2016 we aim to hold a conference to assemble the wider stakeholder community and engage with funding bodies to seek ways to attract funding for the setting up of a dedicated capacity to support the development of EOOS.

The EOOS preliminary Roadmap 2015 - 2020



To submit your views or seek further information, please contact either the EMB or EuroGOOS Secretariats at the addresses provided below. A truly integrated EOOS can give Europe one of the most advanced ocean observing systems in the world. Please join with us in making this vision a reality.



Annex 3: EOOS pilot projects (working draft)

Governance and policy context

- Establish a SG for EOOS comprising key players such as EuroGOOS, EMB, JPI, EC, EEA, IOC and Member State representatives
- Define the Terms of Reference for the EOOS Forum
- Further define a roadmap for EOOS

Observing system: current status and readiness

- Re-examine EEA 2010 and other studies e.g. SEAS-ERA, JPI mapping and analysis study on Europe's ocean observing system and revise in light of developments over the intervening period.

Requirements for sustained ocean observations in Europe

- Societal and policy e.g. MSFD, requirements
- Essential Ocean Variables definition and further requirements from the Framework for Ocean Observing
- GOOS Strategic Mapping
- Science/wider stakeholder advisory process for EOOS

Gap analysis: OSE/OSSE experiments + Seabasin Checkpoint/Marine Spatial Planning methodology to define important gaps in the EOOS (both for the coastal and open/deep ocean).

- Lessons learned from previous projects (ODON, ECOOP, MyOcean, OPEC, Jerico etc)
- Conduct OSE/OSSE experiments for an optimal observing system (strong link to activity in AtlantOS, and JERICO Next, Med Sea, Black Sea and Arctic observing calls as well as relevant SC2 calls of H2020).
- Generate Marine Spatial Planning maps and model forecast skill maps for all European regional sea basins.
- Assess observing system fitness for purpose on the basis of combined Seabasin checkpoint type analysis.

Unlocking valuable existing observational data sets not currently shared (focus on biogeochemistry and ecosystem services)

- Document the full suite of ocean observation data and knowledge producers (spanning operational oceanographic and wider marine scientific/stakeholder community)
- Document barriers to the release of oceanographic data in European system
- Target key data sets for release to the wider ocean observing system portals
- Establish technical standard and institutional agreement to transmit unlocked data sets to European data portals.

Defining gaps in the bathymetric mapping of the EOOS area

Led by EuroGeoSurveys and EMODNET Geology and Bathymetry leaders.

- Compile up to date map of European seabed mapping coverage (complete and planned).
- Liaise with ocean forecasters to establish areas where models are inaccurate due to unknown/changing bathymetry.
- Feedback ocean observing community priorities to entities engaged in MS mapping activities

Pilot demonstrators showing enhanced ocean forecasts based on better observations becoming available

- Test example for physical modelling
- Test example from ecological modelling
- Use of ocean observations for biodiversity and biological applications.
- Potential for enhanced knowledge for policy making e.g. MSFD (need examples/applications here)

Communication and citizen science

- Develop a communication strategy to engage the European citizen in the ocean observing system, building on ongoing projects on ocean literacy e.g. SeaChange
- Pilot citizen science project where members of the public gather oceanographic data and feed into observing system through relevant portals.