eoos

European
Ocean
Observing
System

Towards an end-to-end, integrated and sustained ocean observing system for Europe

Consultation Document

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Why EOOS?

The ocean provides essential services to society. It regulates climate, provides food and energy, and supports a range of important economic activities. But the ocean and its ecosystems are under threat[1]. They are impacted by climate change (warming, sea level rise, acidification, oxygen depletion) and other human-induced pressures such as pollution, fishing, resource extraction and habitat destruction. The United Nations has recognized the importance of the ocean in its 2030 Agenda for Sustainable Development[2] by including a dedicated Sustainable Development Goal (SDG 14) to 'Conserve and sustainably use the oceans, seas and marine resources for sustainable development.' Fundamental to achieving this will be enhanced knowledge the marine system from coastal seas to the deepest parts of the global ocean. There is now, more than ever, a need to continuously observe and monitor the ocean.

In April 2016, the 43rd Plenary Session of the IPCC took a decision to produce a Special Report on 'Climate Change, the Oceans and Cryosphere' (SROCC) as part of its forthcoming 6th Assessment Report cycle (AR6). This reflects the growing appreciation of the relationship between the ocean and climate. In this context, ocean observations are imperative to understand and predict the evolution of our weather and climate, and to develop sound mitigation and adaption measures to climate change[3].

Ocean data are also essential for a better and sustainable management of human activities in coastal seas and increasingly in the open ocean, to understand the impacts of such activities, and to support the development of a sustainable maritime economy. This view was reinforced in May 2016 by the Science and Technology Ministers of the G7 in their Tsukuba Communiqué[4]. The Communiqué stated that 'many parts of the ocean interior are not sufficiently observed' and that 'it is crucial to develop far stronger scientific knowledge necessary to assess the ongoing changes [in the ocean] and their impact on economies.' In short, sustainable Blue Growth is simply not possible without sustained ocean observations.

The scientific community has played an important role in developing the observing system that exists today. Technologies, methods and standards have been developed for collecting an ever-increasing array of marine data. Because the ocean is costly to access and highly variable and unpredictable, collecting marine data in a systematic way is challenging, especially in areas further offshore and in deeper waters. Efforts to improve capability, durability and efficiency and to reduce the costs of observing and surveying equipment are continually ongoing. However, major gaps still exist across a range of important geological, chemical, biological, and ecological parameters necessary for understanding ocean health and its links to human wellbeing.

There is an accepted need to operationalize the collection of a much broader range of marine environmental parameters and to make data available and usable by multiple sectors, including research, industry, and competent national authorities with responsibility for managing marine and maritime activities.

[1] Laffoley, D. & Baxter, J. M. (editors). 2016. Explaining ocean warming: Causes, scale, effects and consequences. Full report. Gland, Switzerland: IUCN. 456 pp. ISBN 978-2-8317-1806-4

[2] http://www.undp.org/content/undp/en/home/sdgoverview/post-2015-development-agenda/

[3] Schulz, M. et al. (2015) The Ocean-Climate Nexus: The Critical Role of Ocean Science in Responding to Climate Change. European Marine Board, Ostend, Belgium.

[4] http://www8.cao.go.jp/cstp/english/others/20160517communique.pdf

At European level, major strides have been made since the adoption of the EU Marine Knowledge 2020 Strategy, including the establishment of the European Marine Observation and Data Network (EMODnet) and the development of the Copernicus Earth monitoring programme and its marine component. Europe now needs to take the next step towards an overarching integrated, and sustained pan-European framework for ocean observation. This framework is referred to as the European Ocean Observing System, or EOOS.

Currently, there are numerous programmes, projects and initiatives working to develop and implement effective ocean observing capacities, operating at different geographical scales (local, national, regional, pan-European and international) and different timescales (real-time, daily, monthly, annually, etc). These capabilities are, by their nature, highly fragmented and complex. While there is some coordination at global level, for example under the auspices of GOOS[5] and JCOMM[6], a strengthening in coordination at regional scale is necessary to ensure that the right observations are made and that they are made on a systematic and sustained basis. An overarching strategy across all measurement platforms is required to ensure that best use is made of limited resources in Member States and at European level. EOOS will link the currently disparate components of the observing system in Europe and will promote novel technology and infrastructure development, standardization, open access to data, and capacity building.

EuroGOOS and the European Marine Board are working together to promote and facilitate the establishment of EOOS as an overarching ocean observing framework for Europe. In doing so, these networks are taking the initial steps to catalyse the development of EOOS on behalf of a wide community of ocean data providers, infrastructure managers, technology developers, data users and ocean observing stakeholders.

This document is designed to support a first engagement with a broad community of stakeholders on how EOOS should be taken forward. This document aims to:

- Describe in simple language what EOOS is, why it is needed, and some of the next steps in making it happen;
- Engage political and policy stakeholders to ensure that the EOOS vision and implementation is in step with current and planned policy objectives in Europe and further afield;
- Provide the basis for an open stakeholder consultation on EOOS which will gather views on the scope of EOOS and how it should evolve.

[5] The Global Ocean Observing System (GOOS) managed by UNESCO's Intergovernmental Oceanographic Commission (IOC) http://www.goosocean.org/

[6] Joint Technical Commission for Oceanography and Marine Meteorology (JCOMM) jointly operated by IOC-UNESCO and the World Meteorological Organization (WMO) http://www.jcomm.info/

A definition and vision for EOOS

The European Ocean Observing System, EOOS, is a coordinating framework designed to align and integrate Europe's ocean observing capacity in the long-term; to promote a systematic and collaborative approach to collecting sustained 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 and for different users.

Specifically, EOOS will:

- Align and connect existing initiatives to ensure efficiency and value for money;
- Identify gaps in the European observing capacity and foster initiatives to fill those gaps;
- Promote observing capacities which can benefit multiple sectors including research, policy, management and industry;
- Ensure that European ocean observing is integrated into the global observation system(s) by providing a focal point for interaction with international programmes (e.g. 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 catalysing new initiatives in a strategic way, targeting identified gaps and communicating progress to a wide range of stakeholders. EOOS will act as a framework to bring the community together to set priorities and act as a single, well-organized voice for Europe, facilitating the exchange of best practice and capacity.

EOOS will also build on the work that has already been done to promote better coordination of ocean observations, both in Europe and internationally. The Framework for Ocean Observing[7], 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 (EOVs).

EOOS Drivers

The European Ocean Observing System, EOOS, is a comprehensive, sustained and integrated approach to ocean observation in Europe. EOOS offers coordination and strategy to the wealth of existing ocean observation initiatives maximizing societal benefits. There are a number of key drivers for EOOS, ranging from research and technology to societal and environmental. A non-exhaustive list is provided below.

Research Drivers
- Ocean variability
- Impacts of human activities and climate change
- Understanding past and present ocean state
- Predicting/forecasting future state
- Biodiversity and ecosystem functioning

Technology Drivers
- Big data (processing, connectivity)
- Multi-use platforms
- Cost effectiveness (sensors and systems)
- Challenges (autonomy, robustness)
- Crowd sourcing, education and training

Societal Drivers
- Food security
- Population growth
- Energy and transport
- Human health
- Climate change
- Maritime economy
- Ecosystem services
- Exploration and recreation

[7] http://www.oceanobs09.net/foo/

Environmental Drivers
- Environmental protection and legislation
- Ocean role in carbon cycle and water cycle
- Hydrographic state
- Pollution monitoring

Policy Drivers (EU)
- Marine Knowledge 2020
- Marine Strategy Framework Directive
- Water Framework Directive
- Maritime Spatial Planning Directive
- Common Fisheries Policy
- Blue Growth Strategy

Other drivers
- Develop and retain expertise
- Funding and long-term planning
- European marine contribution to GOOS and GEO

The scope of EOOS

EOOS aims to provide a framework within which marine observations can be sustained and made available on a continuous basis for applications ranging from real-time services, through ocean health to climate services. As currently envisaged, the scope of EOOS should be all-encompassing, taking into account the systematic collection of all kinds of data from the marine environment, focusing on the European effort, but set within a global context.

It is important to note that use of the word 'ocean' in the context of EOOS, is based on the understanding of a single interconnected global ocean which includes all parts of that system, from shallow coastal waters to the open ocean and deep sea. Moreover, from a geographical perspective, EOOS focuses on the European effort in making systematic observations, but taking a global perspective. European effort is predominantly focused on European seas, but can also include involvement in ocean observing anywhere in the world including outermost regions and international waters (e.g. in the Pacific or Arctic), and all aspects of technology development.

EOOS also takes a broad perspective in terms of the type of observations that are included in its scope. Essentially, EOOS will take account of all systematic efforts to collect marine environmental data from the ocean. This includes highly automated physical observations, through geological information, bathymetric surveys, ocean chemistry, and biological data collection, most of which is not automated (e.g. fisheries surveys, benthic video footage, etc). It will include both real-time (or near real-time) and delayed modes of data collection and both research-driven and operational data collection. As a long-term goal, EOOS will work to improve the coordination and integration of disparate programmes of data collection to catalyse innovation and improve efficiency. As it is still very early in the EOOS process, part of the stakeholder consultation will be to collect views on the scope of EOOS.

EU support for ocean observing

The adoption of the European Union Integrated Maritime Policy in 2007 represented a major step-change in the policy context within which maritime activities take place in European waters. The Integrated Maritime Policy recognised the interconnected nature of the marine environment and the need to manage maritime activities in an integrated way. Since then, several further strategies, policies and legislative instruments have been adopted by the European Union to advance the core goals of the Integrated Maritime Policy and to promote sustainable management of human activities in Europe's seas. These include the Marine Strategy Framework Directive (2008), the EU Blue Growth Strategy (2012), and the Marine Spatial Planning Directive (2014). The successful implementation of these and many other marine and non-marine legislative instruments is strongly dependent on high quality data and information on the state and variability of the marine environment.

The Marine Knowledge 2020 Strategy[8], adopted in 2010, was specifically designed to address the need for marine data and information to underpin maritime activities and protection of the marine environment. The associated Marine Knowledge 2020 Roadmap (2014)[9] highlighted progress and set out the next steps. Notably, it estimated that making high-quality marine data held by public bodies in the EU widely available, would improve productivity by over

[8] COM(2010) 461 final http://ec.europa.eu/maritimeaffairs/policy/marine_knowledge_2020/index_en.htm
[9] SWD(2014) 149 final http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A52014SC0149

€1 billion a year. Furthermore, making data more available and accessible to both public and private sector users will drive forward innovation and competition. The open data concept is now also becoming embedded in EU research policy. In April 2016, the European Commission published a communication on the European Cloud Initiative – Building a competitive data and knowledge economy in Europe[10]. One of the actions arising from this policy initiative will be to make all scientific data produced by the Horizon 2020 programme open by default, whereby projects implement Data Management Plans to make research data findable, accessible, interoperable and reusable (with some opt-out options, e.g. in the case of commercial sensitivity, personal privacy, security, etc).

Marine Knowledge 2020 reinforced the idea that data should be collected once but used many times by multiple users and that marine data from all sources should be made openly available and accessible as much as possible. The European Marine Observation and Data Network (EMODnet), the Copernicus Marine Environment Monitoring Service (CMEMS) and the Data Collection Framework (DCF) for fisheries are the EU's primary mechanisms for achieving this goal.

EMODnet is providing access to bathymetric, geological, physical, chemical, biological, and habitat data from the seas and ocean as well as human activity on the ocean. The legal basis for EMODnet allows for the financial support of the observations themselves but the resources available have only allowed this option to be taken up to a very limited extent (for example, a grant was provided to the Argo programme). The main priorities have been to make sure that data already collected are accessible and to check whether they are fit for purpose.

In Copernicus, the European Commission has put in place an ambitious Earth Monitoring programme. This includes the development of a long-term series of satellite missions (Sentinels) and a set of services related to environmental and security issues. The Copernicus Marine Environment Monitoring Service (CMEMS) provides operational marine services for maritime safety, effective use of marine resources, healthy waters, informing coastal and marine hazard services, and supporting climate services. Many public/private downstream services and applications build and develop on CMEMS which fosters market development and the development of the global ocean economy. The availability of both *in-situ* and remotely sensed marine observations is critical for the delivery of CMEMS. Many elements of the existing *in-situ* observing system are, however, not sustained and there are critical gaps for key observations (in particular for biological/biogeochemical variables). This is a high-risk area for Copernicus.

In addition to these core sustained programmes, the EU has also supported a large number of projects related to ocean observing through consecutive Framework Programmes and, most recently, Horizon 2020. Such funding has allowed the scientific community, in particular, to play a key role in establishing many components of Europe's current observing capacity. Some of these projects, such as EMSO (European Multidisciplinary Seafloor Observatory) and Euro-Argo, were funded by the European Commission as preparatory actions for ESFRI (European Strategy Forum for Research Infrastructures). ESFRI itself has played an important role in identifying and prioritising key infrastructures across all domains of science, some of which fully or partly contribute to ocean observing. Euro-Argo has demonstrated the success of such support by progressing from a short-term to sustained operation following the establishment of an ERIC (European Research Infrastructure Consortium), a legal form specifically designed by the EU to enable Member States to collectively contribute to a common infrastructure.

Horizon 2020 is building on the many previous Framework Programme projects by funding large coordination actions on ocean observing focused on basin scale and the need for international cooperation. AtlantOS (Developing in-situ Atlantic Ocean Observations for a better management and sustainable exploitation of the maritime resources) is a €20.65 million

[10] COM(2016) 178 final http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM:2016:0178:FIN

project funded under the EU Horizon 2020 programme. The four-year project (2015-2019) involves 62 partners from 18 countries (13 EU & 5 non-EU). The overarching objective of AtlantOS is to achieve a transition from a loosely coordinated set of existing ocean observing activities to a sustainable, efficient, and fit-for-purpose Integrated Atlantic Ocean Observing System. Similar large-scale coordination actions for the Arctic (the IntarOS project), as well as for the Mediterranean and the Black Sea will be launched in the near future. These regional observing efforts will be key drivers of progress towards a long-term sustained EOOS.

On 8 July 2016, Karmenu Vella, EU Commissioner for Environment, Maritime Affairs and Fisheries, indicated to the heads of European marine institutes that the Commission would begin to consult stakeholders, assess benefits and develop options for further enhancing Europe's ocean observing capacity[11]. However, there is still significant scope for progress to ensure that all types of data, from whichever source/provider, are made available and in a format that is accessible and useable, not just by scientific experts, but by commercial users and regional and national competent authorities with responsibility for managing and monitoring the marine environment. This could also include the collection of data from industry and vessels of opportunity, such that industry is acknowledged as both a data provider and user. The Commission has indicated that it will shortly issue a call for expressions of interest in participating in an expert group on marine observation and data. This will include representatives of the main users of data such as shipping, ports, offshore energy, fisheries, aquaculture, etc.

The EU's 2014-2020 Financial Framework has greatly increased the effort devoted to ocean observation. Copernicus has moved from a set of research projects to an operational programme, with a total annual investment in the order of €170m on its ocean observing component (part of the Sentinel satellite programme which covers the full spectrum of satellite earth observations, including non-marine applications). The European Maritime and Fisheries Fund (EMFF) has increased its contribution to the Data Collection Framework (DCF) for fisheries, with an annual investment of approximately €70m in EU funds over the same period. Finally, the EMFF has also supported the setting up of the next phase of EMODnet with an investment of around €10m per year. Of course, many observations are made as part of shorter-term EU research projects. At the time of its completion in 2014, the EGDI-Scope[12] project concluded that the EU had spent more than €700 million trying to obtain a coherent geological picture of Europe (including terrestrial geology). The main difficulty is that EU projects tend to run for 3-4 years and that progress usually stops at the end of the project. Efforts are now being made, notably through the EMODnet data ingestion facility, to ensure that marine data collected through research projects are not lost to posterity.

The business case for sustained ocean observing in Europe

The OECD has estimated the gross value added (GVA) of the global ocean economy in 2010, measured in terms of ocean-based industries' contribution to economic output and employment, at USD $1.5 trillion, or approximately 2.5% of the total global GVA[13]. Similarly, the WWF has proposed a figure for 'gross marine product' – equivalent to a country's annual gross domestic product – of at least USD $2.5 trillion, and estimates the total asset value of the ocean at USD $24 trillion[14]. These reports acknowledge that such figures are vast underestimates as many non-market and non-monetary values and services provided by the ocean are not taken into account (e.g. carbon sequestration, climate regulation, bioremediation, and cultural, aesthetic and recreational values).

The provision of sustained data and information on the state and variability of coastal seas and the global ocean, including downstream products and services, is essential to increase

[11] https://webgate.ec.europa.eu/maritimeforum/en/node/3938
[12] European Geological Data Infrastructure www.egdi-scope.eu
[13] OECD (2016), The Ocean Economy in 2030, OECD Publishing, Paris http://dx.doi.org/10.1787/9789264251724-en
[14] Hoegh-Guldberg, O. et al. 2015. Reviving the Ocean Economy: the case for action – 2015 http://d2ouvy59p0dg6k.cloudfront.net/downloads/reviving_ocean_economy_report_hi_res.pdf

efficiency and reduce risk across multiple sectors in the maritime economy. The EU Blue Growth Strategy[15] will only be sustainable if society understands, manages and minimizes the impacts of commercial activities on the health and productivity of Europe's seas. Marine ecosystems are already under considerable pressure from global climate change and ocean acidification as well as localized impacts from human pollution and commercial activities. Hence, a particularly challenging goal is to achieve a balance between protecting the marine environment and supporting Blue Growth.

The value chain for economic activity based on ocean information is well established (U.S. IOOS report 2016)[16]. Many Blue Growth sectors such as marine tourism, aquaculture, shipping, and offshore energy, rely on ocean observations to support decision making. The critical state of the ocean health on the one hand, and the significant economic value of the ocean economy on the other (OECD 2016; IOOS 2016), have put a strong emphasis on ocean observing to deliver knowledge, information, and services to a wide range of users. However, pressure in public budgets is compromising this service. Sustained funding for ocean observations is lacking and the community's capabilities are declining in some areas where they should be expanding. Europe has made an outstanding effort to develop a satellite observing system (i.e. Copernicus and Sentinel satellites) but the in-situ observing system is far from complete and in some cases contracting.

There is a clear need, therefore, to make a stronger case to decision makers on the economic and societal value of accurate, timely and sustained provision of marine data. Such an assessment would have considerable value in stimulating investment in long-term and multi-parametric ocean observing and seabed mapping programmes. Taking account of previous studies and current initiatives in this area, it is proposed to develop a business case for ocean observations in the context of existing and potential European capacity operating within a global system. Some work has already been done on this, both in Europe and elsewhere. Notably, the European Commission is launching a study to consolidate this earlier work that will report by mid-2017.

Assessing current status and gaps in the ocean observing system

Any attempt to develop an EOOS over-arching framework needs to take account of what is already in place. Original baselines for the Global Ocean Observing System (GOOS) were dominated by the requirement for physical observations (for climate), where technology was relatively mature and easy to deploy and maintain. While some ocean observing system elements are well organized with common technology and standards and established international coordinating project offices (e.g. Argo profiling floats), others are operated by a dispersed community of actors with limited standardization and often with a solely national focus for the observations being maintained. It is clear that the systematic collection of physical marine data must also be complemented by a much greater and more operational approach to collecting chemical, biological and biogeochemical data to underpin environmental assessments and decision support.

An important overarching function of the proposed EOOS will be to manage a dynamic and continually updated inventory of the ocean observing landscape. Such an inventory can provide an assessment of the spatial and temporal coverage and gaps for different types of observation infrastructure and capacity, measurements and data across all European sea basins. Hence, one of the first priority actions of EOOS as a coordinating framework will be to conduct an initial mapping of the system to determine the current baseline. This is a complex process because the requirements of the system are constantly changing and because there is imperfect information on the observing system elements.

Any inventory will need to take into account the extensive work already conducted by the community over recent years. For example, EOOS can build on the EMODnet Sea-basin Check-points[17] that are currently examining observing system fitness for purpose, identifying how far scientific, societal or commercial questions can currently be answered by the present ocean

[15] COM(2012) 494 final http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0494&from=en
[16] The Ocean Enterprise: A study of U.S. business activity in ocean measurement, observation and forecasting. U.S. IOOS http://eurogoos.eu/download/publications/OE-REPORT-FEB2016-FINAL-v10.2.pdf
[17] http://www.emodnet.eu/checkpoints

observing system in each European sea basin. A stakeholder workshop in February 2017 will take stock of findings so far. The results of Horizon 2020 projects such as AtlantOS will also be taken into account.

Investigating barriers to achieving open data access and policy for all kinds of marine data and unlocking the potential of existing data sets not currently openly available will also be important. This is currently being done by the teams responsible for the different EMODnet portals[18] and may lead to a paper that will identify datasets whose unreasonable access conditions contribute to unnecessary uncertainty in knowledge of the behaviour of European seas.

How will EOOS be run?

The collaboration between EuroGOOS and European Marine Board is designed to stimulate the transition of EOOS from a visionary concept into a tangible initiative. EOOS needs to be developed as an inclusive, coordinating framework, bringing together three key groups: users, system implementers and funders. Hence it needs buy-in and support of the bottom-up community of infrastructure owners and data providers and the top-down institutions (European Commission, Member State competent authorities) that can provide political endorsement and, potentially, some resources.

Establishing a fit-for-purpose governance structure to guide the development and implementation of EOOS will be crucial to its success. A major challenge is to present the complex relationship between projects and programmes in a way that is understandable to non-specialists. The governance options for EOOS are potentially broad; from a 'light-touch' EOOS where a steering group guides the development through the use of fora, implementation groups and advisory boards, to the establishment of a secretariat to assist the implementation of EOOS in cooperation with the European Commission and Member States.

As a first step, EuroGOOS and the European Marine Board have set up a steering group for EOOS comprising experts from EuroGOOS, EMB, JPI Oceans, the European Commission, and a limited number of Member State experts (Steering Group members are listed in the annex). The primary function of this steering group, initially at least, is to develop this EOOS consultation document and to open this up to a wider community consultation so that a longer term governance structure and priority actions can be defined.

Next steps in the EOOS process

During and since the first EOOS Steering Group meeting in April 2016, a number of early actions have been identified as next steps for the EOOS process. These include, but are not restricted to:

- Organize an event to discuss and promote EOOS with decision makers and ocean observing stakeholders and launch the open EOOS consultation[19].
- Implement a stakeholder consultation via an open online survey and targeted consultations through meetings.
- On the basis of the results of the consultation, develop a medium-term implementation plan for EOOS and seek EU and national resources to undertake early actions.
- Develop a communications strategy to promote EOOS and its development to stakeholders and to promote the value of ocean observing to the wider public.
- Investigate specific 'EOOS pilot' projects to address ocean observation gaps identified through the consultation process.
- Develop and agree an appropriate governance and funding model for EOOS in the medium term and take steps to put these elements in place.
- Encourage participation in the forthcoming European Commission (DG MARE) Expert Group on Marine Observation and Data.
- Present progress on EOOS at the international Ocean Obs conference 2019.

[18] https://webgate.ec.europa.eu/maritimeforum/en/node/3946
[19] The European Parliament event, Building a European Ocean Observing System, 08 September 2016, hosted by Ricardo Serrão Santos, MEP http://eurogoos.eu/2016/09/12/eoos-event-european-parliament-main-outcomes/

Glossary of Acronyms

CMEMS: Copernicus Marine Environment Monitoring Service

DCF: Data Collection Framework

DG MARE: European Commission Directorate-General for Maritime Affairs and Fisheries

EEZ: Exclusive Economic Zone

EGDI-Scope: European Geological Data Infrastructure – Scope

EMB: European Marine Board

EMODnet: European Marine Observation and Data Network

EOOS: European Ocean Observing System

EOVs: Essential Ocean Variables

ESFRI: European Strategy Forum for Research Infrastructures

EuroGOOS: European Global Ocean Observing System

GEO: Group on Earth Observations

GEOBON: Group on Earth Observations Biodiversity Observation Network

GEOSS: Global Earth Observation System of Systems

GOOS: Global Ocean Observing System

IPCC: Intergovernmental Panel on Climate Change

IOOS: U.S. Integrated Ocean Observing System

JCOMM: Joint Technical Commission for Oceanography and Marine Meteorology

JPI Oceans: Joint Programming Initiative Healthy and Productive Seas and Oceans

MSFD: Marine Strategy Framework Directive

OECD: Organisation for Economic Co-operation and Development

SDG: Sustainable Development Goal

SROCC: Special Report on Climate Change

ANNEX

Members of the EOOS Steering Group

Name	Organization
Glenn Nolan (co-Chair)	European Global Ocean Observing System, EuroGOOS
Niall McDonough (co-Chair)	European Marine Board, EMB
George Petihakis	Hellenic Centre for Marine Research, HCMR, Greece
Pierre-Yves Le Traon	Mercator Ocean and French Research Institute for Exploitation of the Sea, Ifremer, France
Jacky Wood	Joint Programming Initiative Healthy and Productive Seas and Oceans, JPI Oceans
Isabel Sousa Pinto	Interdisciplinary Centre of Marine and Environmental Research, CIIMAR, Portugal
Iain Shepherd	European Commission Directorate General for Maritime Affairs and Fisheries, EC DG MARE

The EOOS initiative is being promoted as a joint initiative of EuroGOOS and the European Marine Board. The respective memberships of both of these networks include most of the science institutes and agencies that carry out ocean observing activities in Europe.

EuroGOOS identifies priorities, enhances cooperation and promotes the benefits of operational oceanography to ensure sustained observations are made in Europe's seas underpinning a suite of fit-for-purpose products and services for marine and maritime end-users.
www.eurogoos.eu

EuroGOOS
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The European Marine Board provides a platform for its member organizations to develop common priorities, to advance marine research and to bridge the gap between science and policy, in order to meet future marine science challenges and opportunities
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