



European
Ocean
Observing
System

Draft EOOS Strategy 2018-2022

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Draft - for consultation

“The Oceans have a major role to play in implementing the Sustainable Development Goals – a fit-for purpose Ocean Observing System is part of the solution” Martin Visbeck, GEOMAR, Germany.

This strategy is prepared by the EOOS Steering Group and builds on the EOOS Consultation Document 2016 (launched at the dedicated EOOS event at the European Parliament in September 2016), an open stakeholder consultation on EOOS during December 2016 and January 2017, and participants’ inputs at the interactive EOOS Forum 2018 (8 March, Brussels). This draft strategy, together with the draft implementation plan, are released for further stakeholder feedback between 25 April and 15 June 2018. Following updates and approval by the EOOS Steering Group, the final 2018-2022 strategy and implementation plan will be adopted at the EOOS Conference on 21-23 November 2018.

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<http://www.eoos-ocean.eu/>

What is EOOS?

The European Ocean Observing System, EOOS, is a coordinating framework designed to align and integrate Europe's ocean observing capacity for the long term; to promote a systematic and collaborative approach to collecting sustained information on the state and variability of our seas and global ocean; and to underpin sustainable development, protection and conservation of the marine environment and its resources¹.

EOOS will optimize Europe's existing ocean observing capability, add value to existing efforts, and provide a central focal point for strategy, stakeholder engagement and innovation. EOOS will contribute to the global efforts in ocean observing such as GOOS² and GEOSS³, and international policies including the UN 2030 Agenda for Sustainable Development and climate change agreements.

EOOS focuses on the in situ European ocean observation capability, in the context of wider observations, e.g. space and linked to marine and earth system modelling efforts. This may be in European waters, including the European Exclusive Economic Zone (EEZ), or in international waters worldwide. Coordination is most required between existing initiatives across Europe, with further added value considering the global context.

EOOS Vision

By 2030, EOOS will build a coordinated and connected European ocean observation community that puts user needs at its centre, promoting European leadership, driven by stakeholders, and serving the needs of science, society, and innovation.

This document presents 2018-2022 strategy for EOOS. Ultimately, this will advance Europe's capability in ocean observation both for European societal needs and as a leading contributor to the global efforts in ocean observing and international policies.

Why Does Ocean Observing Matter?

Today, ocean observing has an unprecedented potential to help meet societal challenges (EuroGOOS, 2016⁴). Across the world, a multitude of observing systems monitor the ocean **from the coast to the deep sea**. Ocean observing gives us data and information for activities at sea and for decisions made for societal benefit. Key ocean datasets in near real-time underpin maritime activities, marine resources management, ocean and weather forecasting, warnings of and rapid responses to extreme or hazardous events, climate monitoring and prediction. Long-term ocean monitoring across all ocean parameters is also crucial to help track, understand and forecast human impacts and climate change effects on the health of the ocean.

The value of ocean observing has been recognized at the highest international level, among others by the UN Agenda 2030, UN Decade of Ocean Science for Sustainable Development, and G7. Monitoring and

¹ <http://www.eoos-ocean.eu/>

² <http://www.goosocean.org/>

³ www.earthobservations.org

⁴ <http://eurogoos.eu/download/publications/EuroGOOS-Policy-Brief-2016.pdf>

implementing the 17 Sustainable Development Goals (SDGs), not least SDG 14 “Life Below Water”, will require a systematic and strategic approach to ocean observing, supported by adequate infrastructure and investments.

What are the Drivers for European ocean observation?

Drivers for ocean observing range from climate and ocean services to environmental policies and understanding ocean health (EOOS Consultation Document, 2016⁵). Some examples of known and emerging drivers requiring systematic ocean observation that would benefit from a more coordinated EOOS include:

- European policy: a range of European policies (Marine Strategy Framework Directive, Water Framework Directive, Birds and Habitats Directives, Common Fisheries Policy, Integrated Coastal Management Policy and Maritime Spatial Planning Directive);
- Environmental status monitoring and assessment: Europe's Regional Sea Conventions (Helsinki, Oslo-Paris, Barcelona and Bucharest Conventions) are committed to achieving healthy oceans and have sustained monitoring programmes at Regional level which will support several European policies (see above) and the growing demands for sustainable use of resources;
- Fisheries and mariculture: with total food demand projected to increase by 60% by 2050 (FAO, 2017), there will be an increasing need to monitor our oceans from the coast to the open ocean to maximize, diversify and sustain fisheries and mariculture to feed the world population;
- The wider blue economy: the global ocean economy is projected to double in size to \$3 trillion by 2030 (OECD, 2016⁶; Future of the Sea, 2018⁷). In Europe, this ‘blue’ economy is rapidly expanding from the coast to offshore and deep sea. Marine and maritime industries include tourism, aquaculture/mariculture, renewable energy and shipping require regular and reliable ocean data, linked to wider earth system monitoring (e.g. weather, climate);
- **Forecasting and mapping of ocean phenomena and natural hazards: ocean observing provides crucial data for near real-time ocean forecasts and longer-term predictions to build a resilient society, particularly in coastal regions;**
- Pollution including ocean plastics: plastic in the ocean is projected to treble between 2015 and 2025 (Future of the Sea, 2018) and a coordinated approach at European (and global) level is required to clean the ocean and monitor the legacy of plastics and wider pollution;
- Climate change: long-term ocean monitoring is crucial to help track, understand and forecast human impacts and to observe climate change impacts;
- Enhancing basic knowledge of the ocean/its role in the Earth system: once collected, ocean observations can be used for multiple purposes including scientific research driving new understanding and innovation;
- Ocean literacy: ocean observations are key to demonstrate value of the ocean services, both economic and ecosystem. Citizens can engage through citizen science, contributing to both data collection and increasing public awareness.

EOOS will put mechanisms in place so that users and data providers are part of EOOS co-design and societal drivers, needs and requirements feed into the framework’s development.

⁵ http://www.eoos-ocean.eu/download/promotional_materials/EOOS_ConsultationDocument_02.12.2016.pdf

⁶ <http://www.oecd.org/environment/the-ocean-economy-in-2030-9789264251724-en.htm>

⁷ <https://www.gov.uk/government/publications/future-of-the-sea--2>

What does European ocean observing look like now?

Europe's capability in ocean observing and marine monitoring is large and widespread. From operational oceanography to research-driven observing platforms, and from policy driven environmental monitoring of European waters for assessments, e.g. MSFD, to industry-driven coastal and offshore monitoring for marine and maritime economic activities, the stakeholder communities and observing infrastructures are diverse and span all marine environments.

There is currently no single framework connecting the full diversity of European ocean observation and monitoring, its stakeholders, capabilities, and services (EMB, 2013⁸). Regional Sea Conventions are an important framework for basin-scale coordination of marine environmental monitoring and observations. In addition, some key domain-specific frameworks already exist, such as EuroGOOS for operational oceanography and **EMODnet for data discovery**, provision and visualization. However, these are limited by their scope, geography and/or a particular community. This lack of connection across marine and maritime implementers and users of the ocean observing leads to a fragmented system and a missed opportunity for developing a shared strategy and best practices.

EOOS: an opportunity for European society

EOOS will deliver a fit-for-purpose, sustained ocean observing system for Europe that serves user requirements and needs, supplying key datasets for a multitude of drivers (see above) and their stakeholder communities. This is crucial since the demand for seas and ocean data is growing and yet we still lack sustained and continuous in situ data (**physical**, chemical, biological and geological) to support ocean science, marine biology, operational coastal oceanography and sustainable management of our resources.

A consolidated European outlook is crucial to address this since costs for supporting ocean observing infrastructure and maintenance often falls to national investments. In fact, 50% of national budgets for marine science in the European Union are spent on operating and replacing in situ marine infrastructure assets (GOSR, 2017⁹; EMB, 2007¹⁰). **For publicly-funded ocean observing infrastructure, national investment covers the majority of the full costs, with the rest being supported by projects at national, regional or pan-European level. However, many projects are funded over a short term, without an opportunity to transfer their legacy efficiently.** Certain private sector ocean observing infrastructures are fully funded in the long term but opportunities to share infrastructure and data are underexploited, leading to redundancies in the observing system.

An aligned and better coordinated EOOS will help connect communities, highlight opportunities for synergy and reduce costs whilst maximizing benefits. In addition, Europe is also engaged in international observing programs that plan major upgrades to support GCOS¹¹ and wider Sustainable Development Goals (SDGs) implementation and contribute to infrastructures such as ARGO (Deep Argo and BGC Argo future programs) for which Europe will have to further contribute.

⁸ <http://www.marineboard.eu/file/18/download?token=QescBT06>

⁹ <https://en.unesco.org/gosr>

¹⁰ <http://www.marineboard.eu/file/76/download?token=8mqIDlzG>

¹¹ <https://public.wmo.int/en/programmes/global-climate-observing-system>

EOOS Guiding Principles

EOOS will strive to achieve this vision, being:

- **Efficient** and fit-for-purpose as an integral part of the global ocean and wider earth observation system. EOOS will help deliver data, data products and knowledge for society through ocean, weather and climate forecasting to marine and maritime stakeholders supporting sustainable blue economy, and international assessments;
- **Connecting communities**, coordinating efforts and engaging diverse stakeholders across ocean observing implementers, funders, and users from public and private sector research, operational oceanography, industry, and public authorities;
- **Inclusive**, promoting community-driven principles of open data, open science and Responsible Research and Innovation (RRI);
- **Innovative and adaptable**, adopting the Essential Ocean variables (EOVs) as part of a wider network of societally-relevant time-series for climate, operational oceanographic and wider ocean health;
- **Stakeholder-driven**, set in the context of a regular status reviews and bringing in the latest advancements in ocean observation and technology, including horizon scanning for future developments and opportunities;
- **Sustainable**, helping secure long-term financial investment from multiple stakeholders towards sustainable management of the ocean.

Main focal areas

Better Coordinated and Sustained In Situ Ocean Observing

- EOOS will connect stakeholders across the ocean observing community from in situ (in water) observations and remote sensing (e.g. air-borne). However, the coordination focus of EOOS will be predominantly on in situ observations, linked to remote sensing and modelling.
- EOOS will maximize the value and benefit of European ocean observing, producing knowledge, goods and services to serve society. This will be achieved in close association with the ocean modelling and satellite observation communities to ensure full integration and responding to user needs.

Ocean Variables Relevant to Society

EOOS will serve as a European focal point for systematic, long-term observation and monitoring. It will be a platform to discuss, coordinate and implement:

- The international Essential Ocean Variables (EOVs) and Essential Biodiversity Variables (EBVs).
- Define priorities for Europe for wider ocean variables and parameters, from biology to hydrography, used for environmental monitoring assessments, industry and wider stakeholder purposes.
- EOOS will also connect stakeholders measuring a range of additional parameters that have societal relevance. Furthermore, EOOS will provide a framework for stakeholders to communicate and co-design an innovative, adaptable ocean observing system that can respond to new needs, apply emerging technology and invest in observations and big data challenges.

Integrated Ecosystem Approach

EOOS will enable a new era of European ocean observing that has the Integrated Ecosystem Approach at its core. EOOS will help transformation from platform-specific observing to multi-platform, integrated and thematic observing – crucial to assess ecosystem health and functioning.

Who are EOOS Stakeholders?

EOOS will provide coordination and strategy for the multiple organizations and stakeholders operating and maintaining ocean observation and monitoring infrastructures, ocean observation data collection, management and analysis, and connect to the users of the ocean data, products and services.

EOOS will also facilitate an interface for funders (at national, regional and European levels) to meet, exchange and develop a common understanding of the full European capability and the benefits of cooperation. This will allow funders to critically assess the real gaps in the system – as identified by the ocean observing community – leading to greater strategy, planning and ultimately economic efficiency and increased cost-benefit and societal impact.

What is the EOOS Added Value?

EOOS is about adding value to existing initiatives and approaches, promoting greater alignment and coordination both with existing partnerships and identifying new connections. Table 1 outlines some examples of the state-of-play, current challenges and issues and how EOOS could add value.

Table 1. European Ocean Observing System (EOOS): Examples of added value for Europe and worldwide

State of Play	What's the issue?	How can EOOS add value?
Europe has a loosely coordinated ocean observation capacity with no central focal point that represents the diverse communities	Ocean observation is undertaken at national level, at regional level (e.g. regional conventions), or at community level (e.g. operational oceanography). The lack of a single focal point for European ocean observing means that contributions to international agreements or agendas are not fully coordinated or representative of the full European capability.	EOOS will provide a focal point and coordination for the diverse ocean observations across Europe, to both strengthen pan-European communication and European contribution to global initiatives e.g. COP21, UN 2030 Agenda and the 17 SDGs.
Data do not always meet user needs: despite the availability of relevant European ocean data, many are not used for environmental assessments (e.g. for MSFD) due to lack of data provenance, low quality control and accreditation.	Ocean observation data collection is neither standardized nor quality controlled to an agreed level.	EOOS will provide a framework for data quality management, promoting best practice including a standard methodology, high-quality control and tracking data provenance. This will provide uniform data quality for use across research, industry, assessment and policy domains.

Fisheries monitoring for industry regulation is ongoing in parallel with fisheries research and more could be done to share platforms and data and produce data products for users.	Fishing industry, environmental assessment monitoring, operational oceanography and marine research lack connection, often acting as individual components and not collaborating.	EOOS will connect communities and help ensure fisheries and wider marine ecosystem data are available, platforms are optimized and agreed, and duplications reduced.
Copernicus operational ocean forecasting and climate projections lack the required high-quality data to support accurate forecasting of the ocean, particularly for biogeochemical forecast products. This is due to both data coverage and data availability.	Sustained and quality controlled in situ time series are needed. Comprehensive sets of biogeochemical in situ data over the globe are lacking for biogeochemical and ecosystem modelling and CO2 monitoring. It is difficult to access harmonised coastal data (tide gauges, high-frequency radars, bathymetry, etc).	EOOS will help optimise the essential international in situ networks and define methods and techniques to enhance data availability from oceanographic and hydrographic platforms.

Stakeholder Engagement

EOOS will foster a dynamic European ecosystem of collaborative, connected stakeholders across multiple geographical scales from local to whole sea basin. The EOOS framework will be open and inclusive, based on the developing European Open Data¹² and Open Science¹³ policies. Stakeholder interactions and dialogue will be ensured through regular events and joint actions.

EOOS will help stakeholders to align and integrate existing initiatives, ensure efficiency and value for money, and eliminate duplication by:

- Identifying common areas of interest, finding synergies, and complementarities;
- Engage actively with the users of ocean observations, products and services;
- Connecting and exchanging best practice in ocean observation operation and technology;
- Developing a data quality management framework to deliver high-quality data and track data provenance from collection to products;
- Helping align financial and research/wider observation programming at national, regional and European levels;
- Identifying gaps in the in situ observing capacity from previous studies and new assessments, including links with remote sensing and modelling, and foster initiatives to fill those gaps;
- Conduct foresight and horizon scanning of the current and future scientific and technological developments;
- Drive capacity building for the evolving requirements;
- Identify training needs and capacity building gaps across the EOOS value chain;
- Provide leadership for ocean observation;
- Influence the future direction of the European ocean observing;
- Promote ocean observing services for multiple sectors.

The EOOS Forum on 8 March 2018 provided a platform to connect stakeholders, exchange ideas and gather feedback on how EOOS should develop. The Forum is proposed as a regular event to stimulate

¹² http://ec.europa.eu/research/press/2016/pdf/opendata-infographic_072016.pdf

¹³ <https://ec.europa.eu/research/openscience/index.cfm>

dialogue amongst the ocean observing community as well as wider users and communities. This may be complimented with other event formats from webinars to conferences. Stakeholder engagement and communication strategy will be crucial for the EOOS implementation.

Governance

EOOS is a framework, not a member organization. EOOS will have a light governance structure that is flexible and adaptable, placing stakeholder dialogue and input at its core. EOOS will not take ownership or control of ocean observing in Europe but will help improve the existing efforts and capitalize on the benefits of cooperation. This will help enable strategic planning of European ocean observing, break down institutional barriers, and make ocean observing more efficient and effective at different geographical scales, and for different users.

In its initial stages, EOOS coordination has been jointly led by EuroGOOS and European Marine Board. These two organizations co-chair the EOOS steering group set up in 2016 and involving several ocean observing experts, representatives of the European Commission, and JPI Oceans. An *ad hoc* Advisory Committee was established to advise on the stakeholder engagement and the EOOS events 2018.

EOOS governance will evolve over time and will be implemented in a phased approach. This may include a more structured EOOS secretariat and the development of a business plan including regular cycles of stakeholder input for requirements setting, updates to the observing system and tracking of performance via metrics.

Community Implementation

EOOS is a bottom-up, community-driven initiative. Successful implementation therefore depends on a joint, inclusive approach. An EOOS implementation plan 2018-2022, details key EOOS focal areas for the coming five years and proposes actions.