



- Scoping Paper, June 2021-

## A Global Ocean Monitoring Indicator Framework for Assessments and Observing System Evaluation



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*In collaboration with the Intergovernmental Oceanographic Commission of UNESCO, the Global Ocean Observing System, and other relevant international and regional stakeholders, catalyse and facilitate the evaluation of current indicator frameworks, identify knowledge and observing system gaps, and work towards solutions to enhance global scientific ocean monitoring and reporting, including supplementing existing frameworks as appropriate.*

*Action Areas 1, 2, and 3*

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### 1. BACKGROUND INFORMATION

An Ocean<sup>1</sup> indicator is a simple, easy-to-understand tool to describe, measure and monitor a complex Ocean phenomenon, such as sea-level rise or Ocean acidification, and that may change globally to locally and at different time scales. Ocean indicators are essential building blocks for a Global Ocean Observing System that is capable of providing the data and information needed for holistic scientific assessment and stewardship of the Ocean. They are key elements that link the three pillars of sustainable development – *Environment, Society, Economy* – and play a central role in the Ocean value chain by bridging the gap between raw Ocean data and Ocean information required for sustainable management, developed by specialised scientific experts.

Indicators are necessary for regular, comprehensive, and consistent reporting on the state, variability and change of the Ocean. Ocean indicators can also be used to identify knowledge and observing system gaps that limit our capacity to respond to society's needs for Ocean information, and thus serve as useful guides to prioritize investments in the observing system. Moreover, Ocean indicators can critically foster multi- to transdisciplinary scientific collaboration, and support policy development for sustainable Ocean stewardship through both natural and socio-economic science information delivery. Because the Ocean plays a central role in the Earth system, and as climate change has led to impacts in Ocean functioning and ecosystem health, Ocean indicators play a critical role in monitoring and assessing the rate of change and its implications, and provide the long-term monitoring information required to assess risk, loss and damage, and the efficacy of adaptation and mitigation measures. While playing this multi-faceted scientific and technical role, indicators are also key communication and reporting tools for the general public, enhancing Ocean literacy and the engagement of citizens in the global effort to develop ***The Ocean We Need for the Future We Want.***

The World Meteorological Organization uses Global Climate Indicators to produce regular [State of the Global and Regional Climate reports](#), and five of these indicators are Ocean-related. The Global Ocean Observing System uses Essential Ocean Variables, Ocean Essential Climate

<sup>1</sup> Throughout this paper we capitalize the word Ocean, just as one does for Earth. We use Ocean in the singular to reinforce the idea that Earth has one interconnected Ocean, the same convention followed in the title of the Intergovernmental Panel on Climate Change (IPCC) [Special Report on Ocean and Cryosphere in a Changing Climate \(SROCC\)](#), and adopted by Schuckmann et al, for their Marine Policy Paper [Ocean science, data, and services for the UN 2030 Sustainable Development Goals](#)

Variables, and Ocean Essential Biodiversity Variables to define monitoring requirements, and the GOOS 2030 Strategy calls for these to be streamlined into sets of indicators. [The UN Sustainable Development Goal 14](#) to *Conserve and Sustainably Use the Oceans, Seas, and Marine Resources for Sustainable Development* has targets support by indicators to help nations track their individual and collective progress towards Ocean protection and sustainable management. [The UN Trans-boundary Waters Assessment Programme](#) has developed indicators for Large Marine Ecosystems that address both natural and human dimensions. [The International Council for the Exploration of the Seas has a Working Group on Social Indicators](#) for developing integrated ecosystem assessments. The EU Copernicus Marine Service uses [Ocean Monitoring Indicators](#) to produce an annual [Ocean State Report and its summary for policy makers](#), which provides a comprehensive and state-of-the-art assessment of the state of the global Ocean and European regional seas. These examples represent a subset of the relevant international efforts working on this issue, and there are also numerous regional and national Ocean indicators in use that target a variety of local and regional needs. ***However, there is currently no internationally-agreed comprehensive set of Ocean indicators derived from Essential Ocean Variables to characterize physical, biogeochemical, or ecosystem processes, nor a common framework with agreed methodologies that would unite these individual efforts to create the common understanding and scientific baselines required to monitor changes in the Ocean in a transparent and authoritative way.***

The [OceanObs'19](#) conference held in September 2019 brought together 2400 scientists from 60 nations and produced 140 Community White Papers outlining the state of the Ocean observing system and priorities for the next decade. The [OceanObs'19 Conference Statement](#) specifically highlighted the need for Ocean indicators: *“Indicators based on ocean observations help nations meet national goals and targets of the United Nations 2030 Agenda on Sustainable Development, the Paris Climate Agreement, the Sendai Framework for Disaster Risk Reduction, the Convention on Biological Diversity, and the Small Island Developing States Accelerated Modalities of Action Pathway. Ocean observations are fundamental to increase the scientific and information content of indicators, contribute to the United Nations Decade of Ocean Science for Sustainable Development (2021–2030) and are coordinated by Global Ocean Observing System (GOOS) and Group on Earth Observations (GEO).”*

In their Community White Paper for the OceanObs'19 Conference, several lead authors of the [World Ocean Assessment 2<sup>nd</sup> Report](#) (2020) highlight the essential role of Ocean observations in the assessment process (Evans et al., 2019), but also point to the fundamental gaps in observations and significant limitations in accessing comprehensive and timely Ocean information that hinder the global assessment process. The authors propose establishing a collaborative, functional link between the Regular Process, the Global Ocean Observing System, and the UN SDGs via the Ocean Decade, where the Regular Process would serve both as a mechanism for linking data outputs to global policy development and for identifying observing and knowledge gaps required to address SDGs.

In January 2021, the EU Office of the G7 FSOI Coordination Centre hosted an informal consultative meeting between the Intergovernmental Oceanographic Commission of UNESCO, the Global Ocean Observing System, the High Level Panel for a Sustainable Blue Economy, the European Commission, and the Copernicus Marine Service ([Ocean Monitoring Indicators](#) and the [Ocean State Report](#)) to discuss the needs and interests to develop a comprehensive framework for Ocean Indicators, building on and harmonizing existing frameworks where possible, that can be used not only for assessments but also for the proposed State of the Ocean Reports for the UN Decade and as the foundation for the design and evaluation framework for the Global Ocean Observing System to ensure that it has the capacity to respond to societal benefit areas. The meeting participants supported follow-up actions to establish an international task team ***to develop the definition, criteria and topical organisation for a global Ocean indicator framework, and to prepare a perspective paper to be published in a high-profile journal to establish a***

**science-based rationale.** Participants also expressed interest in seeing this activity develop into a programme of the UN Decade of Ocean Science for Sustainable Development.

In March 2021, the G7 FSOI National Focal Points approved the indicators framework activity for continued scoping. The UK G7 Presidency has highlighted Ocean Indicators as one of three spotlight activities for the new *G7 Ocean Navigation Plan for the Decade* in the [G7 Climate and Environment Ministers' Meeting Communiqué](#) published on 21 May 2021. [The European Union's International Ocean Governance Forum](#) has set a recommendation for EU action to lead the development of an international framework for Ocean Indicators with a goal of enhancing the coherency and alignment in reporting on the state of the Ocean by standardising Ocean indicators, bridging the gap in the value chain between Ocean observations, Essential Ocean Variables, and the evidence-base for Ocean monitoring and reporting, as well as informing the design and evaluation of observing systems and Ocean literacy initiatives.

This scoping paper has been developed to discuss ways the G7 FSOI might address the calls of interest in a comprehensive science-based Ocean indicator framework through an activity that would work towards solutions to enhance scientific Ocean monitoring and reporting, and to explore how to build on and harmonize existing elements of indicator frameworks where possible.

## 2. DESCRIPTION OF THE ACTIVITY AND NEXT STEPS

The proposed G7 FSOI activity is to work with a wide range of stakeholders and multi- to transdisciplinary experts to explore the needs, ways, and means to develop a comprehensive global framework (by enhancing existing frameworks where possible) that allows existing but disconnected and non-harmonized Ocean indicators to work together in a coherent and aligned way, and to identify and close gaps where the necessary global science-based indicators do not exist. Additionally, this activity should examine the compatibility among national and regional indicator frameworks, which is essential for developing a coherent global perspective.

The first step of this activity is to establish an international multi- to trans-disciplinary Task Team, drawing on experts in Earth system science and the human dimensions, to initiate discussions on the definition, criteria and topical organization for a global Ocean indicator framework (see Figure 1, below), to evaluate existing indicators in this context and identify needs and gaps. The Task Team would draw on experts from, *inter alia*, interested G7 member countries and existing global and regional ocean indicator activities, with a view to supporting, coordinating, and enhancing existing frameworks where possible.

Specifically, expertise of this working group should cover a wide range of disciplines such as physical science, biogeochemistry, marine biology, marine ecology, climate sciences, economy, social science, environmental policy. It should range from the global-change scale to regional scale (including EEZ and coastal scales, and particularly including representation for low-lying areas and islands, e.g. SIDS). Developing country representatives and scientists, as well as representatives for indigenous knowledge and local knowledge systems, should be involved in the definition of the framework for Ocean indicators (for example, through the GOOS Regional Alliances and UNEP Regional Seas Programmes, or trans-disciplinary communities under the Belmont Forum) to ensure that their needs and contributions are addressed and recognized at international level.

## THE OCEAN'S ROLE IN THE EARTH SYSTEM

Ocean & Human	Ocean & Climate	Ocean & Biosphere	Ocean & Cryosphere	Ocean & Atmosphere	Ocean & Land
Ecosystem services	Ocean & energy cycle & Sea Level	Ecosystem health	Sea Ice	Climate modes	Coastal dynamics
Sustainable development	Ocean & water cycle & MOC	Ecosystem functioning	Deep circulation & ocean-driven melting	Extreme variability	Coastal ecosystems
Integrated ocean governance	Ocean & carbon cycle	Ocean conservation	Ice sheet, glacier and ice-shelf stability	Ocean currents	Marine spatial planning

**Figure 1:** A DRAFT example of the expertise required for the team of experts using an Earth-system science approach across the three pillars of Sustainable Development – environment, society, and economy.

The Specific goals for the Task Team would be to:

1. Develop a list of characteristics and criteria for Ocean indicators to build the Earth-system approach for sustainable development (see Figure 1, above).
2. Provide topical classifications for the global Ocean indicator framework
3. Define a targeted set of Ocean indicators, their definitions and criteria, their application areas across sustainable development pillars from global to regional scales, and comprehensive uncertainty concepts
4. Based on the framework concept, evaluate existing indicators that could contribute to this global framework; interlink already existing activities within different structures and frameworks, with a particular focus on observing system Essential Ocean and Climate Variables, and highlight existing gaps and provide solutions to close these gaps.
5. Synthesize and promote the framework concept through a high-level publication
6. Promote adoption of the framework in the research and observing system community to facilitate the work of experts contributing to scientific reviews for regular reporting processes, including new reports developed under the UN Decade of Ocean Science for Sustainable Development
7. Work with the observing system community to evaluate observing system capacity as a function of global indicators
8. Provide a long-term perspective and guidance on the evolving developments of an indicator framework (e.g., methodologies, best practices, new developments, etc.), including a regular revision process to allow flexibility for new methodology, capacity, and application area developments.

A phased approach to addressing these issues is proposed, using time-bound deliverables to produce information and proposals for the way forward that will need to be reviewed periodically by the G7 FSOI working group and other stakeholders to ensure that the activity is staying on target and serving the interests of the community.

**Phase 1: Framework Definition and Stakeholder Engagement** (June 2021 – end 2022)

**Develop a G7 FSOI Task Team to address Tasks 1 – 5.**

**Deliverables:**

- i. A report from an international workshop addressing Tasks 1-4, including a draft framework, an evaluation and mapping of existing indicators and initiatives that could contribute to this global framework, and an outline for the journal article (see ii, below).
- ii. A peer-reviewed journal article (Task 5) submitted to a high-profile journal to promote discussion and engagement in the community. Feedback will be used to broaden participation in the activity, to refine the framework, and to determine if there is sufficient interest to develop a programme proposal for the UN Decade of Ocean Science for Sustainable Development.

## **Phase 2. Evolution, Alignment, and Harmonization across the Framework**

### ***Develop a G7 FSOI Task Team to address Tasks 6-8.***

Depending on feedback from Phase 1 and evolution in the relevant programmes of the UN Decade, host or co-host an international workshop with stakeholders and experts to discuss the evolving development and applications of an Ocean indicator framework (e.g. national and regional alignment for global assessments, observing system evaluation activities, outreach and communications, reporting on the State of the Ocean and Climate, etc.), and to work towards harmonization across the framework through agreements on methodologies and best practices. Provide assistance to the international Task Team to develop a proposal of a UN Ocean Decade programme.

### **3. RESOURCING FOR THE G7 FSOI TASK TEAM**

Estimate 20% FTE support by G7 FSOI Coordination Centre to establish the Task Team, guide and facilitate its work, and communicate regularly with G7 members and stakeholders.

Estimate < 2% FTE in-kind support from each G7 member to ensure engagement and communications with respective national experts and focal points (e.g., national, regional, global indicators activities, representatives to the UN Regular Process, etc.).

Estimate 2% FTE in-kind support from the secretariat of the GCOS-GOOS-WCRP Ocean Observations Panel for Physics and Climate, leading the development of this Indicators activity across the GOOS expert panels since 2018.

Workshop (likely virtual or mixed) – estimate \$30k USD for invited experts if not virtual; G7 members to provide participation support for their experts and representatives.

Estimate publication costs for journal article \$3000 USD.