United Nations
Climate Change Secretariat

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Secrétariat sur les changements climatiques

Contribution from UNFCCC secretariat

The United Nations Framework Convention on Climate Change (UNFCCC) secretariat ("the secretariat") seeks to contribute to the report of the Secretary-General on oceans and the law of the sea; in response to your invitation for contribution via the letter (Ref: LOS/SGR/2021/1/IGO) dated 14 December 2021.

The secretariat welcomes this opportunity to contribute to the study on the theme "ocean observing." Climate change is already impacting the ocean and cryosphere and their ecosystems, as well as increasing sea level and the risk and strength of extreme events. Impacts and risks will continue to worsen in the future. Understanding of ocean and climate changes and their effects on society and the biosphere is only possible through ocean observations, informing the understanding of current and future climate change and mitigation and adaptation strategies, and risk management. Ocean observations are the foundation for scientific understanding and research, for example in the scientific literature assessed by the IPCC to produce its Assessment Reports and Special Reports, and by the WMO to produce the State of the Global Climate Reports. Ocean observation and ocean observation networks are expanding and increasing in coverage, but the ocean observation community highlights the lower funding priority given to ocean observing compared to land-based observation systems and the lack of sustainability of this funding (GCOS Status Report).

UNFCCC Mandates on the ocean

Parties have recognized the importance of protecting the ocean and its ecosystems in the Convention and Paris Agreement. In the Paris Agreement, Parties noted the importance of ensuring the integrity of all ecosystems, including oceans, and the protection of biodiversity, recognized by some cultures as Mother Earth[1]. Parties also agreed to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases, which would include the oceans[2].

At COP 25. the Chile Madrid Time for Action 2019, governments recognized the need to strengthen the understanding of, and action on, ocean and climate change under the UNFCCC. The first Ocean and climate change dialogue (the Ocean Dialogue) was mandated and took place in 2020, drawing upon the knowledge and scientific findings from the IPCC Special Report on the Ocean and Cryosphere in a changing climate.

Building on the outcomes of this dialogue, in the Glasgow Climate Pact 2021,[3] governments permanently anchored the inclusion of strengthened ocean-based action under the UNFCCC multilateral process. Parties:

[1] Preamble, Paris Agreement, 2015.
[2] Paragraph 5(1), Paris Agreement, 2015.
[3] The Glasgow Climate Pact is available in Advanced unedited versions of the COP (link above), the Conference of the Parties Serving as the Meeting of the Parties for the Paris Agreement (CMA) and the Conference of the Parties Serving as the Meeting of the Parties for the Paris Agreement (CMP) Cover decisions.

- Noted the importance of ensuring the integrity of all ecosystems, including forests, the ocean and the cryosphere, and the protection of biodiversity[4];
- Emphasized the importance of protecting, conserving and restoring nature and ecosystems, including forests and other terrestrial and marine ecosystems, to achieve the long-term global goal of the Convention by acting as sinks and reservoirs of greenhouse gases and protecting biodiversity, while ensuring social and environmental safeguards[5];
- Recognized the importance of protecting, conserving and restoring ecosystems to deliver crucial services, including acting as sinks and reservoirs of greenhouse gases, reducing vulnerability to climate change impacts and supporting sustainable livelihoods, including for indigenous peoples and local communities[6];
- Invited the relevant work programmes and constituted bodies under the UNFCCC to consider how to integrate and strengthen ocean-based action in their existing mandates and workplans and to report on these activities within the existing reporting processes, as appropriate[7];
- Invited the SBSTA Chair to hold an annual Ocean and climate change dialogue and prepare an informal summary report that is made available to the COP at each subsequent session[8].

Additionally, many Parties have included oceans as priority areas, regarding both mitigation and adaptation efforts of in their new or updated Nationally Determined Contributions under the Paris Agreement (NDCs) as presented in the NDC synthesis report, 30 July, 2021. Sea-level rise and enhancing research regarding sea level were also specifically mentioned in the context of adaptation priorities and needs[9].

UNFCCC Mandates on observation

Article 5 of the UNFCCC specifically refers to Research and Systematic Observation

In carrying out their commitments under Article 4, paragraph 1(g), the Parties shall:

(a) Support and further develop, as appropriate, international and intergovernmental programmes and networks or organizations aimed at defining, conducting, assessing and financing research, data collection and systematic observation, taking into account the need to minimize duplication of effort;

(b) Support international and intergovernmental efforts to strengthen systematic observation and national scientific and technical research capacities and capabilities, particularly in developing countries, and to promote access to, and the exchange of, data and analyses thereof obtained from areas beyond national jurisdiction; and

(c) Take into account the particular concerns and needs of developing countries and cooperate in improving their endogenous capacities and capabilities to participate in the efforts referred to in subparagraphs (a) and (b) above.

The theme strengthening “Ocean observations” is frequently highlighted by Parties and non-Party stakeholders in negotiations under the SBSTA. Parties and relevant organizations are urged to maintain, strengthen and enhance systematic observation through in situ as well as remote sensing observations, and

[4] Preamble, Glasgow Climate Pact, 2021.
[5] Paragraph 2, Glasgow Climate Pact, 2021.
[6] Paragraph 50.
[7] Paragraph 60.
[8] Paragraph 61.
[9] Paragraphs 26 and 159, FCCC/PA/CMA/2021/8.

archiving those data and information, in order to address gaps, needs and challenges in many domains, including in relation to oceans. **The most recent mandates on strengthening ocean observation:**

SBSTA 52-55 (FCCC/SBSTA/2021/3) Research and systematic observation[10]

(Paragraph numbers do not correspond with paragraph numbers in SBSTA report)

1. The SBSTA noted the significant progress in the work of the research and systematic observation community aimed at strengthening the global response to the threat of climate change, as discussed at the events, and the value of continuing the rich exchanges at future events.

2. The SBSTA encouraged Parties and relevant organizations to strengthen support for sustained systematic observations of the climate system for monitoring changes in the atmosphere, ocean and cryosphere, and on land, including by improving the density of observations in areas of poor coverage, developing and providing long-term data sets and facilitating free and open access to data.

3. The SBSTA welcomed the outcomes of the extraordinary session of the World Meteorological Congress,[11] particularly resolution 1 on the WMO unified data policy, resolution 2 on the Global Basic Observing Network and resolution 3 on the Systematic Observations Financing Facility, and encouraged Parties and relevant organizations to support the Facility in order to enhance and sustain implementation of the Global Basic Observing Network in developing countries, including the least developed countries (LDCs) and small island developing States (SIDS).

4. The SBSTA also encouraged Parties and relevant organizations to strengthen systematic observation and research, and address related gaps and needs, including with regard to:

(a) Promoting exchange of usable and accessible scientific information and other relevant knowledge and guidance at the science–policy interface, including in support of implementation of the Convention and the Paris Agreement;

(b) Connecting knowledge holders, innovators and technical experts with decision makers in an equitable and participatory manner so as to increase understanding and use of knowledge, products, tools and climate services that inform risk assessment and management;

(c) Furthering the contribution of youth and local, indigenous and traditional knowledge to understanding climate change and its consequences, and weaving such knowledge into decision-making;

(d) Understanding the opportunities for and challenges of implementing nature-based solutions in land and ocean ecosystems for supporting adaptation and mitigation action;

(e) Improving the performance, development and application of regional and subregional climate models and other downscaling methods in order to improve understanding of local climate-related risks and inform regional, national and local decision-making, including in developing countries with high mountain areas, particularly the LDCs and SIDS;

(f) Recognizing and fostering education as a means to build capacity for climate research in diverse communities, including in the LDCs and SIDS;

(g) Addressing capacity-building requirements of developing countries;

(h) Continuing to make advances in climate model simulations, analysis, and methods combining multiple lines of evidence on a wider range of climate variables to improve parameterization of the physical climate system and understanding of scenarios;

[10] Currently available here: SBSTA 52-55 conclusions, FCCC/SBSTA/2021/L.5

[11] See https://public.wmo.int/en/events/constituent-bodies/cg-ext2021.

(i) Addressing the sensitivities of climate simulations to scenarios and parameterizations.

5. The SBSTA noted the importance of building partnerships as a basis for strengthening understanding and collaboration at the national and regional level, including to facilitate cooperation on addressing key issues such as the ocean and cryosphere. In this regard, it recognized the work of WMO regional climate centres, and work by the Group on Earth Observations on developing relevant knowledge products, indicators, applications and services, notably biosphere observations for ocean and land.

Types of ocean observation tools and their existing and potential contributions to science-based decision-making

As identified in mandated dialogues on the ocean and on systematic observation under the UNFCCC process, non-exhaustive specifics of examples of tools, challenges, and opportunities relevant to ocean observing are detailed below.

Types of tools include inventories and databases of climate indicators to inform Parties' national reporting efforts and national mitigation and adaptation planning, platforms to facilitate data and information sharing, networks of actors facilitating international collaboration, data access methods and visualisation software to aid users to find and use openly available data, and reports on the state, trends, and future of the ocean and its observations relevant to climate change.

The Global Climate Observing System (GCOS) has identified 54 Essential Climate Variables (ECVs) – components of the climate system that are vital to characterise and understand climate change. 19 of the ECVs are directly related to the ocean. The ECV inventory maintained by the Joint Committee on Earth Observation Satellites (CEOS)/ Coordination Group for Meteorological Satellites (CGMS) Working Group on climate (WGClimate) member agencies describes the current and planned provision of ECVs, and is used to perform gap analyses to target actions for space agencies. The inventory houses information on the Climate Data Records (CDRs) that are essential to monitoring climate change and variability, supporting climate modelling, and analysing key climate processes. The inventory is a baseline for status reporting and informs work under GCOS and reporting under the UNFCCC. Additional ECVs were recently added to inform the first Global Stocktake of the UNFCCC and additional support will be provided by satellite observations of relevant areas such as mangroves.

The systematic observation community is contributing to the Global Stocktake of the UNFCCC by assessing the aggregate progress countries have made on adaptation related to several areas including coastal vulnerability. Earth observation-based adaptation indicators are being developed in key areas to further guide adaptation efforts, and the community is working to integrate multiple data sets into models to support countries in their adaptation efforts, including additional technical guidelines for Parties' National Adaptation Plans. A synthesis paper on systematic observations to inform the global stocktake is planned.

The Global Ocean Observing System (GOOS) develops observing tools and technology, information systems, scientific analysis and forecasts. The Framework for Ocean Observing is a guide for multiple stakeholders that reflects concerns about ocean health and the demand from nations for information to manage global economies. It collects insights from the global ocean observation system in a single framework. Coastal areas and regional seas are a growing focus area under the framework. GOOS coordinates global ocean observation such as via the Argo network, the data from which is openly available.

The Europeans Space Agency's Climate Change Initiative (CCI) has produced 23 datasets of cryospheric, atmospheric, oceanic and terrestrial ECVs that contribute to the evidence base required to understand climate change. The ECV datasets are freely available via the CCI Open Data Portal, accompanied by tools to support their analysis and interrogation tailored to a variety of users.

The latest dataset produced through the Copernicus Climate Change Service (C3S) global reanalysis is the ERA5. This integrates several satellite and non-satellite datasets to provide a gridded dataset of the weather of the last 70 years in the form of a map of a number of Essential Climate Variables. C3S' Climate Data Store enables users to run applications that exploit datasets without the need to download the data, providing access to data such as temperature anomalies and future trends for different renewable energy sources.

The Copernicus Marine Service monitors and forecasts the global ocean to aid ocean management on state and international levels. The Service provides free, regular and systematic authoritative information on the state of the Blue (physical), White (sea ice) and Green (biogeochemical) ocean, on a global and regional scale. It is designed to serve EU policies and international legal commitments related to ocean governance, to cater to the need for global ocean knowledge and to boost the Blue Economy across all maritime sectors by providing open access to ocean data and information.

The Group on Earth Observations Biodiversity Observation Network (GEO BON) works to produce a suite of analytical tools and online platforms for the establishment of national and regional monitoring networks including the Marine Biodiversity Observation Network (MBON). MBON is a "coalition of the willing" who agree to share knowledge and know-how to evaluate changes of biodiversity in the ocean, including data, products, protocols and methods, data systems and software. This could serve as an entry point for developing indicators to track the progress of adaptation action under the Paris Agreement and the Global Stocktake as well as implementing nature-based solutions and linking the UN CBD with UNFCCC.

GEO Blue Planet aims to work with the UNFCCC to use Earth observations to inform national adaptation plans on issues related to coastal erosion, saltwater intrusion, changes in species distributions, ocean acidification, storm surge risk and other coastal issues. GEO Blue Planet also intends to support work on mapping blue carbon ecosystems to set LMDC targets.

Reports relevant to ocean observing presented during meetings and events under the auspices of the UNFCCC include:

- The *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* assesses the scientific literature on the ocean and cryosphere as informed by ocean observations.
- The *WMO State of the Global Climate 2021* report highlights key events and looks at a range of specific climate indicators.
- The *GCOS Status Report* 2021 identifies improvements in observational capabilities and highlights outstanding issues and gaps. The findings are presented for each Essential Climate Variable (ECV) and specific action identified in the last GCOS Implementation Plan.
- The Intergovernmental Oceanographic Commission of *UNESCO* report *Integrated Ocean Carbon Research: A Summary of Ocean Carbon Knowledge and a Vision for Coordinated Ocean Carbon Research and Observations for the Next Decade* frames the needs for stakeholder engagement and enhanced ocean carbon observation.
- The Framework for Ocean Observation (FOO) collects insights from the global ocean observation system in a single framework.
- World Ocean Assessments of the Regular Process for Global Reporting and Assessment of the States of the Marine Environment, including Socioeconomic Aspects provide scientific information on the state of the marine environment to support decisions and actions for the achievement of Sustainable Development Goals, in particular goal 14, as well as the implementation of the United Nations Decade of Ocean Science for Sustainable Development.
- The *Global Ocean Science Report* of IOC-UNESCO is a resource for policymakers, academics and other stakeholders seeking to assess progress towards the sustainable development goals of the UN 2030 Agenda, particularly 14a. The global community can

submit data to the GOSR portal and consult data to regularly assess progress on the efficiency and impact of policies to develop ocean science capacity.

- High Level Panel for a Sustainable Ocean Economy report *Ocean Solutions that Benefit People, Nature and the Economy* draws on the latest scientific research and analyses, including ocean monitoring, to detail a sustainable ocean economy where people have more opportunities and better health, nature thrives and resources are distributed more equitably .
- The *GHG Monitoring from Space* report is the outcome of a public-private collaboration brokered by GEO, ClimateTRACE and the Word Geospatial Industry Council. The report maps government, commercial, and joint satellite missions that detect and measure greenhouse gases, identifying those relevant to the ocean.
- The Copernicus *Ocean State Report* (OSR) covers the state of the ocean, natural variations, and changes in line with climate changes. The fifth details examples of tools and technologies used to support climate mitigation and adaptation, including alert systems, forecasting technologies, and real-time monitoring programs.

Challenges in ocean observation

The GCOS Status Report notes that ocean observing systems in particular are subject to geographical coverage gaps. Data stewardship remains an issue. Data archiving and access require sustained funding and effort. The Global Ocean Science Report 2020 indicates that ocean research is limited and underfunded, especially in Africa. It highlights the need for more observation and research, particularly to increase support for ocean science in Africa, the LDCs and SIDS.

The ocean has not been adequately addressed in the conversation around climate change but is essential to achieving global net-zero. Ocean carbon observations are essential to achieving effective climate targets. Establishing sustainable observation networks and taking effective action requires discourse and cooperation on a global level. Additionally, a baseline is needed to inform ocean-based Carbon Dioxide Removal (CDR). Without a credible way to measure the impact of CDR, ocean industries cannot be adequately supported and the effects of ocean CDR is not adequately understood (Earth Information Day 2021 informal summary report).

Gaps remain in scientific observation and research in ocean biochemistry, ecology and biology as well as specifically in the areas of blue carbon, ocean acidification and deoxygenation, seagrass, macroalgae and sea floor carbon (Ocean and climate change dialogue to consider how to strengthen adaptation and mitigation action informal summary report).

The maintenance of observations systems is an obstacle to sustainable observations. Observation systems must be maintained and improved so that they can contribute to long-term continuous data exchange and inform both national services and international systems. Achieving this will require additional staff capacity and training, as well as funding (Earth Information Day 2021 informal summary report)

Regional challenges include the need for additional regional research, capacity building, and the downscaling of global climate models. The WMO has contributed to addressing these needs through its regional workshops. Continued research facilitated through the WMO and other initiatives is particularly important in regions that may more exposed to the effects of climate change, such as small island states (Earth Information Day 2021 informal summary report)

Climate Change 2021: The Physical Science Basis, the Working Group I contribution to the IPCC Sixth Assessment Report, finds that information on certain climate variables is not available over many LDC countries, preventing the determination of the impact of certain extreme events and associated risks. This hinders national planning and restricts capabilities to engage in policy discussions. The lack of

sufficient data also impacts the development of documents, such as Nationally Determined Contributions and National Adaptation Plans.

Opportunities to expand and strengthen the global ocean observation framework

Engagement on science-related issues, including under the research and systematic observation agenda item of the SBSTA will continue to identify gaps and encourage ocean observation and research that will drive action and provide support to the UNFCCC process. The Ocean Dialogue highlighted the need for strengthening observation and research in parallel to strengthening ocean-based action. There are opportunities to synergise between the UNFCCC process and the UN Decade of Ocean Science for Sustainable Development in terms of understanding and strengthening ocean observation among other issues.

Collaboration on a North Atlantic carbon observatory is one way to begin the process of enhancing international discussion on integrating the ocean in effective climate targets. The ocean in this area takes up 30% of all ocean carbon and nations in the region could collaborate to create a globally applicable example of international ocean observation and data sharing (Earth Information Day 2021 informal summary report).

Addressing the challenges of the UN Decade of Ocean Science for Sustainable Development will strengthen adaptation and mitigation, while Decade Challenge 5 is specifically related to the ocean–climate nexus. The Ocean Decade Challenges will be achieved via Decade Actions that will be identified, implemented and resourced by a wide range of stakeholders. The Decade is an opportunity to develop integrated ocean–climate initiatives, and the UNFCCC could facilitate the sharing of scientific information emerging from this work (Ocean and climate change dialogue to consider how to strengthen adaptation and mitigation action informal summary report).

The ocean should be included in the assessment of collective progress and in the global stocktake via the GCOS global climate indicators that relate to the ocean (ocean heat, ocean acidification, sea level and Arctic and Antarctic sea ice extent) and the scientific measure of the Earth's energy imbalance. Furthermore, Parties' ocean-related actions, which are identified in NDCs, reports and synthesis documents, should also be an important input to the global stocktake (Ocean and climate change dialogue to consider how to strengthen adaptation and mitigation action informal summary report).

Investment in ocean science and monitoring would increase observation of and research on the impact of climate change on ecosystems and marine areas involved in mitigation and adaptation, increase observation and understanding of sea level rise, enhance ocean and coastal monitoring, and contribute to the provision of remote sensing products and related technologies in developing countries (Ocean and climate change dialogue to consider how to strengthen adaptation and mitigation action informal summary report).

The 2022 UN Ocean Conference due to take place in Portugal in June, is an opportunity to highlight the role of ocean observations in providing the best available science on climate change. It also provides a forum to discuss international collaboration on the establishment, maintenance and enhancement of ocean observing networks.

The next Ocean and Climate Change Dialogue will be held in conjunction with the 56th session of the SBSTA in June 2022. The Dialogue will build on the exchanges from its previous meeting and again facilitate the discussion of Parties and non-Party stakeholders on how to strengthen adaptation and mitigation action on ocean and climate change, drawing upon the latest knowledge and scientific findings and the submissions of Parties and non-Party stakeholders.