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**REPORT OF THE EXECUTIVE SECRETARY ON THE WORK ACCOMPLISHED
SINCE THE THIRTY-FIRST SESSION OF THE ASSEMBLY (July 2021–May 2022)**

Addendum

This Addendum is a part of the IOC Executive Secretary report and provides a more detailed update on the work accomplished over the period June 2021 to May 2023. It is presented by IOC Functions. The work on Ocean Decade has a dedicated agenda item of the Assembly, but it is also briefly reported in this document. The work of Regional Subsidiary Bodies is mostly reported under Function E (on the Decade) and under Function F (on capacity development).

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FUNCTION A: OCEAN RESEARCH

Foster ocean research to strengthen knowledge of ocean and coastal processes and human impact upon them

Understanding climate change and its effects on the world ocean

1. The World Climate Research Programme (WCRP) underpins the work of the Intergovernmental Panel on Climate Change (IPCC), which in turn supports decision-making by the UN Framework Convention on Climate Change (UNFCCC). IOC brings the oceanographic constituency to WCRP, as the ocean is an integral part of the climate system. IOC's co-sponsoring of WCRP, therefore, represents an example of climate change science in action, through a value-chain approach, going from research to decision-making. In the period June 2021 until May 2023 effort was invested into the organization of the WCRP Open Science Conference (OSC) 2023 'Advancing climate science for a sustainable future', which is now scheduled for 23–27 October 2023 in Kigali, Rwanda. This work is carried out via the WCRP OSC Scientific Organizing Committee.

2. Through decision EC-LI/4.2 the IOC convened the current main players in ocean carbon research and systematic observations under the umbrella of an expert Integrated Ocean Carbon Research (IOC-R) initiative. This initiative federates: the IOC; the International Ocean Carbon Coordinating Project (IOCCP, which also operates as the Biogeochemistry Panel of the Global Ocean Observing System); the Surface Ocean-Lower Atmosphere Study (SOLAS); the Integrated Marine Biosphere Research Project (IMBeR); the Climate and Ocean Variability, Predictability and Change (CLIVAR) core project of the WCRP; and the Global Carbon Project (GCP). The goal of this initiative is to design an integrated research and observation agenda in the next decade in support of relevant efforts by the UNFCCC and its SBSTA (Subsidiary Body for Scientific and Technological Advice). The group has delivered a Summary of Ocean Carbon Research and Vision of Coordinated Ocean Carbon Research and Observations for the Next Decade, published as IOC Technical Series, 158 ([IOC/2021/TS/158](#)). Over the course of the reporting period IOC coordinated the revitalization of the IOC WG IOC-R. Forty-eight (48) experts from all over the world participated in the first scoping meeting on 8 December 2022 and more than 40 experts joined the meeting in person on 3–5 May 2023. The objectives of this and future activities are the review and update of the IOC-R vision document in order to close existing knowledge gaps in the understanding of the ocean carbon cycle.

3. IOC continued to provide active support to Member States in developing capacity to act towards, and to report on, SDG Indicator 14.3.1, which focuses on ocean acidification (cf. Function D). In its capacity as custodian agency for the indicator, the Commission developed the methodology providing guidance to scientists and countries on how to carry out measurements following the best practices established by the ocean acidification (OA) community. In this way, IOC and its networks, including the Global Ocean Acidification Observing Network (GOA-ON), directly contribute to the achievement of SDG Target 14.3. Since the launch of the SDG 14.3.1 data portal in December 2019 an increasing number of ocean acidification observations have been reported to IOC and are included in the annual 14.3.1 assessment (308 stations in 35 countries reported in 2022 to 539 stations in 41 countries in 2023). However, the current global coverage of ocean acidification remains inadequate, with gaps in observations and data in all areas of the ocean. The rate of change in ocean acidification, its pattern and scale, show great regional variability and therefore require observations with high spatial and temporal resolution. The latest results from the IOC SDG 14.3.1 reporting will be published on the UN DESA website in July 2023.

4. In order to further advance SDG 14.3.1 related measurements and data reporting, IOC is working with experts to improve methodology and data collection. IOC convened expert working groups consisting of data managers and representatives of global ocean carbon data products and databases, including EMODNET, ICOS, GLODAP, NCEI, and SOCAT as well as several National Oceanographic Data Centres (NODCs) to develop an automated exchange of data towards the SDG 14.3.1 Indicator from other databases already hosting and collecting relevant datasets. These expert working groups are establishing aligned requirements for data and metadata to be adopted across

the existing databases to facilitate the automated and regular exchange of relevant datasets through the implementation of a federated data system.

5. GOA-ON has now more than 1,100 members, from 98 countries (2015 comparative: 150 scientists, 31 countries) and is constantly growing. Currently 19 SIDS and 22 African countries are represented in the network, owing to IOC's engagement in projects in the Pacific Islands, Caribbean, the Middle East and East Africa. GOA-ON continues to host a webinar series providing a platform for presenting on scientific findings and new development to ocean acidification researchers from around the world.

6. IOC also contributed to the preparation of the 5th Symposium on the Ocean in a High CO₂ World, scheduled on 13–16 September 2022 (Lima, Peru). The symposium provides a long awaited opportunity to achieve a better understanding of the impacts of ocean acidification (OA) at different spatial and temporal scales, on the natural environment, on the economy and on human wellbeing. IOC supported four young scientists from developing countries to attend the meeting, presented the SDG 14.3.1 data collection process and chaired a session focusing on the science-policy interface. In order to ensure the engagement of the OA community during a pandemic, IOC supported the organization of a second GOA-ON Ocean Acidification week, on 13–17 September 2021.

7. IOC was invited to contribute with Ocean Acidification data to the *WMO Statement on the state of the Global Climate* in 2021 and 2022, published in April 2022 and 2023, respectively.

8. Capacity development tools developed by IOC include the Ocean Teacher Global Academy (OTGA) online curriculum on ocean acidification. It was first offered in a training course in the Pacific Islands between February and April 2022, together with The Ocean Foundation. The OTGA Ocean Acidification course will next be used in trainings in Africa as part of IOC capacity development efforts in the region.

9. Since 2021, IOC, together with the GOA-ON, co-chairs the Ocean Decade Programme "Ocean Acidification Research for Sustainability" (OARS). The programme is structured around seven transformative outcomes and aims at providing systematic evidence of the impacts of ocean acidification on the sustainability of marine ecosystems, enhance research capacity, increase observations of ocean chemistry changes, improve communication to policymakers and communities by providing the information needed to mitigate and adapt to ocean acidification and to facilitate the development and evaluation of strategies to offset future impacts. A scientific paper introducing OARS was published in September 2022. Over the reporting period IOC co-coordinated the preparation of seven white papers, outlining the implementation strategy for OARS, which went through a community review from January to April 2023. These documents will be published as IOC technical series by the end of 2023.

10. Together with partners from GOA-ON, IOC co-organized five events during the UNFCCC COP-26 and five during the UNFCCC COP-27, highlighting the latest developments in ocean acidification science. The events helped to increase awareness of the impacts of ocean acidification on ocean and human health and to engage with new partners like the Commonwealth Secretariat. During the UN Ocean Conference, IOC together with GOA-ON led the organization of four side events and workshops and contributed to others highlighting the threat of ocean acidification.

11. IOC continues co-sponsor the Blue Carbon Initiative (BCI) with Conservation International and IUCN. A meeting of the Scientific Working Group of the BCI was organized and held on 10 November 2021 in Edinburgh, UK. The Group agreed to form two new sub-groups to focus on seagrass and seaweed, and committed to submitting a proposal for a Global Ocean Decade Programme for Blue Carbon (GO-BC), which was endorsed in June 2022. GO-BC is led by the University of St Andrews and IOC is a partner and part of its Steering Committee. The BCI Scientific Working Group met again on 10–14 October 2022 in Mérida, Mexico, for the 14th time since its creation, with a record in-person attendance of over 100 participants from 16 countries, of which over 40% were from the host country, and 58% were women.

12. IOC now also co-hosts together with Australia the secretariat for the coordination of the International Partnership for Blue Carbon (IPBC). A revised Strategic Plan and a fully-fledged workplan were adopted to steer the day-to-day management of the partnership. Partner and stakeholder engagement activities resulted in the growth of the partnership, which has 54 Partners as of January 2023. Based on a needs assessment and bilateral consultations with IPBC Partners carried out by IOC, two online thematic knowledge exchange sessions were planned and held in 2022, and at least three more are expected to be held in 2023. Additional learning and guidance materials were developed in collaboration with Partners and made available through a new online catalogue of resources. An in-person three-day IPBC Partners Dialogue was co-hosted by IOC, Australia and France at UNESCO headquarters in February 2023, which was attended by around 80 participants from 21 countries. A key outcome of the Dialogue was the establishment of a High-Level Ambition Group (HILAG) within the IPBC, with the aim to step up ambition globally and ensure that commitments to blue carbon made in international fora translate into action on-the-ground. The HILAG was initially conceived as an initiative of France and Conservation International at the One Ocean Summit in Brest in 2022, and will now be an integral part of the IPBC and jointly coordinated by France, Australia and IOC.

13. Several blue carbon events were organized at UNFCCC COP-26 (31 October–13 November 2021, Glasgow, UK) and COP-27 (6–18 November 2022, Sharm El-Sheikh, Egypt), and at the 2nd UN Ocean Conference (27 June–1 July 2022, Lisbon, Portugal), which contributed to raising the profile of blue carbon for climate action.

14. IOC continues to co-sponsor GESAMP Working Group 41 on Ocean Interventions for Climate Change Mitigations (formerly Geo-engineering in the Marine Environment), which provides for a continued interagency focus on the challenges and possibilities in marine geo-engineering (also referred to as ‘carbon dioxide removal and negative emissions techniques’). In its current phase, GESAMP WG 41 is focusing on wider societal implications of different marine geo-engineering approaches for the marine environment. This will include the development of an assessment framework that covers social, political, economic, ecological, ethical and other societal dimensions. IOC continues to facilitate the contribution of GESAMP WG 41 to the work of the UNFCCC related to ‘negative emissions’ (carbon removal and other similar techniques), as part of the mitigation element of the Convention’s programme of work. GESAMP WG 41 met in Copenhagen, Denmark, on 9-12 May 2023 hosted by IMO and the IOC Science and Communication Centre on Harmful Algae Blooms at University of Copenhagen.

Research on multiple ocean stressors and their effects on the world ocean

15. As reflected in the IPCC *Special Report on the Ocean and Cryosphere in a Changing Climate* and the Sixth IPCC Assessment Report (AR6), de-oxygenation is an emerging problem exemplifying the effects of climate change-induced ocean warming, and also related to eutrophication along coastal areas. IOC leads scientific and capacity development efforts related to deoxygenation, for the benefit of its Member States, through its working group on Global Ocean Oxygen Network (GO₂NE). The GO₂NE series of regular webinars (19 webinars in total at April 2023) continues to be a huge success with on average more than 100 participants. Since November 2020 year scientists and other stakeholders from 95 countries joined.

16. In order to improve data availability and quality, GO₂NE contributed to the planning of an ocean oxygen data portal and a white paper was published in December 2021. The working group also published a scientific paper comparing low oxygen areas around the world. Following the call for international programmes contributing to the United Nations Decade of Ocean Science for Sustainable Development (2021–2030), GO₂NE and its partners submitted the “Global Ocean Oxygen Decade” (GOOD) proposal. Actions and activities include raising global awareness about ocean deoxygenation, provide knowledge for action and develop mitigation and adaptation measures through local, regional and global efforts, including intensified monitoring, transdisciplinary research, bi-directional knowledge transfer among stakeholders and scientists, innovative outreach and ocean education and literacy. The high-level objective of the Ocean Decade Programme is to

provide data, knowledge and best practices to enable society, stakeholders, and scientists to co-design and develop measures that can mitigate the drivers and impacts of ocean deoxygenation and provide appropriate adaptation measures where mitigation is not possible. In addition, GO₂NE contributed to the *Ocean Observing System Report Card 2021* (OceanOPS) published in July, which focused on ocean oxygen.

17. One project under the GOOD programme is the GO₂DAT (Global Ocean Oxygen Database and Atlas). During the reporting period IOC supported the establishment of the Steering committee and its first meeting in March 2023. One outcome of the meeting is a survey which is shared with the ocean oxygen community to map types of measurements and quality controls. It is envisaged that a 'GO₂DAT Best practices paper' will be published late 2023. GO₂DAT was also presented at the IODE-XXVII session and received the support by the intergovernmental committee of the International Oceanographic Data and Information Exchange (IODE).

18. Another activity in the framework of GOOD and GO₂NE including OARS is the support of IOC to the organization of a summer school, which will take place in November 2023 in Chile. It is expected that around 40 students from 18 countries will join this training.

19. In collaboration with the Liege University, IOC organized the 53rd international Colloquium on ocean dynamics, 16–20 May 2022. The scientific steering committee, including IOC staff, helped to outline the programme and to secure additional funding to support participation of keynote speakers and young researchers. The annual GO₂NE meeting in 2022 took place just before the Liege Colloquium. In 2023 IOC organized it on 15–16 April 2023, preceding the 5th Symposium on Effects of Climate Change on the World's Ocean (ECCWO5).

20. IOC together with ICES, PICES and FAO co-organized ECCWO5, on 17–21 April 2023, in Bergen, Norway. More than 800 experts (343 ECOPs, 239 remote participation) joined the meeting and discussed different aspects of the ocean changes due to climate change in more than 19 sessions, multiple side meetings and four workshops.

21. The inherent variability in Eastern Boundary Upwelling Systems (EBUS) poses large challenges in projecting their responses to climate change and other ocean stressors. This has a direct impact on food security, livelihood systems of local populations, and economies. The IOC is currently implementing a project aimed at furthering the scientific knowledge and capacity basis in the Canary Current Large Marine Ecosystem (CCLME) by focusing on invasive alien species and their connection with other ocean stressors. The project is funded by the Spanish Agency for International Development Cooperation (AECID) and implemented in partnership with the Spanish Institute of Oceanography (IEO). Three virtual workshops have been held so far to facilitate scientific discussions and IOC co-convened the Open Science Conference on Eastern Boundary Upwelling Systems (EBUS): Past, Present and Future & the Second International Conference on the Humboldt Current System, 19–23 September 2022 in Lima, Peru.

22. The IOC has initiated a process to acknowledge and incorporate Indigenous and Local Knowledge (ILK) into its work, with the aim of facilitating a sustainable and advantageous conversation between ILK and ocean science. In order to support the IOC Secretariat and Governing Bodies with this endeavour, a guidance document entitled *Guidance on dialogue between IOC programmes and Indigenous and Local Knowledge (ILK)* was prepared. IOC/INF-1430 clarifies the terminology and its associated definitions and highlights ILK's interest in the High-Level Objectives of the IOC's proposed Medium-Term Strategy 2022–2029. The document also identifies possible opportunities that can be explored within the current structures and mechanisms, especially through the UN Ocean Decade. Finally, the document presents some programmatic, conceptual, and politico-social challenges and inquiries that need to be addressed when initiating a dialogue between ILK and ocean science. In order to facilitate the execution of this document, a side-event will be presented during the Assembly in 2023. The objective of the event is to familiarize the governing bodies of the IOC and its Member States with the vocabulary and concepts of Indigenous and Local Knowledge (ILK).

The 2nd International Indian Ocean Expedition (IIOE-2)

23. The IIOE-2 currently includes 45 projects, including three new projects endorsed in 2022. On 14–18 March 2022, a most successful and well-attended online International Indian Ocean Science Conference (IIOESC-2022) was conducted under the auspices of IIOE-2, with leadership and great support from Indian National Centre for Ocean Information Services (INCOIS), Ministry of Earth Sciences, India. A vast volume of oceanographic research was presented at the conference. With the departure of Dr Nick D'Adamo, the secretariat support for IIOE-2 continues on the basis of a project office hosted by INCOIS.

24. Six Science Themes keep shaping the work of IIOE-2, namely:

- Human benefits and impacts
- Boundary current dynamics, upwelling variability and ecosystem impacts
- Atmospheric and monsoon Variability and ecosystem response
- Circulation, climate variability and ecosystem change
- Extreme events and their impacts on ecosystems and human populations
- Unique geological, physical, biogeochemical and ecological features of the Indian Ocean.

25. The IIOE-2 was submitted for consideration as an Ocean Decade Action. In this regard, discussions are underway between the Ocean Decade and IIOE-2 leadership on how IIOE-2 can maximize its delivery to sustainable development.

26. The work of IIOE-2 goes hand-in-hand with a number of related science alliances: Indian Ocean Global Ocean Observing System Regional Alliance (IOGOOS); Sustained Indian Ocean Biogeochemistry and Ecosystem Research of IMBER/IOC-GOOS (SIBER); Indian Ocean Observing System (IndOOS) Resources Forum (IRF) and associated Indian Ocean Region Panel of CLIVAR/IOC-GOOS (IORP).

Key challenges encountered in implementation and remedial actions taken

27. Until early 2022 the COVID-19 pandemic continued to hamper the convening of expert meetings and capacity development activities as face-to-face events. While all, secretariat, as well as partners and participants, have become better at and more familiar with on-line meetings, the limitations have become evident when it comes to building networks, fostering relations and solving issues that are more complex. Reduced manpower due to the leave of absence of the Head of the Ocean Science Section throughout 2022 and first half of 2023 made the preparation of the IOC "State of the Ocean Report" (StOR) and the development of the ocean science portfolio all the more challenging.

FUNCTION B: OBSERVING SYSTEM/DATA MANAGEMENT

Maintain, strengthen and integrate global ocean observing, data and information systems

28. The Global Ocean Observing System (GOOS) coordinates sustained ocean observing activities across the global ocean to support the delivery of information to decision makers across climate adaptation and policy, regarding hazard warnings and weather, for marine resource management, and for marine transport and operations.

29. GOOS is brought to life as a system through the work of three Expert Panels (physics and climate, biogeochemistry, and biology and ecology), ocean observing and forecasting coordination groups, ocean observing networks and systems. These GOOS components coordinate the sustained ocean observing system made up of national contributions, and work to integrate, strengthen, advocate for and develop, a fit-for-purpose Global Ocean Observing System through activities in key areas. Innovation and transformation come through GOOS Projects and Ocean Decade Programmes. IOC/UNESCO is the lead sponsor of GOOS, with co-sponsors World Meteorological Organization (WMO), United Nations Environmental Programme (UNEP) and the International Science Council (ISC). The GOOS Office is headquartered at IOC/UNESCO in Paris with other components supported through staff located at WMO in Geneva, Hobart (Australia), IOPAN in Sopot (Poland), and IFREMER in Brest (France). This distributed network of offices are supported through contributions from IOC/UNESCO, WMO, the Scientific Committee on Oceanic Research (SCOR), USA, France, Australia, China, Canada, European Commission, United Kingdom, Japan, Germany, Italy, India, New Zealand, South Africa, and Monaco.

30. Guided by its [2030 Strategy](#), GOOS works to transform the capacity of the Global Ocean Observing System to deliver fit-for-purpose ocean information to science and society, and for the core team to increase its effectiveness in supporting this transformation. Goal 1: Deepen engagement, partnership and impact; Goal 2: Enhance system integration, delivery and fit-for-purpose; and Goal 3: Build for the future through innovation, capacity development and good governance.

31. GOOS is also evolving to become more user led: the GOOS 2030 Strategy has the value chain, from observations, through data, modelling and assessments, to user services, at its core. These connections are being actively developed through the work of the GOOS Expert Team on Operational Ocean Forecasting, (ETOOFs), the three GOOS Ocean Decade Programmes (CoastPredict, Ocean Observing Co-Design, and Observing Together), and WMO.

Sustaining, strengthening, and expanding implementation of GOOS – Goal 2

32. The *in situ* Global Ocean Observing System now numbers more than 8,600 ocean observing platforms across 13 global ocean observing networks, with some 84 Member States (plus the European Union) supporting these networks, with eight from African States and eight from SIDS (large ocean States). There are also 12 BioEco EOVS ocean observing communities. This system supplies essential data and products to weather, climate, and ocean forecasters, maritime commerce, sustainable fisheries, biodiversity and assessments, governments and coastal communities. It is foundational for monitoring long-term climate change and the increasing stress on the ocean from human activity.

33. The *Ocean Observing System Report Card* continues to be recognized as a key source of information on the status and benefits of the integrated Global Ocean Observing System. The [2021 Report Card](#) included information on the status of biogeochemical observations, and the 6th [GOOS Ocean Observing System Report Card](#), launched in September 2022, added biological and ecological EOVS and networks. The Ocean Observing System Report Card is now truly an integrated cross-GOOS view of the state, value and capacity of the Global Ocean Observing System.

34. GOOS and its partners identified knowledge gaps on the status of marine life in a [study](#) published in *Frontiers in Marine Science* journal (2021). The study reveals that sustained biological

observations only cover 7% of the ocean surface. The open ocean and some parts of the South American, Eastern European, Asian, Oceania and African coasts were especially underrepresented. The results are concerning, as they suggest that the lack of information is often greatest where it is needed the most: in areas of high biodiversity with intense human pressures. The study will allow GOOS to take prioritized action.

35. New EOVs and subvariables have been added: Marine Debris, Ocean Sound, and Bottom Pressure, for a current total of 35 EOVs. An authoritative paper on the GOOS EOVs will be published in 2023.

36. In July 2022 GOOS launched the GOOS [BioEco Portal](#), an online platform that provides information on the sustained ocean observing programmes focused on observing the 12 BioEco EOVs that deliver information about biodiversity and the health of marine life. For the first time the Portal provides a comprehensive view of who is measuring what, where, how, and why for marine biodiversity. This is a fundamental starting point to coordinate and enhance observations, including filling gaps. Two GOOS BioEco EOVS observing communities, macroalgae and seagrass, held workshops in Europe in 2021 and 2022 to improve coordination, integration, and standardization across the observations. In 2022 a key paper was released around the impacts of climate change on zooplankton, linked to work on the EOVS.

37. In addition the GOOS Observation Coordination Group have mapped the data flow of 12 of the global ocean observing networks. For the first time, this enables external data managers, service providers and users to understand how the data flow from different countries through the network specific data quality control procedures, and through to Global Data Assembly Centres (GDACs) where the data can be harvested for many different applications. The OCG Data Strategy has been developed in the last two years, alongside the data mapping work and it is anticipated that it will be adopted at OCG-14 Meeting in June 2023. This aims to improve the FAIR data delivery across all 12 global ocean observing networks, frictionless data flow, and to ensure the data from these global networks reaches an end point that is harvestable (ERDDAP server). This will enable all ocean data from the global ocean observing networks to be harvested across the future of federated ocean data systems, in line with the IODE ODIS Architecture and the Ocean Decade Data and Information Strategy from the Decade Data Coordination Group, the WMO Global Telecommunications System (GTS), and the internet. The future evolution of the WMO data system is also considered (WIS 2.0).

38. This data mapping also covered the metadata flow that is important to track the ocean observing system implementation and data delivery, through OceanOPS. Standards and high quality metadata is at the core of data harmonization and reuse. OceanOPS released a minimum metadata standard—ocean-ops.org/metadata—and works with all the global network to improve metadata standardization and quality.

39. Best practices are another fundamental component for integration and efficiency, and the GOOS-IODE Ocean Best Practice System has significantly increased the visibility of best practices in the last years. There are now over 1,750 best practices archived, seven GOOS Endorsed Best Practices and more under development in all parts of the ocean observing system. The benefits of using best practices are significant, including harmonization, data quality and cost savings, and enhancing integration along all parts of the value chain. There are some 29,000 monthly accesses of the Ocean Best Practice System repository. In October 2022 the OBPS held its annual Workshop to focus on the next frontiers in best practices.

Connecting ocean observations to international frameworks and communicating on the need for ocean observations – Goal 1

40. In November 2021 GOOS presented on ocean-climate priorities at the 26th session of the 2021 United Nations climate change conference ([COP-26](#)) in Glasgow (U.K.). GOOS co-chair Anya Waite (Ocean Frontiers Institute, Canada) presented on major role of the ocean in global carbon budgets in the science pavilion as part of the Earth Information Day. Waite highlighted the critical

need for ocean carbon observations for effective monitoring of CO₂ reduction measures and climate mitigation action.

41. From March 2002 the GOOS Ocean Observation Physics and Climate Panel (OOPC) has helped to write the Global Climate Observing System (GCOS) Implementation Plan (ocean component), presented at this year's Assembly. GCOS's reports on the state of the global climate observing system are submitted to the UN Framework Convention on Climate Change (UNFCCC). The GCOS Implementation Plan was welcomed at COP-27, and Parties and Organizations were called out to act on improving the global climate observing system by implementing together. GOOS will help focus nations on the existing gaps described in the GCOS Implementation Plan, and will support implementation through the [Ocean Observing Co-Design Programme](#). The UNFCCC and WMO have been noting the need for more ocean observations as the only way to mitigate against the impact of extreme weather such as hurricanes, to underpin carbon budgets, and to support governments in adapting to the impacts of climate change on coastal communities and marine resources.

42. GOOS raised the profile of the ocean and the critical need for observations at the 22nd meeting of the United Nations Open-ended Informal Consultative Process (ICP) on Oceans and the Law of the Sea, in June 2022, which focused its discussions on the theme "Ocean observing. The ICP session was held at UN Headquarters and the IOC Chair, GOOS Co-Chairs, and several members of the GOOS Core Team were invited to participate as panellists. This and the UN Oceans Conference in June 2022 were important opportunities to highlight where coordinated support from Member States can lift the Global Ocean Observing System (GOOS) is key areas of need. GOOS and its partners will also contribute to this year's Informal Consultative Process on Oceans and the Law of the Sea, topic of Marine Technology, around the GOOS-MTS-NOAA [Dialogues with Industry](#).

43. GOOS again raised the profile of the ocean and the critical need for observations at the UN Climate Change Conference (COP-27) in November 2022, and again at the UN Biodiversity Conference (COP-15) in December 2022. The event where the ocean observing community had the most influence in reaching country climate negotiators was the Earth Information Day—a UNFCCC-organized event. The event was attended by hundreds of negotiators and featured clear messages from UNESCO and other agencies on the need to systematically monitor the climate for the purposes of the convention. At COP-15 the power of new technologies to monitor the 12 biodiversity EOVs was highlighted at an oceans event organized by the IOC Ocean Decade team.

44. A GOOS Communications Plan was finalized and is now being implemented. This aims to both connect with the ocean observing community and highlight the critical need for ocean observing to government, policy, science, private sector, and coastal communities. Since July 2022, GOOS has produced 20 original articles, all shared on the IOC website, with four of the feature stories picked up by external news portals, and also featured on the UNESCO website. A GOOS bi-monthly community news Update is sent out, plus 120+ tweets, and now also LinkedIn posts. GOOS invests in one part time communications professional to support this work.

45. The IMOCA sailing class and UNESCO renewed their partnership agreement until 2025, in close collaboration with the OceanOPS operations coordination centre. Creating high level visibility on the importance of observing the ocean systematically, racing skippers working in collaboration with scientists will further deploy oceanographic equipment in areas where few vessels are going and use international race events to communicate about the importance of ocean science for sustainable development.

46. A University of New Mexico-OECD-GOOS collaboration has developed a paper that provides a new economic model that uses EOVs to reduce risk in assessment of marine resource or ocean management decisions. This will be published as an OECD Technical Report in 2023, and the OECD and GOOS will work to test the model with case studies.

Build for the future through innovation, capacity and good governance – Goal 3

47. GOOS has supported implementation of the vision of an Integrated Marine Debris Observing System (IMDOS) by publishing the first version of the new Marine Plastics Debris EOVS Specification Sheet. The Marine Plastics Debris is a new emerging EOVS which paves the way for a new class of EOVSs which help GOOS address the need to monitor human impacts on the ocean as mandated by the GOOS 2030 Strategy. A UN Ocean Conference Side Event "Integrating Marine Litter Monitoring to Inform Action" proposed the emerging Integrated Marine Debris Observing System (IMDOS), as key to addressing the complex problem of marine plastic pollution through a globally coordinated and integrated monitoring programme providing information for science-based decision making. This is a joint project between GOOS, GEO Blue Planet, UNEP Global Partnership on Marine Litter, and other organizations. At the 12th Session of the GOOS Steering Committee (GOOS SC-12) IMDOS was formally adopted as a GOOS Project.

48. In September 2022, GOOS and the Marine Technology Society (MTS) initiated the [Dialogues with Industry](#)—a forum for compact and meaningful dialogue with new and established companies, academia, and governments. The dialogues aim to highlight opportunities for the public and private sectors to work in partnership towards achieving a mature, vibrant ocean observing enterprise that will help accelerate the development of a thriving blue economy.

OceanOPS – the GOOS Operations Centre

49. Supporting GOOS and the global networks under the Observations Coordination Group, OceanOPS is pursuing the vision of its five-year Strategic Plan ([GOOS-250](#) Report), to become the international hub and centre of excellence that provides vital services in monitoring, coordinating, and integrating data and metadata, across an expanding network of global oceanographic and marine meteorological observing communities.

50. In 2021, OceanOPS coordinated a sailing vessel charter to re-seed sparse areas of the Atlantic Ocean with 80 Argo floats, at low cost and with a low carbon footprint. This was a new example of international cooperation, achieved with the USA, Canada, and the European Commission. A successful pilot to import real-time data on R/V cruise plans into OceanOPS from the new Marine Facilities Planning tool from the International Research Ship Operators–IRSO (the international coordination body for research vessels) was completed. This link has the potential to drive greater efficiency in the coordination of instrument deployments. OceanOPS also launched the Odyssey Project for the start of the One Ocean Summit in Brest (France), in February 2022. Through this Ocean Decade endorsed project, OceanOPS is aiming to unlock the potential of more ocean-going vessels, from racing yachts, NGOs, divers, and the commercial sector to make needed ocean observations.

51. OceanOPS increased its capacity in 2021, with the hiring of a new OceanOPS manager, a position supported by WMO, and a new Technical Coordinator for metadata implementation. A new Technical Coordinator post for Biogeochemical-Argo will be established in 2022 through support from Monaco.

Strengthening knowledge and exchange around services to boost local uptake

52. The Expert Team on Operational Ocean Forecasting Systems (ETOOFS) has completed the development of its guide *Implementing Operational Ocean Monitoring and Forecasting Systems*. This guide, initiated under the past Joint WMO/IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM), released in June 2022, will be a cornerstone of ETOOFS work to improve the quality, capacity, and interoperability of ocean forecast products. The significant interest in this area can be judged from the successful ocean forecasting training courses, undertaken in June 2021 with 270 participants from 65 countries, using the IODE infrastructure.

Ocean observing in waters under national jurisdiction

53. A Report on the [Ocean Observations in Areas under National Jurisdiction Workshop \(GOOS-246\)](#) was released by GOOS in early 2022. This was the result of multi-agency work by global experts in ocean observing and maritime law and looked at how scientific networks can carry out systematic ocean observations within UNCLOS in the Exclusive Economic Zones (EEZs) of coastal States, which cover almost one-third of the global ocean.

54. The concept of EEZs was formalized in the 1982 United Nations Convention on the Law of the Sea (UNCLOS), commonly referred to as “the constitution of the ocean”. However, 40 years after UNCLOS provided clear guidance on access to EEZs for scientific purposes, managers of the sustained ocean observing system have raised concerns about inconsistencies in how governments regulate scientists’ access to their national waters. These inconsistencies are constraining the work of some of the global ocean observing networks and so impair the implementation of the Global Ocean Observing System, which can result in gaps in our ability to mitigate climate change, improve weather forecasts, and hazard warnings. The Ocean Observations in Areas under National Jurisdiction Workshop Report ([GOOS-246](#)) defined seven solution spaces under UNCLOS, that could be implemented through collaborative action across IOC-UNESCO, WMO and the United Nations Office of Legal Affairs through its Division for Ocean Affairs and the Law of the Sea (DOALOS).

55. The report and recommendations were discussed by the IOC Governing Bodies, with the decision to ask the Executive Secretary to survey the networks and the Member States with regard to their experiences in the taking of ocean observations in areas under national jurisdiction. The surveys have been completed and a summary presented to the Assembly (Item 4.8.2).

GOOS at the heart of the Ocean Decade

56. GOOS observations and predictions are fundamental to achieving the ambition of the UN Ocean Decade. In 2021, GOOS responded to the Ocean Decade’s call for transformational action to address the Decade challenges by launching three ambitious Ocean Decade programmes. These programmes share a vision for a co-designed and integrated ocean observing and forecasting system. Details can be found here: [Observing Together](#), [CoastPredict](#), [Ocean Observing Co-Design](#). Much has been achieved with limited resources. Ocean Observing Co-Design and CoastPredict made significant progress, these programmes now have clear plans for transformational change of the ocean observing system around areas of clear societal need. The GOOS Ocean Decade Programme Observing Co-Design is working with 11 endorsed projects and 6 Exemplar Co-Design projects around key areas for delivery—with a number of pilot areas globally under consideration. The Exemplar Projects aim to lift the ocean observing system in key areas: Ocean Carbon, Tropical Cyclones, Marine Life, Storm Surge, Marine Heatwaves and Boundary Systems. The CoastPredict Programme has 68 partner organizations contributing to the CoastPredict Steering Committee, and three core and three affiliated projects, contributing to six thematic areas for action in the global coastal ocean. Global Coast Experiment will develop the implementation of this programme in and with several regions over the next 3–4 years. The first Ocean Observing Co-Design Workshop held in June 2022 was attended by 274 participants from 42 different countries. The Observing Together programme is working with five endorsed projects. One example of an initial project is the establishment of a national ocean observing system, which is underway with National Commission for Education, Sciences and Culture, Morocco (MarocNatCom), and another is the Fishermans Weather School developed by Indonesia.

57. A significant number of the endorsed Ocean Decade Programmes and Projects (approx. 55% in 2022) are directly contributing to meeting the Ocean Decade Challenge 7 related to observations. This speaks both to the urgent necessity for an expanded ocean observing system to meet pressing societal needs and to the importance of active coordination. GOOS and the Ocean Decade Coordination Unit (DCU) have worked together in the last months to develop plans for a Decade

Coordination Office (DCO) for Ocean Observations. This will be managed by GOOS and supported by funding from the Decade Coordination Unit for the first year of operation.

Focus on GOOS Regional Systems

58. GOOS Regional Alliances (GRAs) integrate national needs into regional systems and deliver the benefits of GOOS's strategy, structure, and programmes at a regional, national and finally global level. In 2022 and 2023 there has been a focus to rejuvenate the Pacific Islands GOOS Regional Alliance (PI-GOOS). In February 2023, Circular Letter [2922](#) called for Expressions of Interest to host the PI-GOOS Office, which have been evaluated and validated by the GOOS Steering Committee in May 2023, ahead of announcement at the IOC Assembly. IOCARIBE held a specific Science Day in May 2023 aimed at rejuvenating development of IOCARIBE-GOOS. In Europe, the European Ocean Observing System (EOOS) Strategy 2023–2027 was released in March 2023.

59. There has also been a focus on strengthening and developing the role of the GOOS National Focal Points (NFPs). In February 2023, Circular Letter [2931](#) invited Member States to comment on updated Terms of Reference for the GOOS NFPs and also update or nominate a focal point, resulting in a current total of 65 GOOS National Focal Points. The overarching objective of the GOOS National Focal Points is to promote and support nationally and regionally coordinated strategies for the implementation of a sustained Global Ocean Observing System, and to act as a focal point for communication between GOOS and the national organizations and individuals involved in the Member State's sustained ocean observing infrastructure.

60. A comprehensive survey of the status of the ocean observations platforms in Africa and the Adjacent Island States was undertaken and a webinar organized to review the report on 23 March 2022. The participants agreed on the publication of the report on the African Ocean Observations Network, taking into account the proposed changes discussed during the session. Collaboration with the African Union Commission was strengthened, in particular with the GMES and Africa project. The “Workshop on collaboration between GOOS-AFRICA and GMES & AFRICA” was held on 24–28 October 2022 in Kigali (Rwanda) and focused on developing partnerships between GOOS-AFRICA and GMES & AFRICA, in order to improve the African ocean observations network.

GOOS and its co-sponsor WMO

61. The 2021 Extraordinary World Meteorological Congress (October 2021) approved the new WMO Unified Data Policy, which supersedes its older policies relating to the international exchange of meteorological, hydrological and climate data between the 193 Member states and territories of the WMO. The approved WMO Unified Data Policy Resolution (Res.1) can be found [here](#). For the first time, ocean data and the GOOS Essential Ocean Variables are called out in this WMO Data Policy, which is a call for action to share ocean data that reaches beyond the global meteorological community. The ocean data aspects of the policy state that ‘core data’, encompassing all physical GOOS Essential Ocean Variable (EOVs) and GCOS Essential Climate Variable (ECV's) data collected as part of GOOS, shall be exchanged on a free and unrestricted basis. The exchange of all other observed biogeochemical and biological/ecosystems GOOS EOVs and GCOS ECVs is recommended (see [article](#) for details). This is supportive in raising the importance of sharing EOV and ECV data.

62. The Global Basic Observing System (GBON) of the WMO, as approved by the WMO Congress in 2018, represents a new approach in which the basic surface-based observing network is designed, defined and monitored at the global level. The GOOS Steering Committee requested WMO to include the mature GOOS networks able to deliver to GBON obligations (SC-10 Part 2 Report [here](#)). By end the of December 2023 GOOS the Technical Specifications for two variables (sea surface temperature and sea surface pressure) will be complete, the integration mechanism for entry into GBON. However it may take some years more (subsurface) ocean variables are included. Inclusion into GBON is important for the SOFF (Structured Observing Finance Facility).

63. Recently GOOS has engaged WMO Rolling Review of Requirements (RRR), which seeks to define the temperospacial density of observations to meet specific service requirements. The aim of this partnership work with WMO is to ensure that GOOS is delivering and coordinating the expansion of the ocean observing system to meet key meteorological services user needs, and to widen the support for ocean observations within the meteorological community.

64. The Study Group on Ocean Observations and Information System (SG OOS), met from 2020 to 2022, and developed a series of recommendations for maintaining relevant connections with WMO post-JCOMM. Many of these recommendations are in existence or now underway. The WMO Infrastructure Commission will create SG Oceans, a new Study Group on ocean issues.

GOOS Steering Committee Sessions: evolving GOOS

65. The 10th Session of the GOOS Steering Committee Part 2 (GOOS SC-10-2) held online, November 2021, included a special one-day workshop on GOOS Regional Policy. This focused on regional support to GOOS—critically looking at GOOS Regional Alliances (GRAs), GOOS Projects with a regional scope, and their connection to both global networks and national sustained ocean observing activity—with discussion to identify the best scales of activity to effect change and support stakeholders, including regional ocean management structures.

66. The 11th Session of the GOOS Steering Committee (SC), held online across late April/early May 2022, focused in four areas, namely governance, communications, fundraising, and implementation planning for cross-GOOS actions, including the Ocean Decade actions. There were two additional topical sessions in October and November. The GOOS SC approved the Terms of Reference for the Task Team to Evolve GOOS Governance and requested the secretariat to publish the open call with IOC Member States, WMO Members, and a broader ocean observing community (this will be undertaken post Assembly). Guidance was sought on the forming of a Decade Coordination Office (DCO) for Ocean Observations. The SC identified that the DCO could support GOOS and Ocean Decade development by undertaking some key work to integrate data flow in the observing community across GOOS, and with new data management and modelling DCO/DCC. Smart Subsea Cables was endorsed as a new GOOS Project, focused on placing sensors on underwater telecommunication cables for tsunami detection and climate applications, and bottom pressure was added as a new Essential Ocean Variable (EOV), important for tsunami networks.

67. The 12th Session of the GOOS Steering Committee (April 25–27, Halifax, Canada) focused on assessing the challenges, opportunities and level of implementation across the 11 GOOS Strategic Objectives. The GOOS SC-12 was focused around assessment of progress towards the 11 GOOS Strategic Objectives (GOOS 2030 Strategy). Considerable progress has been made in all areas (see GOOS Work Plan Agenda Item 4.8), and many of the highlights are noted in this report. The Steering Committee adopted the updated GOOS NFP ToRs, and also approved the Integrated Marine Debris Observing System (IMDOS) as a GOOS Project. The ongoing development of an IMDOS is important and the project will need support in 2024 to continue its work. The advances in communicating about the global ocean observing system and the focus and role of GOOS were welcomed. The GOOS Steering Committee deemed regional coordination as vital, and welcomed the rejuvenation of PI-GOOS, and recent development activities in IOCARIBE and GOOS-Africa. The developing and deepening connections with WMO were also welcomed. The UN Ocean Decade continues to be viewed as an important opportunity for GOOS, and the work of the Ocean Observing Co-Design Programme was referenced as important to several of the Strategic Objectives. Evolving GOOS Governance will be a key action across 2023.

68. GOOS continues to grow in size and capability to deliver integrated multidisciplinary ocean information in support of monitoring and predicting our changing climate, ocean health, ocean life, weather, and hazard warnings, despite continued risk due to short-term funding horizons and inflation related pressures. However the Steering Committee noted some frailty in the core GOOS support structures. To deliver on its strategy and Decade actions GOOS needs to both stabilize and

grow; the support of its sponsors, member states and philanthropic organizations will be sought to achieve this.

The Second International Ocean Data Conference

69. The second International Ocean Data Conference—The Data We Need for the Ocean We Want, was held at UNESCO Headquarters in Paris (France) as a hybrid event on 20–22 March 2023. The event was attended by 160 participants on site and 296 online. The web site of the Conference is available from <https://oceandataconference.org>. The goal of IODC-II was to focus on the implementation of the commitments and main recommendations identified at IODC-I, and therefore was organized around four sessions. Session 1 emphasized the importance of investing in systematic data integration services, providing APIs, and using controlled vocabularies to achieve harmonized and FAIR data. It also highlighted the need for collaboration across communities with different technological maturity levels and keeping licensing as open as possible. Session 2 focused on improving cooperation mechanisms for multi-stakeholder partnerships, enhancing documentation of experiences, and embedding capacity development through transdisciplinary approaches. Session 3 called for more coordination and co-governance of digital interoperability norms and developing clear, common, and computable maps of data and service flows. It also highlighted the need to update metrics for success and rally potential co-implementers to challenge the Decade Data & Information Strategy's implementation plan. Session 4 emphasized the need for inter- and transdisciplinary research practices to ensure diversity, transparency, equity, inclusion, and trust in ocean science. Social sciences were identified as a key support for improving ocean data use and addressing injustices and discrimination in data-related practices.

The IODE Network

70. The IODE network now includes: (i) 58 National Oceanographic Data Centres (NODC) of which 18 in Africa, 11 in Latin America, and 10 in the WESTPAC region, 10 of these are accredited NODCs; (ii) 40 Associate Data Units (ADU) of which two are accredited; (iii) six Associated Information Units (AIU). Overall 68 Member States have one or more NODCs or ADUs. There are 89 IODE national coordinators for data management and 39 IODE national coordinators for marine information management.

Renewal of the MoU between the Flanders Marine Institute and IOC

71. As a follow-up to recommendation IODE-XXVI.6.5 and Decision A-31/3.4.2 (International Oceanographic Data and Information Exchange), sub-section IV) regarding the renewal of the MoU between the Flanders Marine Institute (VLIZ) and IOC, a new MoU was signed between UNESCO/IOC and the Government of Flanders (Kingdom of Belgium) through the Flanders Marine Institute (VLIZ) covering the period January 2022 to December 2026. In addition, VLIZ and the Project Office moved to new facilities (InnovOcean Campus) in September 2022.

IODC Contribution to the UN Ocean Decade

72. IODE has now successfully submitted six Decade Actions by IODE: (i) environmental-DNA expeditions in marine World Heritage sites; (ii) Ocean Practices for the Decade; (iii) OceanTeacher Global Academy: Building Capacity and Accelerated Technology Transfer for the Ocean Decade; (iv) Pacific Islands Marine Bioinvasions Alert Network (PacMAN); (v) OceanData-2030; and (vi) OBIS 2030. In addition, several proposals were submitted in cooperation with IODE: (i) the World Ocean Database Programme (WODP): Openly discoverable, accessible, adaptable, and comprehensive digital global profile oceanographic data of known quality (submitted by NCEI/NOAA, United States as a Decade contribution); (ii) CoastPredict – Observing and Predicting the Global Coastal Ocean (Italy); (iii) Ocean Observing Co-Design: evolving ocean observing for a sustainable future; and (iv) Marine Life 2030.

73. In addition, the IOC Project Office for IODE, Ostend (Belgium) offered to host (and this was accepted) the Decade Coordination Office for Data Sharing (DCO Data Sharing). The main roles of the DCO are: “Acts as sub-unit of the central Decade Coordination Unit. Catalysis and coordination of Decade Actions including of Calls for Decade Actions, organize and coordinate Decade review processes, promote cooperation amongst UN and Member State partners, communications, monitoring, and resource mobilization“. The DCU mobilized funding (for 11 months) for a DCO Lead and the vacancy was published in March/April 2023.

Revision of the IOC data policy

74. The IOC Inter-sessional Working Group on the Revision of the IOC Oceanographic Data Exchange Policy (IWG-DATAPOLICY) completed the eight steps of its workplan, prepared a draft which was approved by IODE-XXVII, and the new IOC Data Policy and Terms of Use (2023) will be discussed under agenda item 4.4.

IODE cooperation with other IOC Programmes

75. IODE is continuing and further developing its collaboration with, and support to, other IOC programmes and activities, including the GOOS BioEco panel, GOOS/IODE Ocean Best Practices System (OBPS) (see below), GOSR, HAB (HAIS, GHSR), GO₂DAT and SDG Indicator 14.3.1[1]; as well as more broadly the implementation of the IOC Capacity Development Strategy through its OceanTeacher Global Academy (OTGA) project in which all IOC programmes have been invited to participate (see also below and under [Function F](#)).

The IODE/GOOS Ocean Best Practices System (OBPS)

76. The IODE/GOOS Ocean Best Practices System (<http://www.oceanbestpractices.org>) (OBPS) continues gaining support across ocean disciplines and users as it moves further in its strategy of providing visibility and discovery of known methods (including best practices and standards), facilitating transparency and trust of information and improved global level interoperability. Understanding the flow from data to information to knowledge leading to decision-making will make ocean management more effective. There are also challenges in adopting best practices globally due to the differences in infrastructure, personnel capacity and national and regional issues. To further global interoperability, OBPS has a Task Team to adapt best practices to regions of limited infrastructure, initially focused in Africa. A second phase has begun in the Caribbean supported by NORAD funding through IOC. Further extension to a global level was proposed in January 2023 for endorsement as an Ocean Decade Project. The global user base brings the need for access to best practices in multiple languages; automated translations are being tested to expand OBPS services. The growth in Repository records means users ask what practice to choose in various situations. Supplementing the OBPS/GOOS Endorsement process, a new Task Team on Decision Trees is looking to provide guidance on how to design a tree to be effective in selecting applicable best practices.

77. The Ocean Decade presents opportunities for OBPS to enhance its strategy of providing visibility and discovery of known methods, by supporting and leveraging new structures at IOC and the Ocean Decade in both data sharing, ocean observations and applications. Engagement with multiple Ocean Decade programmes is underway. This includes, for example, collaboration with the Ocean Prediction Decade Collaborative Centre and programmes such as Coast Predict and MarineLife 2030. As the Ocean Decade has affirmed, ‘best practices are essential for moving towards managing the ocean sustainably on the basis of capable ocean science. The potential is mighty’.

78. To capture this potential, methods resident in global organizations need to be more readily discoverable and accessible. A co-design exercise with the Ocean InfoHub Project. is underway on a federated network of methodology systems to address this need. Participation in international projects EUROSEA; JERICO-S3 and ILIAD (a Digital Twin of the Ocean project), and the NSF

Research Coordination Network has supported technology growth in the OBPS in areas such as the federated network, language support as well as engaging traditional knowledge holders.

79. Dialogues supporting global needs and adoption are a successful element of the annual OBPS workshops. The Workshop in October 2022 had some 600 active participants contributing to 19 Theme sessions. The 2023 Workshop will be focussed on the 10 Ocean Decade Challenges and OBPS will be inviting Ocean Decade Programmes to contribute.

80. Focusing on diversity and inclusion, OBPS introduced a global ECOP Ambassador programme as well as expansion of the geographic representation in the OBPS governance. Success stories are emerging with one of the ambassadors receiving international recognition and the implementation of national level best practices in Australia and elsewhere.

The Ocean Biodiversity Information System (OBIS)

81. OBIS continues to grow and added another 8.8 million species observations, including 23,000 previously unreported species from 360 new datasets between April 2022 and May 2023. Two new EU Horizon projects started recently in which OBIS plays an important role: (i) the MARCO-BOLO project aims to enhance the monitoring and protection of marine biodiversity in coastal and marine environments across Europe and globally. It will structure and connect existing observation capabilities and contribute to global efforts to restore ocean health. The OBIS Secretariat is involved in various project activities, including delivering Essential Ocean/Biodiversity Variables (EOVs) for marine and coastal systems, developing protocols and standard operating procedures for eDNA-based approaches, and engaging stakeholders and communities; and (ii) the Marine Protected Areas Europe (MPA Europe) project aims to identify locations in European seas where Marine Protected Areas (MPAs) can protect the maximum number of species, habitats, and ecosystems, including blue carbon benefits. The OBIS Secretariat will contribute to the project by providing species distribution models, diversity metrics for European seas, and habitat maps based on OBIS data, which will be used in the prioritization process. The models will also include predictions for future scenarios according to CMIP6.

82. OBIS also plays a crucial role in a new Flanders Government funded project "eDNA expeditions in marine World Heritage sites", which IOC implements together with UNESCO's World Heritage Centre. The environmental-DNA expeditions initiative is a two-year project to collect eDNA samples from approximately 25 marine World Heritage sites, analyze the DNA sequences in a designated central laboratory, and make the resulting data openly accessible through OBIS. The project is a global collaboration that seeks to establish a standardized approach to collect, process, and publish eDNA data from citizen science sampling campaigns. The project will also look at potential impacts of climate change on shifts in species composition. This is especially important for the 50 flagship marine protected areas on the UNESCO World Heritage List that host over 20% of the world's blue carbon ecosystems and are a refuge for at least 35% of the world's vulnerable and endangered species (based on data from OBIS).

83. As a response to the request by Member States, OBIS developed the proposal OBIS2030, a biodiversity data hub for the Decade actions, which has been endorsed by the UN Ocean Decade. OBIS2030 aims to provide standardized, quality-controlled, and managed biodiversity data to create information tailored for decision-makers in protecting and restoring marine ecosystems and life in the ocean. The project plans to improve data flows, create information products, support digital representation of the ocean, and engage stakeholders while collaborating with international partnerships. OBIS2030 will also support communities requiring actionable data and information products for policy and management/decision-making at national, regional, and international scales. Funding and investment will be crucial to ensuring the project's success, which involves data collection, management, capacity building, and communication and outreach efforts.

84. The GOOS BioEco portal, which focuses on metadata information on Biological and Ecosystems monitoring programmes was launched by GOOS in 2022 (bioeco.goocean.org). The

portal was developed by the OBIS secretariat. The portal now holds information from over 600 programmes worldwide. The GOOS BioEco portal aims to be the backbone for future GOOS outputs, including assessing the status of BioEco EOY monitoring, which will feed into the annual *GOOS Report Card*, and other assessments of the state and trends in ocean observation. The portal's initial funding has been exhausted, and additional funding is necessary to sustain and expand its development.

The Ocean Data and Information System (ODIS) and Ocean InfoHub (OIH)

85. The ODIS Catalogue of Sources (ODISCat) (<http://catalogue.odis.org>) is an online browsable and searchable catalogue of existing ocean related web-based sources/systems of data and information as well as products and services. The content of the catalogue has continuously been growing and (as on 18 April 2023) contains now 3,105 entries of on-line content sources covering 16 content types. 2,179 of those entries have already been quality controlled and this quality control process will continue in the future. ODISCat is the starting point for discovering sources that are compliant with the ODIS-Architecture that is defined in the Ocean InfoHub project.

86. The IOC Ocean Data and Information System (ODIS) is an e-environment where users can discover data, data products, data services, information, information products and services provided by Member States, projects and other partners associated with IOC. While ODIS will initially focus on "partners associated with IOC" this has been expanded, considering the partnership established under the UN Decade of Ocean Science for Sustainable Development. As such it will become a key contribution to the data chapter of the Ocean Decade implementation plan. The first Steering Group meeting for the ODIS project was held in August 2022.

87. The Ocean InfoHub (OIH) Project (<https://oceaninfohub.org/>) is a four-year project, funded by the Government of Flanders (Kingdom of Belgium). The aim of the project is to support the initial development of the Ocean Data and Information System architecture (ODIS-Arch), as well as develop communities of practice (information systems and their end users) in three pilot regions: Africa; the Latin America and Caribbean region; and the Pacific Island Developing States. Thus, it aims to improve access to global ocean information, data and knowledge products for management and sustainable development.

88. Since June 2020, three regional communities of practice (Africa, Latin America and the Caribbean, and the Pacific Small Island Developing States) have been established, and Steering Group meetings have been held over three sessions. An expert technical working group has grown, now with over 120 technical experts from partner projects and pilot regions, with technical working platforms on [Slack](#) and Github. The global ODIS-architecture has been established, and proof-of-concept achieved with several partners. The documentation for the ODIS-architecture is openly available online <https://book.oceaninfohub.org/index.html>.

89. Many partner organizations ([working spreadsheet available here](#)) are working with the project to demonstrate proof-of-concept of the ODIS architecture. Eighteen project partners are fully operational nodes in ODIS, and are contributing openly discoverable content to the Ocean InfoHub knowledge graph. We have developed an Ocean InfoHub Global Search portal as a demonstration of ODIS (<https://oceaninfohub.org>), and this will be further developed over the duration of the project, to improve and refine services offered. The portal currently (April 2023) contains nearly 100,000 content items in eight content categories: (i) Experts (24,000); (ii) Institutions (13,000); (iii) Documents (42,000); (iv) Training (1,900); (v) Vessels (238); (vi) Projects (3,500); (vii) Datasets (5,500); and (viii) Spatial data (8,700).

90. A training course was prepared and delivered via the OceanTeacher Global Academy platform in 2021: IOC/OTGA/OIH Training course: Implementing the Ocean Data and Information System (ODIS) architecture <https://classroom.oceanteacher.org/course/view.php?id=722>. The course resources remain open online and may be used at any time. Full course materials were

translated into Spanish, French and Portuguese. Courses have been offered in four languages during April 2023.

91. A Programme called “An Ocean Data and Information System supporting the UN Decade of Ocean Science for Sustainable Development” (OceanData-2030) has been registered with the UN Decade for Ocean Science for Sustainable Development. The programme will play a central role in supporting the Ocean Decade mission to catalyze transformative ocean science solutions for sustainable development, connecting people and the ocean. In order to achieve the Ocean Decade vision of ‘the science we need for the ocean we want’.

Key Challenges Encountered in Implementation and Remedial Action Taken

92. The Global Ocean Observing System showed resilience to the initial impacts of the COVID-19 pandemic, due to its increasingly autonomous capabilities and diversity of platforms. However, multiple long-term buoy data sets, research-vessel-based reference measurements, and ocean carbon observations will forever have a gap during the pandemic period. Some networks that were more severely impacted have now resumed operations, for example the Ship-of-Opportunity based measurements of ocean temperature profiles resumed at 80% of the original reference lines thanks to the cooperation of commercial shipping companies and their crew. The RAMA array of open ocean buoys in the Indian Ocean has been in critical condition, with a number of inactive buoys.

93. New supply-chain and inflationary pressures, particularly increases in the cost of fuel, mean operational costs are rising across the Global Ocean Observing System. The Observation Coordination Group (OCG) and OceanOPS will monitor the situation and report on any worsening of regional gaps or impact on data returns. GOOS is addressing the fragilities of the system, some of which were uncovered through COVID, facilitating international coordination and support that are vital to the continued strengthening of the observing system.

94. Regarding IODE, out of the 12 staff currently working for IODE (seven at the IOC Project Office for IODE in Ostend, Belgium) only two are employed on UNESCO regular programme positions, three FTEs are seconded by the Flanders Marine Institute (funded by the Government of Flanders, Kingdom of Belgium) and seven are project appointments, consultants or other contractual arrangement of limited duration. The current level of staffing has remained insufficient and a more solid foundation remains essential to maintain not only IODE’s core business but also continue and expand its cross-cutting role across all IOC programmes as well as the emerging data related activities within the Ocean Decade.

95. In order for OBIS to respond to the growing demand in providing user support and to deliver key products and services (e.g. support to the CBD and global assessments under IPBES and UN Regular Process) as well as to cover the day-to-day management and maintenance of the infrastructure, a full-time data manager is urgently needed. In addition, to further develop and maintain the other IOC data portals and websites (e.g. GOSR, OA, HAB...), IODE will need an additional full-time software engineer.

96. The return to the office took place in April 2022, but since then many meetings have been held online.

FUNCTION C: EARLY WARNING AND SERVICES

Develop early warning systems and preparedness to mitigate the risks of tsunamis and ocean-related hazards

97. Function C centres around four main programmatic components: (i) the global Tsunami Warning System; (ii) the Global Sea Level Observing System (GLOSS); (iii) Operational Ocean Forecast Systems services under JCOMM¹; and (iv) the Harmful Algal Bloom programme.

Tsunami Warning Systems

98. The main elements of the Tsunami Programme focus on: (i) secretariat support to the four Intergovernmental Coordination Groups (ICGs) and respective technical working groups and task teams under the four regional Tsunami Warning and Mitigation Systems in the Caribbean (CARIBE-EWS), Indian Ocean (IOTWMS), Pacific (PTWS) and North-Eastern Atlantic, Mediterranean and Connected Seas (NEAMTWS) as well as the Working Group on Tsunamis and Other Hazards related to Sea-Level Warning and Mitigation Systems (TOWS-WG) which addresses inter-ICG and cross-cutting coordination and harmonization; (ii) preparedness and awareness courses and workshops; and (iii) enabling research and policy development. The 15th meeting of the TOWS-WG was held online in February 2022 (Cf. IOC/TOWS-WG-XV/3).

99. In the IOTWMS region, the 13th Session of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System (ICG/IOTWMS) was held hybrid on 28 November–2 December 2022 in Bali (Indonesia). The session was attended by 54 delegates from 17 Member States across the Indian Ocean region, four staff from United Nations agencies (including three from UNESCO and one from UNESCAP), and an additional 10 observers from five Member States (Australia, Germany, Indonesia, Iran and Oman). Due to international travel restrictions associated with COVID, an Intersessional Meeting of the ICG/IOTWMS (online) was also held on 23–24 November 2021. This meeting was attended by 88 participants from 18 Member States. Several other online intersessional working and project meetings have been organized by the Secretariat for the ICG/IOTWMS and Indian Ocean Tsunami Information Centre (IOTIC), including: ICG/IOTWMS Steering Group; Working Group 1 on Tsunami Risk, Community Awareness & Preparedness; Working Group 2 on Tsunami Detection, Warning & Dissemination; Task Team Scientific Tsunami Hazard Assessment Makran Subduction Zone; Task Team on Tsunami Preparedness for a Near-Field Tsunami Hazard; IGCP 740 West Makran Paleo-tsunami Investigation Project First Workshop for West Makran Paleo-tsunami Investigation; IOWave20 Task Team; IOWave23 Task team; and Intersessional Meeting of the Subregional Working Group for the North West Indian Ocean (WG-NWIO).

100. In the NEAMTWS region the 17th Session of the ICG for the Tsunami Early Warning and Mitigation System in the NEAMS (online) was held on 24–26 November 2021 (78 participants, 16 Member States). Several other online working sessions were organized including of the Task Team on Operations and the Steering Committee.

101. Tsunami Service Providers (TSP) countries (France, Greece and Türkiye) celebrated 10 years operations by organizing scientific workshops on 29–30 September 2022.

102. A hybrid workshop on Tsunami Warning Systems in the Context of Multi-Hazard Disaster Risk Mitigation in the NEAM Region was also co-organized with the Joint Research Centre of the European Commission on 4 October 2022 in Ispra (Italy). The workshop was attended by a total of 70 expert participants. Furthermore, an experts meeting was co-organized with the National Institute of Geophysics and Volcanology (INGV) in Naples (Italy) on 28–30 November 2022 to explore

¹ JCOMM was abolished at the 30th session of the IOC Assembly and is now replaced by the Joint WMO-IOC Collaborative Board .

opportunities and identify key actions to implement the new [ICG/NEAMTWS 2030 Strategy](#). The meeting was attended by a total of 68 participants.

103. ICG/CARIBE-EWS-XVI was convened on 25–28 April 2023, hosted by the Government of Costa Rica (Cf. ICG/CARIBE-EWS-XVI/3s).

104. In the Pacific Ocean, the 29th Session of Intergovernmental Coordinating Group for the Pacific Tsunami Warning System (ICG/PTWS-XXIX,) was organized online on 1–8 December 2021 (116 participants, 27 Member States). Additional online meetings of the Steering Committee and Working Group for the South China Sea Region (WG-SCS) and Central America (WG-CA) were organized. An IOC training for seismic and tsunami warning operators on strengthening standard operating procedures for seismic data and tsunami warning in the South China Sea region, 9–10 December 2021 was organized (56 participants).

105. The project ‘Strengthening the Resilience of Coastal Communities in the North-Eastern Atlantic, Mediterranean Region to the Impact of Tsunamis and Other Sea Level-Related Coastal Hazard’ (CoastWave) was launched through an online kick-off workshop on 17 and 20 December 2021. The project is financially supported by the European Union Directorate-General for European Civil Protection and Humanitarian Aid Operations (DG ECHO). The workshop was organized with the participation of partner Member States: Cyprus, Egypt, Greece, Malta, Morocco, Spain and Turkiye, as well as key project partners including the European Commission's science and knowledge service, the Joint Research Centre (JRC) of European Commission, and project supporting countries (technical advice), in particular France and Italy. Several other CoastWAVE workshops have been organized in 2022–2023, including the Resilient and Safer Coasts Side event at the African Conference on Priority Setting & Partnership Development for the UN Ocean Decade, 11 May 2022, Cairo (Egypt); and a first ever training workshop on the Standard Operating Procedures (SOP) Planning and Implementation for Tsunami Response in NEAM region on 5–6 October 2022 at the Joint Research Centre (JRC) in Ispra (Italy). A hybrid training workshop on Tsunami Ready Recognition Programme was also organized, on 16–17 February 2023. The training was attended by 48 experts.

106. The IOC Tsunami Unit supported the organization of the Third Multi-Hazard Early Warning Conference (MHEWC-III) held in Bali (Indonesia) on 23–24 May 2022 and contributed to several panel events. More than 2,000 participants registered for the hybrid event.

Tsunami Exercises

107. Tsunami exercises and drills help to increase tsunami preparedness and awareness of coastal communities. Regular exercises are essential to maintain operational readiness of response agencies and exercises test communications, review agency standard operating procedures, and promote emergency preparedness.

108. The [CARIBE WAVE 2022](#) regional Exercise for the Caribbean and adjacent regions was conducted on 10 March 2022, with over 400,000 citizens, experts and government officials participating across 32 Caribbean countries and 16 territories. This annual exercise has been improving and validating tsunami readiness since 2011. Equivalent exercises were organized in the other basins in 2020–2021 and will be organized in the second half of 2022 and in 2023.

109. Two hypothetical scenarios were simulated for CARIBE WAVE 23, a tsunami generated by a magnitude 7.6 earthquake located in the Gulf of Honduras and a tsunami generated by a flank collapse in Mount Pelée volcano, Martinique. The volcanic scenario was used to test experimental procedures and products for a tsunami generated by volcanic activity. It was up for each of the 48 Member States and Territories to choose between the two scenarios and decide the level of participation and activity for their country. Over 430,000 people from the Caribbean and adjacent regions participated in the CARIBE WAVE 23, carried out on 23 March 2023. The majority of the 432,244 participants from across the region were from K-12 schools. State government, universities

and preparedness organizations also had high levels of participation. A marked increase of people with disabilities was also noted. Full-scale exercises, seminars, and communication tests were some of the many activities that were organized for CARIBE WAVE.

110. The [Exercise Pacific Wave 2022](#) was conducted by 26 Member States from September to November 2022. Regional and national exercises were also conducted in 19 countries. The [Pacific Wave 2022 Pacific Islands Countries and Territories \(PICT\) Regional Exercise](#) was conducted on 9 November 2022 at 2300 UTC with the participation of 18 Pacific Island Countries. Around 80 officials from PICTs national stakeholders (National Tsunami Warning Centres—NTWC—and National Disaster Management Offices—NDMO) tested sharing event information through multiple informal communications modes: WhatsApp (86 messages), electronic mail listserv (63 messages), HF Radio (6 PICTs involved).

Tsunami Events

111. The Hunga-Tonga Hunga-Ha'apai (HTHH) volcano, located 60 kilometres northwest of Tongatapu, Tonga began erupting at 4:07 UTC on 15 January 2022 based on Himawari-8 satellite images, with a massive explosive eruption at 04:14 UTC from seismic data. The eruption triggered a tsunami that caused damage locally, regionally, and across the Pacific. The local tsunami killed three people and caused major destruction to many low-lying coastal communities on Tongatapu, 'Eua and the Ha'apai Group of Tonga; runups up to 15 m and 500 m inundation were reported for Mango Island by the Tonga Geological Services (TGS).

112. The 15 January eruption was preceded on 14 January by a smaller eruption which generated small waves and observations of abnormal tides on Mango Island (closest to HTHH volcano) and up to 30 cm waves at the Nuku'alofa sea level gauge. For this event, the National Tsunami Warning Centre (NTWC) at the Tonga Meteorological and Coast Radio Service (TMCRS), issued a marine warning at 22:12 UTC, which was cancelled the next morning at 21:00 UTC 14 January 2022. The massive explosion occurred unexpectedly seven hours later. At Fua'amotu Domestic Airport, Tongatapu, Tonga, the eruption was first seen as an ash mushroom cloud at 04:12 UTC, 15 January 2022, heard as several loud blasts, felt as a shock wave at 04:21 UTC, followed by sea birds coming inland from the direction of HTHH volcano. Based on these and the eruption the day before, the Tonga Meteorological and Coast Radio Service (TMCRS) issued an Urgent Tsunami Warning asking for immediate evacuation at 04:30 UTC through a direct verbal message on Radio Tonga. The Warning was downgraded to a Marine Warning at 12:48 16 January based on visual ocean observations, and cancelled at 21:00 UTC 17 January 2022 for northern Tonga and at 01:00 UTC 18 January 2022 for southern Tonga.

113. The volcanic eruption and tsunami severed the undersea telecommunication cable, leaving Tonga's National Tsunami Warning Centre (NTWC) at the TMCRS with no weather and earthquake/tsunami monitoring data, only HF radio to communicate weather and tsunami alerts within Tonga, and a satellite phone to receive weather, volcano, and earthquake/tsunami information from outside Tonga. Reduced mobile services were restored on 21 January, followed by VSAT-based satellite services, with full service restored in March for the undersea cable.

114. For the event, the Pacific Tsunami Warning Center (PTWC) reported tsunami wave measurements from 26 countries, with the largest waves (1-2 m amplitude) recorded in Tonga, Chile, New Caledonia and Vanuatu. The first tsunami wave arrived at the Nuku'alofa sea level gauge at 04:27 UTC, reaching about 1.2 m amplitude at 04:47 UTC before it stopped transmitting at 05:30 UTC. The last internet-based message occurred also at about 05:30 UTC.

115. Many countries experienced waves greater than 0.3 metre in amplitude, which typically triggers marine advisories recommending to citizens to stay out of the water as strong currents and/or unusual waves may occur. Damaging waves struck harbours and coasts in New Zealand, Rarotonga, Hawaii and the US west Coast, and as far away as Peru (where, additionally, two deaths occurred), Chile in the eastern Pacific, and Japan in the north-western Pacific.

116. This is the first time that the PTWC had to respond to such an event since the system is primarily focused on earthquake-generated tsunamis causing nearly 90% of the world's historical tsunamis. In 2015 at its 8th session, the IOC TOWS-WG decided to adopt an IOC all-ICG Post-Event Assessment Questionnaire to be triggered when there is a tsunami threat of more than 1 m-amplitude forecast in one or more countries of a region. The decision to trigger the post-event questionnaire is taken by the regional Tsunami Information Centre (TIC) in consultation with the ICG Steering Group and Secretariat concerned taking into consideration whether the tsunami resulted in a national response in one or more countries. For the 15 January 2022 Hunga Tonga-Hunga Ha'apai volcanic explosion and shockwave, no amplitude forecast was possible during the event since it was not triggered by an earthquake. However, observations of more than 1 m amplitude waves were measured in several countries and tsunami advisories or warnings were issued by more than one country, thus meeting the existing formal criteria for triggering the assessment. Further consultation by the International Tsunami Information Center and the Technical Secretary of ICG/PTWS with the Steering Committee in the week following the event indicated consensus to proceed with the post-event assessment, which was launched through Circular Letter [2877](#). The report was being produced at the time of closing this document.

Tsunami Ready

117. In the Caribbean, there are 14 recognized Tsunami Ready (TR) communities. The British Virgin Islands and St. Kitts and Nevis met requirements for Tsunami Ready recognition renewal. Old Harbour Bay, St. Catherine, Jamaica met requirements for recognition. There has been progress in the implementation of Tsunami Ready Indicators in St. George, St. Vincent and the Grenadines. The implementation of Tsunami Ready Indicators has been postponed in Holetown, Barbados and Belize City with Holetown scheduled to be completed in 2022 with NORAD financial support, together with the communities of Port Maria, St. Mary, Jamaica and Mayaro, Trinidad, Trinidad and Tobago.

118. The Indian Ocean Tsunami Information Centre (IOTIC) and the UNESCO-IOC Secretariat for the ICG/IOTWMS held the hybrid "Indian Ocean Tsunami Ready Workshop in Bali (Indonesia) on 22–26 November 2022 to invite, encourage and support Member states to implement the UNESCO-IOC Tsunami Ready Recognition Programme (TRRP) or similar national initiatives. Funding to support the workshop was provided by Government of Indonesia, Government of Australia, and UNESCAP. The workshop was attended by 270 participants (90 in-person and 180 online) from 29 countries from around the Indian ocean and across the world. In the Indian Ocean. So far two communities in India and 9 communities in Indonesia have received Tsunami Ready recognition from UNESCO-IOC. In addition, up to a further 100 communities are in the process to become Tsunami Ready recognized in Indonesia and India. Maldives, Seychelles, Sri Lanka, and Thailand have subsequently also expressed interest in implementing the UNESCO-IOC Tsunami Ready Recognition Programme (TRRP). A Working Group 3 on Tsunami Ready Implementation was established at the 13th Session of the ICG/IOTWMS in November 2022 to facilitate and coordinate implementation of the TRRP and similar national initiatives across the Indian Ocean.

119. A Task Team on Tsunami Ready under Working Group 4 on Public Awareness, Preparedness and Mitigation was formally established with Terms of Reference (TORs) in the ICG/NEAMTWS XVII Session (24–26 November 2021). The TT on Tsunami Ready will promote, coordinate, and provide advice regarding the implementation of Tsunami Ready in the NEAM region. Several activities have been carried out in the NEAM region with the purpose of obtaining the Tsunami Ready recognition in countries such as Spain (Chipiona), France (Cannes), Italy (Palmi, Minturno, and Marzamemi), Turkey (Bodrum and Istanbul), Greece (Kos and Samos), Malta (Marsaxlokk) and Portugal (Region of Madeira and Azores). Several of the 12 Tsunami Ready Indicators have been completed in Cannes, Palmi, and Minturno. Samos, Chipiona, Istanbul, and Marsaxlokk are currently preparing to move forward with the Tsunami Ready Programme through the support of the newly approved EU DG-ECHO and UNESCO-IOC CoastWave Project.

120. In the Pacific Ocean the PTWS Working Group 3 on Disaster Risk Management and Preparedness facilitates and monitors Tsunami Ready campaigns and outcomes. Tsunami Ready

recognition has been achieved by 10 communities in five countries with 30 communities in 10 countries in the process or planned: Tonga, Fiji, Cook Islands, Solomon Islands, Vanuatu, Republic of the Marshall Islands, Federated States of Micronesia, Palau, Costa Rica, Panama, and Ecuador. UNESCO/IOC in collaboration with the International Tsunami Information Center (ITIC) conducted the UNESCO/IOC Tsunami Ready Recognition Programme 1st Regional Training for Pacific Island Countries and Territories (PICT) in Nadi (Fiji) on 30th January–1st February 2023 (38 participants). The Fiji Tsunami Ready Stakeholder Workshop was held on 8–9 February 2023 in Suva (Fiji).

121. The Tsunami Ready Recognition Programme (TRRP) is a voluntary international community-based recognition programme developed by IOC-UNESCO. It aims to build resilient communities through awareness and preparedness strategies that will protect life, livelihoods and property from tsunamis in different regions.

122. Through Decision IOC-XXXI/3.4.1, the IOC Assembly at its 31st session (14–25 June 2021, online) approved the establishment of the IOC Ocean Decade Tsunami Programme. The Ocean Decade Tsunami Programme includes the aims of: (i) Increasing the timeliness and accuracy of tsunami warnings; and (ii) Making 100% of communities at risk of tsunami prepared for and resilient to tsunamis by 2030 through the implementation of the IOC-UNESCO Tsunami Ready Recognition Programme (TRRP) and other similar national initiatives. The implementation of the IOC-UNESCO TRRP will be a key contribution to achieving the societal outcome 'A Safe Ocean' of the Ocean Decade.

123. The 15th Meeting of the TOWS-WG (TOWS-WG-XV), 24–25 February 2022 endorsed the IOC-UNESCO Tsunami Ready Recognition Programme (IOC-UNESCO Tsunami Ready) presented by the Task Team on Disaster Management and Preparedness (TTDMP) and recommended that the IOC Executive Council at its 55th session in 2022 consider approving the establishment of the IOC-UNESCO Tsunami Ready Recognition Programme (IOC-UNESCO Tsunami Ready) as described in the [Working Document on the UNESCO/IOC Tsunami Ready Recognition Programme](#) that was presented to the TOWS-WG.

124. The 16th Meeting of the TOWS-WG (TOWS-WG-XVI) and meetings of its Task Team on Tsunami Watch Operations and Task Team on Disaster Management and Preparedness were held Headquarters, 27 February–3 March 2023. Updates and recommendations were provided by the *Ad Hoc* Team on Tsunamis Generated by Volcanoes and *Ad Hoc* Team on Meteo-tsunamis on what needs to be done to warn and prepare for tsunamis generated by non-seismic and complex sources. Progress and plans with regards to global implementation of the UNESCO-IOC Tsunami Ready Recognition Programme (TRRP) were reviewed.

125. The IOC Tsunami Unit will be the official holder of the documentation supporting the Tsunami Ready recognition. The Tsunami Ready Recognition Programme web site (www.tsunamiready.org) serves as the public information site providing information on the Programme and recognized Tsunami Ready communities. The Tsunami Ready Recognition Programme web viewer (<https://tsunamireadyviewer.ioc-tsunami.org>) provides up-to-date metadata information on recognized communities, and those seeking recognition. The Tsunami Ready Recognition Programme is implemented by Member States. Each Member State is responsible for administering its national programme. Its National Tsunami Ready Board (NTRB) and Tsunami Ready Local Committee (TRLIC) provide guidance to the community during the recognition process. The NTRB is responsible for reviewing and approving the Tsunami Ready Application. In the case of small countries and territories, the recognition may be made at the national/territorial level. In this case, a Regional Tsunami Ready Board (RTRB) would be responsible for reviewing and approving recognition. The IOC [Manual and Guides 74, Standard Guidelines for the Tsunami Ready Recognition Programme](#) (2022) serves as the primary implementing reference. The publication also includes information on the resources needed, tools, references, and videos, as well as training materials. The users of the Tsunami Ready Guidelines are local authorities of coastal communities at risk of tsunami impact, as well as representatives of Emergency Management Agencies or

Disaster Management Offices and Disaster Risk Management experts working with coastal communities facing risk of tsunami impact.

Targeted capacity development and technical assistance

126. Human and national capacity to deal with tsunamis are still unevenly spread among nations. Since its start the Tsunami programme has contained a strong capacity development component. The aim of these activities is to enable Member States to understand the risk and know ways in which they can mitigate the hazard, provide warning to people in a timely manner, and be able to carry out awareness and preparedness activities to sustain knowledge and ability-to-respond across generations.

127. In the backdrop of the pandemic and under the coordination of the IOC-UNESCO Tsunami Unit in close collaboration with Tsunami Information Centres (CTIC, ITIC, IOTIC, NEAMTIC), the International Tsunami Information Center (ITIC) and Indonesia BMKG were chosen as OTGA Specialized Training Centres (STC). A series of online or blended trainings will be developed by ITIC and BMKG within the framework of OTGA. Delivery is planned for 2022–2023 and will include seven courses: Tsunami Awareness, Tsunami Ready, Tsunami Early Warning Systems, Tsunami Warning and Emergency Response SOPs, TEMPP, Tsunami Warning Centre Competencies and Tsunami Hazard/Risk Assessment. These training courses will be developed based on the related IOC Manual Guides and training that have been implemented by the Tsunami Information Centres and hosted on the OceanTeacher e-Learning Programme. The first training on Tsunami Awareness has been made available (online) in the first semester of 2022 and the second training on Tsunami Ready will be available (online) in the second semester of 2023.

128. With support from the Government of Indonesia, the Partnership Agreement between UNESCO/IOC and BMKG on the Indian Ocean Tsunami Information Centre (IOTIC) has been extended for the period 2022–2027 with revised Terms of Reference endorsed by the ICG/IOTWMS. The Partnership Agreement will support the sustainability and continuation of services of the IOTIC for the Indian Ocean Member States for the next five years.

129. The UNESCAP funded project on “Strengthening Tsunami Early Warning in the North-West Indian Ocean region through Regional Collaboration” implemented in India, Iran, Pakistan, Oman, and United Arab Emirates continued to engage with the participating Member States via online national consultations and hybrid regional workshops as part of Phases 1, 2a, and 2b. The ICG/IOTWMS and IOTIC organized three regional training workshops on Standard Operating Procedures (SOP) for tsunami early warning and emergency response in the North-West Indian Ocean (NWIO) region for NTCs, DMOs and the broadcast media (7–9 September, 26–28 October 2021, and 31 October–3 November 2022). Gap analyses on capacity of Member States for tsunami inundation modelling and evacuation planning was undertaken in 2022. Tsunami evacuation planning workshops were organized 24 August 2022 (regional), 13 September 2022 (India), 5 October (Pakistan), and 26 November 2022 (regional). Tsunami inundation modelling workshops were organized on 7 September 2022 and 26 November 2022. The hybrid “Workshop on Makran Subduction Zone Science Strengthening Tsunami Warning and Preparedness” was held on 14–16 November in the UAE. Phase 2c of the project has been approved by UNESCAP and is planned to start on 1 June 2023.

130. On Wednesday 22 November 2022, a final activity of the Tsunami Unit (UNESCO/IOC) – Man and Biosphere Programme (UNESCO/MAB) Joint Initiative on Integrated approach to coastal hazards in the Savegre Biosphere Reserve, Costa Rica: saving lives, protecting biodiversity, was held with local and national stakeholders, including the Comision Nacional de Emergencias (CNE), the Comite Municipal de Emergencias (CME) of Quepos, the Parque Nacional Manuel Antonio, the Municipality of Quepos, the National Tsunami Warning Center of Costa Rica SINAMOT, the MAB Board for the Savegre Biosphere Reserve, ASANA. The meeting took place in the meeting room of Parque Nacional Manuel Antonio and coincided with celebrations for the 50th anniversary of the park. This initiative was designed to strengthen the resilience of vulnerable coastal communities in

Savegre Biosphere Reserve by developing an integrated approach to coastal hazard preparedness. At the end of the project, selected communities of the Savegre Biosphere Reserve obtained an improved understanding of coastal hazard risks based on sound scientific assessments.

131. To improve preparedness to tsunamis, IOC organized a five-day tsunami modelling workshop for the Peruvian Navy Tsunami Warning Center on 17–21 October 2022, held in the facilities of the Directorate of Hydrography and Navigation (DHN) in Callao (Peru). Overall, 38 participants from key Peruvian institutions such as the National Institute of Civil Defense of Peru (INDECI), the Peruvian Geophysical Institute (IGP), the San Marcos National University (UNMSM), the Peruvian-Japanese Center for Seismic Research and Disaster (CISMID), the National Center for Estimation, Prevention and Disaster Risk Reduction (CENEPRED) and the DHN, successfully completed the 40 hours of training, thus receiving their certificates at the end of the training.

132. Following the 15 January 2022 Hunga-Tonga Hunga-Ha'apai volcanic eruption and tsunami, and within the framework of activities of the Regional Working Group on Tsunami Warning and Mitigation in the Southeast Pacific Region (WG-SEP), this workshop entitled "Shared Access to Sea Level Data: A Tool for Effective Regional Tsunami Emergency Response" was organized. The workshop brought together representatives from the National Tsunami Warning Centres of Chile, Colombia, Ecuador, and Peru. Expert presentations were also made by the Pacific Tsunami Warning Center (PTWC), VLIZ, UNESCO/IOC and SHOA. The primary objective of the workshop was to enhance capabilities of WG-SEP Member States for tsunami warning and mitigation through sharing of data in real time from regional sea level stations. During this workshop representatives agreed that 26 additional sea level stations across the region will share their data with the IOC Sea Level Monitoring Facility, thus providing additional information to decision-makers across the region. Of the 26 sea levels stations added, the stations are located as follows: 14 in Peru, six in Ecuador, four in Colombia, and two in Chile.

World Tsunami Awareness Day

133. The 5th November was designated as World Tsunami Awareness Day (WTAD) by the United Nations General Assembly in December 2015 through its Resolution [A/RES/70/203](#). The resolution requested that the United Nations Office for Disaster Reduction, in collaboration with relevant organizations of the United Nations system, facilitate the observance of WTAD, starting in 2016.

134. For the WTAD 2021 Campaign in the NEAM region, two separate exercises/drills were conducted in France: Prefecture of Bouches du Rhône Department Tsunami Exercise (Marseille, Martigues, Fos-sur-Mer and Cassis) on 4 November 2021 and a Tsunami drill and seminar was held in the city of Cannes on 5 November 2021. In Malta, an end-to-end tsunami exercise (JRC TLM-MALTA21) was organized by the Civil Protection Department and the University of Malta with the support of the JRC in the village of Marsaxlokk on 5 November 2021. CAT-INGV TSP, Italy provided regional tsunami alert messages to Malta to execute the exercise. The CAT-INGV, Italy and NOA, Greece also participated in a table-top exercise promoted by the ChEESE project on 5 November 2021, to show the potentiality of Urgent Computing for Rapid Post Event Assessment. CAT-INGV also created [The Story Map](#): "*A journey through the tsunamis of the Mediterranean Sea. From 365 A.D. to today: an interactive path to tell the tsunamis occurred in the Mediterranean Sea*". A Tsunami Ready office was inaugurated in Chipiona, Spain on 3 November 2021 with a permanent exposition display to the local public and visitors. A tsunami awareness event was co-organized by the Istanbul Metropolitan Municipality and KOERI, Turkiye with the participation of METU and various national stakeholders. The National Institute of Oceanography and Fisheries (NIOF), Egypt organized social events for public awareness, including an online workshop on 8 November 2021.

135. In the Indian Ocean for WTAD 2021, Indian Ocean Tsunami Information Centre (IOTIC) and ICG/IOTWMS Secretariat organized a webinar, "International Cooperation: A Strategic Pathway for the Indian Ocean Tsunami Warning and Mitigation System within the context of the UN Decade of Ocean Science". The webinar was attended by 78 participants and was composed of a closed strategic pathway discussion session with breakout groups about risk assessment and reduction:

hazard and risk identification and risk reduction; and tsunami risk, community awareness and preparedness. The webinar resolved to continue to encourage Member States to put priority into the effort of improving the timeliness, reducing uncertainty levels in tsunami detection and warning, and implementation of Tsunami Ready, and to continue to facilitate local, regional, and national communities of Member States to pro-actively learn about Tsunami Ready indicators and implement Tsunami Ready to enhance readiness levels. An open session was streamed through IOTIC Facebook with the announcement of the Indian Ocean Youth Video Competition winners. In the Indian Ocean for WTAD 2022, IOTIC and ICG/IOTWMS Secretariat organized the hybrid North-West Indian Ocean Regional Standard Operating Procedure Workshop for NTWCs, DMOs, and the Broadcast Media in the Tsunami Warning Chain, 31 October–3 November 2022.

136. In the Pacific Ocean, regional activities included seminars on International Cooperation on Tsunamis in Asia-Pacific, introduced by Sweden, with contribution from the Philippines, UNDRR, ESCAP, UNESCO, and UNDP, and International Cooperation for Tsunami Warning and Mitigation in Pacific Island Countries (PIC), introduced by Fiji, with contributions from Cook Islands, UNDRR, SPC, ICG/PTWS Vice Chair (Tonga), and ITIC. PIC activities included active Facebook posts from Fiji, Samoa, Solomon Islands, Cook Islands, Vanuatu, and Tonga, as well as awareness events, in Tonga (media, youth awareness competitions), Samoa (exercise), Solomon Islands (youth events), and Vanuatu (Aneitjom, Epi island exercises). The UNDRR and IOC collaborated to produce several short awareness videos highlighting activities in several PTWS countries, including New Zealand (DARTs) and the Solomon Islands (Tsunami Early Warning System). For the global level video, the ITIC Director joined the IOC Executive Secretary to highlight the UN Ocean Decade and Tsunami Ready.

137. The Caribbean Tsunami Information Centre (CTIC) activities supported concept development of global UNDRR-led WTAD activities. CTIC took part in the UNDRR-led VII Regional Platform Disaster Risk Reduction in the Americas and the Caribbean (Virtual), Ideas Incubator Session (Side Event) – [“Tsunami Ready: Towards A Safer Ocean”](#), and Innovator Platform Session (virtual exhibition). There were two CARIBE-EWS videos showcasing international collaboration for Tsunami Ready. Key partners included the Caribbean Disaster Emergency Management Agency (CDEMA), the Coordination Center for the Prevention of Disasters in Central America and the Dominican Republic (CEPREDENAC) and the Delegation of the European Union.

138. At global level there were major events in New York (UN Headquarters), Asia-Pacific, Africa and the Caribbean that were supported by IOC-UNESCO in collaboration with UNDRR and UNESCAP. The 2021 campaign had 194 million [impressions](#), which is the number of times WTAD 2021 messages were displayed to people. It generated 1.1 million views, and over 54,000 reactions and shares. It was used by nearly 3,400 accounts including the UN and UNESCO. November 5, 2021 high-level online WTAD event at UN New York Headquarters was co-organized by the Governments of Japan, Chile, Fiji, Maldives, as well as Australia, Indonesia, Norway, and Peru, UNDRR, UNDP, and UNESCO.

139. The WTAD 2022 theme was on the Sendai Framework Global Target G: Substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments to the people by 2030. WTAD 2022 advocated on reducing tsunami risk globally through increasing access to early warning systems. Through political engagement to drive change, the UN Secretary-General, Antonio Guterres launched the “Early Warnings For All” Action Plan to achieve early warning for all in five years. Initiatives implemented in collaboration with UNDRR included #gettohighground public-facing campaign, where citizens participated in fun walks of tsunami evacuation routes at local level. The campaign was supported by Member States such as Indonesia, Samoa, Ecuador, Cook Islands, Portugal, and Mauritius. Approximately 4,000 people participated in the #gettohighground campaign.

Support for enabling research and policy development

140. Ongoing improvements of tsunami warning systems and mitigation efforts contribute to sustain the system, reduce costs and uncertainty, and maintain public trust.

141. The Tsunami community contributed actively to the development of the approved Implementation Plan for the UN Ocean Decade and continue to participate in key events and in regional meetings including the Safe Ocean Laboratories (“Further Challenges for Tsunami Warnings” on 6 and 7 April 2022 and “Tsunami Ready Communities” on 7 April 2022) and the “African Conference on Priority Setting & Partnership Development for the UN Decade of Ocean Science for Sustainable Development – Current Status, Challenges and Opportunities”, 10–12 May 2022.

142. The 15th Meeting of the TOWS-WG (online), on 24–25 February 2022, noted the establishment of the Scientific Committee (SC) for the Ocean Decade Tsunami Programme; and accepted the workplan of the SC to develop the *Draft 10-Year Research, Development, and Implementation Plan* for consideration by the TOWS-WG at its 16th meeting in February 2023.

143. The 16th Meeting of the TOWS-WG (TOWS-WG XVI) reviewed and endorsed (subject to a relative few modifications) the latest draft of the Research and Development Implementation Plan prepared by the Science Committee for the UN Ocean Decade Tsunami Programme (UN ODTP), which is to be submitted to this Assembly-32 session for endorsement.

Harmful Algal Bloom programme

144. Impacts of harmful algae on aquaculture, food safety, fisheries, tourism and other ecosystem services are permanent and widespread and intensify proportionally to the exploitation of the coastal seas. Routine monitoring and appropriate management plans can to a large degree prevent or minimize impacts.

145. IOC priorities and actions on Harmful Algal Blooms are set by the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms (IPHAB) and the programme is implemented via a number of global and regional initiatives. The research component under IPHAB, GlobalHAB, which is jointly sponsored with SCOR, has implemented a number of initiatives from its Science and Implementation Plan. The IOC Science and Communication Centre on Harmful Algae at the University of Copenhagen serves as an implementation mechanism and fundraising partner for IOC HAB and GlobalHAB activities. The 16th Session of the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms (IPHAB-XVI) was held at FAO Headquarters, Rome, from 27 to 29 March 2023. With reference to IOC Assembly Resolution XVI-4, this was the first session of IPHAB since IPHAB-III in 1995 with FAO back as co-sponsor of the Panel.

146. IOC ties together and provides an international network for a multi- and cross-disciplinary community of researchers and practitioners through *Harmful Algae News* (HAN), an IOC on-line newsletter on harmful algae and algal blooms published regularly since 1992. Four issues were published in the intersessional period. There is a team of regional Editors, and HAN also serves as a newsletter for the International Society for the Study of Harmful Algae (ISSHA).

147. GlobalHAB has developed a best practice [Guidelines for the Study of HABs and Climate Change](#) to focus research on the occurrence of HABs under changing climate conditions. The guidelines were published in February 2022.

148. GlobalHAB is also focusing on HAB event modelling, with a strong training component including the development of an online textbook on HAB modelling. A workshop with open attendance on ‘Modelling and Prediction of Harmful Algal Blooms’ workshop scheduled for May 2020, but postponed due to COVID-19, was successfully held on 9–13 May 2022, Glasgow (U.K.).

149. There is rapid technological development in different types of observation systems, and GlobaHAB, jointly with SMHI/Sweden, organized a GlobalHAB symposium on automated *in situ* observations of plankton. The aim was to bring together experts on, and users of, automated *in situ* imaging systems to present methods, recent results and to share experiences. Another goal was to carry out a comparison of results when analyzing plankton communities quantitatively. Young scientists were particularly encouraged to attend the symposium and there was a special follow-on workshop for young scientists on data processing and report/article writing. The symposium was held on 22–26 August 2022 at the Kristineberg Marine Research Station, Sweden.

150. A GlobalHAB initiative is addressing the mass occurrences of the macro algae Sargassum in both West Africa and the Caribbean. A sub-committee is established with an initial focus to join a GESAMP Task Team on Sargassum in developing a white paper on Sargassum science and research needs as well as a social network analysis and survey on Sargassum. This will involve the GESAMP technical secretaries of the sponsoring agencies that have indicated an interest in this topic (IOC, UN Environment, FAO, UNDP, WMO, IAEA). The white paper will be published in a peer-reviewed journal and will form the basis for GlobalHAB's and GESAMP's future engagement in the Sargassum issue. The white paper will be prepared to complement the United Nations Environment Programme- Caribbean Environment Programme (2021). Sargassum White Paper – *Turning the crisis into an opportunity*.

151. IOC and FAO have joined forces to develop and test early warning systems (EWS) for HABs in Africa. Based on a survey among African Member States, Namibia and Morocco were selected as pilot countries. In both countries stakeholder workshops were conducted to co-design EWS for HAB to meet national needs. The initiative is supported by funding from the Government of Norway (NORAD) and draws on the expertise in the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms (IPHAB) Task Team on the Early Detection, Warning and Forecasting or Harmful Algal Events. The workshop in Namibia was held in partnership with the Namibian Ministry for Fisheries and Marine Resources in Swakopmund on 5–7 October 2022, with 32 stakeholders from various industries and backgrounds gathering together to define the early warning system requirements for Namibia, review current capacities and resources in place, and outline missing knowledge and data gaps. Participants identified an urgent need to establish a rapid monitoring and regulatory framework to ensure the protection of human health and safe seafood trade from the regular occurrence of harmful algae in the country. The workshop in Morocco was organized in partnership with the National Institute of Fisheries Research (INRH) of Morocco on 5–8 December 2022 in Casablanca, gathering 45 participants from government ministries, private sector, academic institutions and official laboratories. The workshop included a two-day data training session on R programming and predictive modelling systems which could be implemented for operational use in Morocco for the prediction of the onset and duration of harmful algal bloom events. During the two workshops on EWS for (HABs, all stakeholders: scientists, administration, aquaculture profession ...) agreed on the necessity of setting up an Early Warning System for HAB. Both workshops were guided through the Joint FAO-IOC-IAEA technical guidance for the implementation of early warning systems for harmful algal blooms to foster engagement through a step-by-step process. This guidance was the collective effort of group of experts that were convened by FAO, IOC and IAEA.

152. The comprehensive undertaking to develop the first Global HAB Status Report (GHSR) based on data compiled in the Harmful Algal Information system (HAIS) is completed. HAIS is composed of IOC/HAEDAT, OBIS and the literature with the collaboration of IAEA, ICES, and PICES and with the financial support of the Government of Flanders (Kingdom of Belgium). HAIS thus provides the basis for the [Global HAB Status Report](#). The GHSR consist of the HAIS Data Portal; a special issue of the *Elsevier journal Harmful Algae* with regional reviews and partly open access (published February 2021); a paper in *Nature Communications* (released 8 June 2021); and an IOC Synthesis and Scientific Summary for Policy Makers ([IOC/INF-1399](#) released 8 June 2021). This first-ever global statistical analysis examined ~9,500 HABs events over 33 years and found that the harm caused by HABs rises in step with growth of the aquaculture industry and marine exploitation and calls for more research on linkages. Conducted over seven years by 109 scientists in 35 countries, the study found that reported HAB events have increased in some regions and decreased

or held steady in others. A widely-stated view that HABs are on the rise throughout the world, perhaps due to climate change, could not be confirmed based on the available data. Compilation of data on HAB events continued throughout 2022 and 2023 with ICES and PICES as strong regional partners in data compilation and submission to HAEDAT.

153. The comprehensive IOC website on Harmful Algae was completely rejuvenated and relaunched in February 2022 (<https://hab.ioc-unesco.org/>).

154. The Chairs of all Task Teams under the IOC-FAO Intergovernmental Panel on Harmful Algal Blooms (IPHAB) met on 26–27 April 2022 in Elsinore (Denmark) to define their contributions to address the UN Ocean Decade challenges and to draft initiatives to be submitted for endorsement as Decade activities.

155. Through the IOC Science and Communication Centre on Harmful Algae the longstanding opportunities for capacity enhancement in monitoring of HABs continue with several annual courses. Concluding examinations give the trainees certification in identification of HAB causative species. All courses are run within the IOC OceanTeacher platform and include a combination of preparatory e-learning, hands-on practical courses and an examination. All courses throughout 2021 were given online due to the COVID-19 situation, but the hands-on-training resumed second half 2022. The IOC Centre collaborates with the Marine Institute (Ireland) and the University of Las Palmas de Gran Canaria (Spain) in operating the International Phytoplankton Inter-calibration (IPI) which is working with more than 100 participants from more than 50 laboratories. IPI is also established within the OceanTeacher platform and is accredited under ISO17043.

Marine invasive species

156. One million species are on the verge of extinction and the introduction of non-indigenous species (NIS) to new environments is listed as one of the five key drivers impacting biodiversity, according to the recent IPBES global assessment. SIDS are particularly vulnerable to such a risk, which also creates a real biosecurity risk for human health and the sustainability of livelihoods. It is widely recognized that ship's ballast water and vessel biofouling, including the surge of new (or larger) marine structures linked to the unfolding and fast-growing blue economy, are the main vectors for the introduction and spread of NIS in the marine environment. The IOC has a number of activities addressing marine invasive species.

157. The Government of Flanders' funded PacMAN project (Pacific Islands Marine Bioinvasion Alter Network) is developing an early-detection early-warning monitoring system for marine invasive species based on environmental DNA analyses in Fiji in close collaboration with local stakeholders. In 2022, the project successfully tested sampling protocols in the field and gained support from major stakeholders in Fiji. The project aims to deliver a decision support tool that will empower the local community to interpret monitoring programme results efficiently. PacMAN will enter its third and final (operational) year and IOC is now seeking other Member States to further build upon and replicate PacMAN in other States, especially developing States and SIDS that are more vulnerable to the socio-economic impacts of marine invasive species, in line with CBD COP 15 Kunming-Montreal 2030 targets.

158. IOC cosponsors with ICES and IMO a Working Group on Ballast and Other Ship Vectors (<https://www.ices.dk/community/groups/Pages/WGBOSV.aspx>), which provides scientific support to the development of international measures aimed at reducing the risk of transporting non-native species via shipping activities. The Group met online in 2022 in Athens with Okko Outinen (Finland) as Chair.

159. Some Member States have recently taken steps to address the role of biofouling in the transfer of NIS and are at different stages in the development of national legislation and requirements to manage biofouling across maritime sectors. The IMO Secretariat, partnering with the Global Environment Facility (GEF) and the United Nations Development Programme (UNDP), have also

stepped up their efforts to meet the challenge of biofouling. A project was launched in January 2019, the GEF-UNDP-IMO GloFouling Partnerships, to develop suitable tools and provide capacity building on biofouling management in 12 developing countries and SIDS. IOC has joined the three agencies to provide scientific guidance and coordinate efforts to implement projects elements addressing non-ship pathways. Within this multi-year project, IOC is currently developing best practices guidelines for management of biofouling in the aquaculture; offshore oil and gas ocean energy; offshore structures; ocean instrumentation; dredging and costal infrastructure sectors. To date guidelines for biofouling management has been developed for the aquaculture industry and is published as volume 1 of IOC Technical Series, [174](#). Equivalent guidelines for the oil & gas offshore industry and offshore infrastructure are in preparation.

160. Under the leadership of the IOC, GESAMP has established a Working Group on Biofouling Management (WG 44) with the overall objective to build a broader understanding on introduction and spread of non-indigenous species via biofouling across all maritime industries. The Working Group provides a global overview of the impact of biofouling across all maritime industries and structures and support the initial information requirements of the GloFouling Partnerships for understanding the role of biofouling in the transfer of non-indigenous species. The Working Group comprises experts from various disciplines and sectors which are related to impact and management of biofouling. They worked by e-mail correspondence and met face to face on 7–9 February 2023 in Copenhagen (Denmark) to deliver a first draft of their global overview.

Key Challenges Encountered in Implementation and Remedial Action Taken

161. For IOC Tsunami programme, the COVID-19 pandemic remained a severe challenge for regular training and capacity development activities but it was taken as an opportunity to anticipate development and deployment of online training, in close partnership with OTGA. In the same sense, the initial postponement of most of presential meetings led to a more intense use of online webinars, workshops and intergovernmental groups meetings. Furthermore, the programme seized the opportunity to produce more communication and visibility—information materials, which are being disseminated through various channels, including social media.

162. To some extent, field-based activities could continue when only nationals were involved or using remote support for international experts (i.e. Tsunami Ready verification visits).

FUNCTION D: ASSESSMENT & INFORMATION FOR POLICY

Support assessment and information to improve the science-policy interface

Sustainable Development Goals (SDG)

163. In the context of the 2030 Agenda for Sustainable Development, several targets of SDG 14 are directly relevant to the work of IOC, particularly in the areas of marine pollution, ocean acidification, ecosystem-based management, as well as marine research capacity and transfer of marine technology. IOC is identified as the UN custodian by the Inter-agency and Expert Group on SDG Indicators (IAEG-SDGs) for SDG indicators 14.3.1 (ocean acidification) and 14.a.1 (scientific knowledge and ocean research capacity). IOC has recently provided reporting on these indicators for inclusion in the UN Secretary General's Progress Report towards the SDGs in 2022 and 2023.

164. Significant progress was made in the collection of new data provided by Member States to IOC towards the SDG Indicators 14.3.1 and Target 14.a.1. Member States followed IOC's invitations to contribute to the *Global Ocean Science Report (GOSR) tracker* — the basis for 14.a.1 reporting and the ocean acidification data portal for 14.3.1 reporting. Hosted in Ostend, this portal helps Member States, NODCs, other organizations and individual scientists to submit ocean acidification data. IOC HQ and IODE further develop a user-friendly GOSR data portal, which allows open access to all GOSR2020 data, and in particular the 14.a.1 information. In February 2022, IOC reported to the IAEG Indicator 14.3.1 and in February 2023 IOC reported to the IAEG on both indicators. Several activities were undertaken to advance the methodology of indicators for Targets 14.3 and 14.a, as well as in relation to Target 14.1 on marine pollution (nutrients).

165. Concern over the impacts of altered nutrient inputs, N, P and Si, to coastal waters led the UN to include an "Index for Coastal Eutrophication Potential" (ICEP) as indicator for SDG Indicator 14.1.1 on eutrophication: *By 2025, prevent and significantly reduce marine pollution of all kinds, in particular from land-based activities, including marine debris and nutrient pollution*. UN Environment is the custodian agency for Indicator 14.1.1, and the IOC is responsible to develop ICEP as the indicator. To implement ICEP, it is required to develop a component on a dissolved silica model and evaluate the effectiveness of ICEP in predicting coastal impacts at the global scale. To promote and increase the understanding of the potential of ICEP as indicator, the IOC in 2019 produced an animation for YouTube: <https://youtu.be/qW2nV2bsyCs>. The detailed plan of work was elaborated by the IOC N-CIRP Group of Experts in 2017. The work required funding for two postdoctoral scholars and an expert workshop to validate models. Identifying funding proved a hard challenge but was solved late 2021 as a combination of funds from UNEP via a UN agreement as well as Norwegian (NORAD) funding. The work is ongoing and will be completed second quarter 2024.

Assessing the impacts of the COVID-19 pandemic on ocean science

166. The *Global Ocean Science Report* measures, in a systematic manner, investments in ocean science (human resources, infrastructure such as research vessels and laboratories) as a proportion of national R&D envelopes. Trends in scientific production, including through international scientific collaborations, and in the transfer of research findings to the application sectors (via patents and their licensing) are also measured by the GOSR. It is important to assess the impacts of the COVID-19 pandemic on such strategic investments in relation to the 2030 Agenda. The next full edition of the GOSR, expected to be published in 2025, will allow to measure the possible impact of the global pandemic on ocean science in the long-term, including *inter alia* employment, diversity in ocean science, core funding, additional investments, conferences, observations and publications. In the meantime, the IOC Secretariat launched the *Global Ocean Science Report Tracker* questionnaire in January 2023 via Circular letter [2919](#) to collect basic information on current ocean science capacity in a given country. The full analysis will be presented in the *Global Ocean Science Report Tracker* publication meant to provide key up-to-date numbers, e.g. human and technical capacity in addition to some preliminary assessments of the effects of COVID-19 on Ocean Science. This questionnaire was also be the basis for the SDG 14.a.1 indicator reporting in 2023, which will be published in July 2023.

World Ocean Assessment

167. IOC continues to provide scientific and technical support to the World Ocean Assessment (WOA) process established under the UNGA. A third cycle of assessment (2021–2025) was initiated under the UN Regular Process for Global Reporting and Assessment of the State of the Marine Environment, including Socioeconomic Aspects. In accordance with the programme of work for the third cycle, one of the outputs of the third cycle will be the production of one or more assessments of the marine environment, including socioeconomic aspects. In addition, the Regular Process will provide support for other ocean-related intergovernmental processes which may include a series of policy briefs for policymakers tailored to each process. In this context, a dedicated brief highlighting synergies between the Regular Process and the Ocean Decade will be produced.

168. IOC will also contribute to the third cycle by supporting UN DOALOS in developing a coherent capacity-building programme with the aim of strengthening the ocean science-policy interface at national, regional and global levels. A joint Symposium on this topic organized by IOC and UN DOALOS will take place on 12–13 December 2023 at the UNESCO Headquarters.

169. The Ocean Biodiversity Information System (OBIS) secretariat contributed to two chapters of WOA-2. Together with the World Register of Marine Species (WoRMS), hosted by the Flanders Marine Institute, OBIS developed statistics on the trends in marine biota (chapter 6) as well as the state of biodiversity in marine habitats (chapter 7), which resulted in improved understanding of the ocean.

The IOC State of the Ocean Report (StOR)

170. At the 53rd session of the IOC Executive Council, Member States considered a proposal by the IOC Executive Secretary to undertake an IOC State of the Ocean Report (StOR).

171. By its mandate, IOC is the UN body responsible for ocean science and provides a first place for the world to look for ocean-related information. An annual State of the Ocean Report (StOR), to be coordinated by IOC, will update the community of stakeholders on the current state of the ocean and progress in expanding its management. This information can support actions by multiple stakeholders in the context of the UN Ocean Decade and within various fora, including by providing evidence to support the World Ocean Assessment process.

172. Following the Executive Council's discussion on the length and periodicity of the report, the 31st session of the IOC Assembly approved a revised concept as contained in [IOC/INF-1393 Rev.](#)

173. The 'State of the Ocean Report 2022 – Pilot edition' was presented to the 55th session of the Executive Council in June 2022. This first edition was structured around the 10 initial Challenges of the [UN Decade of Ocean Science for Sustainable Development](#), 2021–2030, and identified an urgent need for a quantitative description of the state of the ocean and the capacity to report changes. The pilot edition consists of 21 storylines² and was authored by 65 authors and peer reviewed by 40 experts. The Council welcomed the report and adopted Decision [IOC/EC-55/3.3](#), which laid out the consecutive process during the intersessional period. Following the Executive Council, the Secretariat used the opportunity of the UN Ocean Conference in Lisbon, Portugal (27 June-1 July 2022) to present the pilot [StOR to the wider public](#). StOR will be reviewed by the IOC-32 Assembly under a dedicated agenda item.

General Bathymetric Chart of the Oceans (GEBCO)

174. The GEBCO symposium: Map the Gaps Symposium was held from 30 November to 3 December 2021, with approximately 70 panelists addressing several topics such as Regional

² Storyline definition: brief narrative description of parameter(s), issues describing the trend and activities including figure(s) illustrating the trend and activities.

Mapping Initiatives, Crowdsourced Bathymetry, Technology Innovations, the Nippon Foundation-GEBCO Seabed2030, Africa and Ocean Mapping, Economic Equity in Ocean Mapping, Building an Inclusive Ocean Mapping Community.

175. Several meetings of the GEBCO Sub-Committee on Undersea Features Names (SCFUN) took place in November (SCUFN 34 virtual meeting) and March 2022 (SCUFN 35 as hybrid meeting at UNESCO HQ).

176. The 38th Meeting of the GEBCO Guiding Committee (GGC) took place in Monaco at the IHO on 21–23 April 2022. The GGC approved the terms of reference of a new Sub-Committee on Education and Training (SCET) to develop and coordinate the education and training strategy of the GEBCO Programme. In addition, SCET aims to raise awareness amongst academic institutions of gaps in education and training that may impact on the progress and development of ocean mapping and in particular, the objectives of the GEBCO Programme. Recognizing the need to periodically review the governance of organizational frameworks and acknowledging recent important new developments with the two parent organizations (e.g. for IOC and IHO new strategic frameworks, the Ocean Decade, the Nippon Foundation/GEBCO Seabed Project), the GGC also agreed to launch a governance review of GEBCO. Terms of Reference were developed by a review group with IOC and IHO Secretariat representatives and three GEBCO members from the GGC. Both SCET and the GEBCO Governance Review Terms of Reference were presented to the IOC Executive Council in 2022. The 39th Meeting of the GEBCO Guiding Committee took place in November 2022, in Southampton (U.K.).

177. Overall, important GEBCO developments during the intersessional period include: (i) progress in raising the percentage of ocean floor mapped under GEBCO and Nippon Foundation-GEBCO Seabed 2030 Project, currently seating at 25%; (ii) celebrations of the 120th Anniversary of GEBCO in 2023; (iii) the development of a GEBCO Charter/Code of conduct to consolidate the ethical expectations of all GEBCO's participants; and (iv) the development of a GEBCO Mid-term Strategic Plan that clearly sets out the connections between the strategic objectives of the parent organizations (IOC and IHO), the future direction of GEBCO and the work of the subordinate bodies, initiatives and activities.

178. With regards to the GEBCO Governance Review, the core elements of the review are focusing on stakeholder mapping and engagement, mapping of the existing organization and functional structure, a review of the legal structure and framework, a gap analysis of existing governance instruments, a review of the financial status and the identification associated of findings and recommendations. Due to the complexity of activity, and despite significant progress in completing core elements of the review, the GEBCO Guiding Committee still needs to discuss the final report and recommendations at its 40th Meeting in November 2023, prior to consideration by the parent organizations in 2024.

Key challenges encountered in implementation and remedial actions taken

179. IOC's work in the area of assessments and information for policy contributes to global assessments such as the UN World Ocean Assessment, the SDG reporting framework, IPBES, IPCC and some regional assessments. IOC's comparative advantage lies in its unique position as an intergovernmental framework that advances research, identifies new scientific issues through collaborative action, and thus acts as a conduit for delivering relevant information to support decision-making of Member States. However, whilst IOC contributes to global assessment processes, IOC efforts are not always clearly visible in the end product. There is therefore a need to both explain the essential role of IOC in the upstream efforts (in terms of science, observation and data requirement) that are essential in the compilation of assessment end-products, and to increase the visibility of IOC's inputs to global assessment products, and develop relevant standalone assessment products, such as the *State of the Ocean Report* proposed by the IOC Executive Secretary. Core capacity related to the conduct of integrated marine assessment exists within the

Secretariat, as well as expertise in indicator-based methodologies for assessing environmental, socio-economic, governance processes in the marine environment.

FUNCTION E: SUSTAINABLE MANAGEMENT & GOVERNANCE

Enhance ocean governance through a shared knowledge base and improved regional cooperation

Sustainable Development Goals – 2022 UN Ocean Conference

180. The UN Ocean Conference on SDG 14 which was initially planned to take place in Lisbon in June 2020, hosted by Portugal and Kenya finally took place on 27 June–1 July 2022. The central theme of the Conference was “Scaling up Ocean Action based on science and innovation for the period 2020–2030: stocktaking, partnerships and solutions”. The Conference also provided input to the review of SDG 14 by the High Level Policy Forum that took place in July 2022. More than 6,000 participants, including 24 Heads of State and Government, and over 2,000 representatives of civil society attended the Conference, advocating for urgent and concrete actions to tackle the ocean crisis. Close to 700 commitments were registered, adding to the substantial commitments made at the 2017 UN Ocean Conference. These commitments showcase the critical need for innovation and science to revitalize the ocean.

181. IOC directly supported the conference by leading the preparation of concept papers for the interactive policy dialogues that will structure the core programme of the conference. IOC convened the preparation of the concept paper for Interactive Policy Dialogue 6: Increasing scientific knowledge, research capacity and transfer of marine technology; and co-convened the preparation of the concept paper for Interactive Policy Dialogue 3: Minimizing and addressing ocean acidification, deoxygenation and ocean warming. IOC also participated in the drafting of several other concept papers.

182. IOC led the organization of a series of high-level events during the conference proceedings related to the Decade and most aspects of IOC programmes (see <https://ioc.unesco.org/news/2022-un-ocean-conference-lisbon>). A high level meeting of the Ocean Decade Alliance was integrated in the main programme of the Conference and brought four Heads of State, as well as several Ocean Decade Patrons. Several commitments towards the Ocean Decade agenda were made.

183. The Conference also saw the unanimous adoption of [the Lisbon Declaration](#), a suite of science-based and innovative actions, taking into account the capacity challenges facing developing countries, in particular, SIDS and LDCs, at the frontline of the devastating impacts of the ocean emergency. IOC is one of the few organizations specifically mentioned whereby *inter alia* Member States expresses their support with regards to the role of IOC in the framework of the Ocean Decade.

Biodiversity in Areas beyond National Jurisdiction (BBNJ)

184. IOC actively contributed to the negotiation process on an International Legally Binding Instrument (ILBI) on the conservation and sustainable use of marine biodiversity of areas beyond national jurisdiction (BBNJ). During the intersessional work, IOC participated in two webinars on the Clearing-House Mechanism (14 October and 2 November 2021), and presented the work of IOC in relation to Capacity Development and Data and Information Management, as well as IOC the Clearing-House mechanism currently in development as part of the Ocean InfoHub project. The 4th meeting of Intergovernmental Conference (IGC-4) took place in New York in March 2022, and the 5th meeting took place in August 2022. As delegates had not reach consensus, an extended session of the 5th meeting took place in March 2023, and culminated with the agreement reached amongst UN Member States in March 2023 for an international legally-binding instrument under the United Nations Convention on the Law of the Sea (UNCLOS). IOC-UNESCO was represented through its Secretariat in all meetings of the ICG. The agreement covers a range of issues, including marine genetic resources, environmental impact assessments, area-based management tools, and capacity building and technology transfer. Importantly for the Commission, the final agreed text of the Agreement makes reference to the possible cooperation with IOC-UNESCO in the implementation of the clearing-house mechanism to be created under the auspices of the new treaty potentially opening a pathway for deploying IOC’s tested, and fully operational platforms and programmes in capacity development and transfer of marine technology for the benefit of all countries. Given that

IOC possesses recognized technical expertise in several areas of relevance to the BBNJ agreement, further discussion will be required with Member States and the future Secretariat of the Treaty (undefined at this stage) to identify and develop further collaborative approach so that the IOC can contribute scientific and technical inputs in the operationalization and implementation of the Agreement, in accordance with its mandate.

Convention of Biological Diversity

185. The Convention on Biological Diversity prepared the Post-2020 Global Biodiversity Framework (GBF) negotiations which was eventually adopted at the 15th meeting of the Conference of Parties of Convention on Biological Diversity in December 2022 in Montreal (Canada). Prior to this, the Open-ended Working Group on the post-2020 global biodiversity framework (WG2020) published document CBD/WG2020/3/INF/4 providing information on marine and coastal indicators, and listed several potential contributions from IOC. In particular the role of a global marine biodiversity observing system based on the Essential Ocean Variables, which is coordinated through the Biology and Ecosystems Panel of the Global Ocean Observing System could have a prominent role in supporting Goal A of the proposed framework—Ecosystem Integrity collaborating with the Ocean Biodiversity Information System (OBIS), the Marine Biodiversity Observation Network (MBON) of GEO BON, and the new UN System for Environmental Economics (UN SEEA) Ecosystem Assessment working group which has been given formal responsibility for these ecosystem indicators. On 19 January 2022, IOC participated and presented on those IOC contributions at a CBD webinar (online at <https://www.youtube.com/watch?v=dgNXEbG56Aw>). After two and a half years of virtual discussions, the CBD was finally able to reconvene its Subsidiary Body on Scientific, Technical, and Technological Advice (SBSTTA), Subsidiary Body on Implementation (SBI) and WG2020 for face-to-face discussions in Geneva. The Geneva Biodiversity Conference (13–29 March 2022) was held to prepare the foundations for the 15th meeting of the Conference of the Parties. At the Geneva meeting, UNESCO provided a statement reconfirming that OBIS is well positioned to support the development of statistics related to the proposed marine headline indicators and that the IOC's Capacity Development Strategy may also be of assistance, as well as the Ocean InfoHub and the Ocean Data and Information System. Although the 24th SBSTTA approved a draft of the Post-2020 Global Biodiversity Framework (GBF) for final negotiation and approval by COP later this year—much bracketed text remains, with many Parties and organizations continuing to provide text on the Goals and Targets. Less consideration has been given to the indicators and the marine and coastal biodiversity issues could not be completed. A 4th meeting of the Working Group is scheduled for June 2022 in Nairobi. An *ad hoc* Technical Group on Indicators was approved by SBSTTA in April 2022 to support the development of indicators and countries capacity to report on those indicators. The first meeting will be held from 29 June to 1 July 2022 in Bonn (Germany), and IOC has provided nominations to this *ad hoc* group in response to a request from the CBD.

186. At the 15th Conference of the Parties Meeting in December 2022, the IOC in its role as coordinator of the Ocean, held COP15's flagship half-day ocean event: 'An Ocean of Life' on 16 December 2022, bringing together key voices in a high-level dialogue on the science and policy solutions required to halt ocean biodiversity loss. Opened by UNESCO's Director-General, the event highlighted the importance of protecting and sustainably managing marine and coastal biodiversity to achieve a future more sustainable world. It also explored the role of the Ocean Decade to generate the science and knowledge that is the basis for action to address the marine biodiversity crisis.

187. The adoption of the new Kunming-Montreal Global Biodiversity Framework at the 15th Conference of the Parties (COP-15) of the Convention on Biological Diversity is a key development. The Framework is divided into four overall goals and 23 targets for the protection of the world's biodiversity. The most emblematic of these, "at least 30% of terrestrial, inland water, and of coastal and marine areas" by 2030 (Target 3) – when the current areas under protection respectively account for 17 and 8%. Several other targets are relevant to the work of IOC and the Ocean Decade, in areas of ocean science, biodiversity assessment, ocean observation and data management, marine spatial planning and capacity development to name a few.

Integrated Coastal Area Management, including Marine Spatial Planning

188. IOC is the leading international organization promoting marine spatial planning (MSP). Within the context of the “*Joint Roadmap to accelerate Maritime/Marine Spatial Planning processes worldwide*” ([MSProadmap](#)), from 1 November 2018 to 31 October 2021, IOC implemented the [MSPglobal Initiative](#), co-funded by the European Commission. The project contributed to develop capacity building and increase awareness among governmental authorities and stakeholders about the importance of marine spatial planning (MSP). On 5 October 2021, the institutions organized the [MSPglobal Final Conference](#) in virtual format to share the key outcomes of the project. The MSPglobal activities, together with the editions of the International MSPforum and additional activities in the context of the MSProadmap, engaged about 5,000 stakeholders from about 150 countries. During this 3-year project, IOC-UNESCO produced 10 technical reports, six policy briefs and the new “*MSPglobal International Guide on Marine/Maritime Spatial Planning*”, available in English, French, Spanish and Arabic. The guide was collaboratively developed with the support of MSPglobal experts from Africa, the Americas, Asia and Europe.

189. One of the objectives of the MSProadmap and the MSPglobal Initiative was the promotion of transboundary MSP, i.e., to improve the dialogue on MSP among Member States that share the same sea-basin so they can develop marine spatial plans coherent across borders, taking into consideration transboundary issues. The initiative focused on two pilot projects: [Western Mediterranean](#) and [Southeast Pacific](#). Together with MSPglobal national focal points nominated by IOC focal points, regional roadmaps on MSP and sustainable blue economy were developed for each region. The WestMED Initiative Steering Committee decided to endorse the Western Mediterranean Roadmap at their meeting on 30 June 2021. As a follow-up of this pilot, IOC is now an observer of the recently launched Mediterranean Maritime Spatial Planning Community of Practice ([MED-MSP-CoP](#)).

190. Another key MSPglobal output is the IOC-UNESCO knowledge platform on MSP [www.mspglobal2030.org](#). The website is a multilingual repository (English, Spanish, French and Arabic) where all IOC products on MSP can be found, as well as an assessment about “*MSP around the world*”. Country profiles were created or updated with the information shared by Member States when answering the IOC Circular Letter, [2891](#) (May 2022). IOC Secretariat is currently developing some new methods to improve the regular assessment on the status of MSP globally. Within the context of the IOC State of the Ocean Report (StOR), an MSP typology criteria was developed to help IOC to assess whether there are commonalities, differences and/or trends in the adoption of MSP worldwide.

191. In November 2022, IOC-UNESCO and the European Commission’s Directorate-General for Maritime Affairs and Fisheries (DG MARE) jointly organized in Barcelona (Spain) the [5th International MSPforum](#) (86 participants from 43 nationalities) and the 3rd International Conference on MSP (168 participants from 63 nationalities). The events marked the launch of the [Updated MSProadmap \(2022-2027\)](#), which has six priority areas: 1. knowledge support; 2. capacity development and awareness; 3. transboundary cooperation; 4. climate-smart MSP, 5. marine protection and restoration; and 6. sustainable blue economy. This framework identified 15 actions that will guide IOC work on MSP in the following years.

192. To develop some of these actions, a new phase of the MSPglobal project is under preparation (MSPglobal 2.0), which will be co-funded by DG MARE. At the global level, the project’s expected result is a larger and strengthened pool of practitioners and stakeholders ready to support MSP. Tools complementary to the MSPglobal Guide will be co-developed with the support of internal and external collaborators. Besides, new capacity development and awareness opportunities will be created through a multilingual online training on OceanTeacher Global Academy, the 6th edition of the International MSPforum in 2024 and communication activities. At regional level, the project will focus on transboundary pilots in the Gulf of Guinea and the Western Pacific regions. Through national and regional activities, the project will provide support towards institutionally strengthened MSP processes.

193. Within the context of the 5th Phase of the GEF IW:LEARN project (International Waters Learning Exchange and Resource Network: Strengthening transboundary water management of the GEF International Waters portfolio), IOC will lead regional capacity building activities on MSP for the GEF portfolio of LME projects. In addition, IOC will assist GRID Arendal in the development of a practical approach to integrate MSP into the GEF Transboundary Diagnostic Analysis and Strategic Action Program (TDA-SAP) methodology.

194. Since 2019, the Government of Sweden has provided additional support to the IOC Secretariat to assist the MSP Roadmap through the organization of meetings, workshops and trainings. During the second semester of 2021, with the support of national authorities as well as regional and international organizations, IOC-UNESCO jointly organized a diverse set of activities to promote the MSP approach and tools among different stakeholders from IOC Member States. National activities were organized in Comoros, Kenya and Morocco, while five regional dialogues/workshops were organized in Africa, Latin America and the Caribbean, East Asia and Pacific. Among the regional activities, it can be highlighted the partnership with FAO in the organization of workshops on [“Engaging blue fishing ports in marine spatial planning”](#) in order to strengthen the alignment of sectoral planning with MSP. Case studies on “Gender and Poverty Perspectives of Marine Spatial Planning” were implemented in Kenya, Madagascar and Tanzania in collaboration with the Swedish Agency for Marine and Water Management (SwAM). IOC supported the publication of an IOC Technical Series on [Marine Spatial Planning and the Blue Economy in Kenya](#). In 2022, IOC and its Sub-Commissions (IOCAFRICA, IOCARIBE and WESTPAC) organized online the first edition of the [Regional MSP forums](#) (Africa: 128 participants; Latin America and The Caribbean: 284 participants; Western Pacific and its Adjacent Areas: 151 participants). The launch of such regional events is one of the actions of the Updated MSP Roadmap. IOC Secretariat aims to organize the next editions of such forums in collaboration with other regional organizations as in person events, although budget for this action still need to be identified.

195. The Government of the Netherlands donated 12 additional MSP challenge board games (MSP global Edition in Arabic, Chinese, English, French, Portuguese, Russian and Spanish) to IOC-UNESCO regional and national collaborators in support of the Updated MSP Roadmap. This resulted in the creation and launch in June 2022 (during the UN Ocean Conference in Lisbon) of the [MSP Challenge/MSP global training network on Marine Spatial Planning](#).

196. In December 2021, a new global coalition [Ocean Action 2030](#) was launched to support the development and implementation of Sustainable Ocean Plans, which are a core recommendation of the High Level Panel for a Sustainable Ocean Economy (Ocean Panel). IOC-UNESCO is one of the leading technical institutions of this coalition. The IOC Secretariat role is focused on area-based plans, i.e., marine spatial planning and coastal zone management. The members of the Ocean Panel have a shared ambition to sustainably manage 100% of ocean areas under their national jurisdiction through Sustainable Ocean Plans. To support such initiative, IOC is developing an Ocean Decade Programme on Sustainable Ocean Planning.

197. The IOC Secretariat contributed to the development of the UN Global Compact (UNGC) publication on [“Roadmap to Integrate Clean Offshore Renewable Energy into Climate-smart Marine Spatial Planning”](#), which was launched at COP-26 in November 2021, during a [side event](#) co-organized by UNGC, IOC-UNESCO and the Global Wind Energy Council. This roadmap states that future initiatives to address some of its recommendations (e.g., strengthen the cross-border and transnational collaboration mechanisms on MSP and offshore renewable energy) should build on the work of the MSP global Initiative. During the UN Ocean Conference in Lisbon, IOC co-organized a side event with UNGC and the Government of the Netherlands on ‘Public-private cooperation to foster sustainable ocean management globally’. After that, UNGC established a Steering Committee for a working group on Offshore Renewables and Sustainable Ocean Planning, which focus on data harmonization, biodiversity and co-existence. IOC is a member of this Steering Committee.

198. Over the period June 2021 to May 2023, IOC-UNESCO participated as a key invited speaker in several national, regional and international events on MSP. For instance, in 2023, IOC promoted

MSP during meetings of the G20 Environment and Climate Sustainability Working Group (ECSWG), under the India Presidency, which is developing high level principles for a sustainable and climate resilient blue economy.

Sargasso Sea Transboundary Cooperation

199. IOC, working in close collaboration with UNDP and the Sargasso Sea Commission, finalized the execution of a GEF Preparatory Grant (PPG) for developing a project aimed at strengthening the stewardship of an economically and biologically significant high sea area—the Sargasso Sea. The project was successfully submitted to the GEF and started its implementation in August 2022. The overall objective of this 4-year GEF-funded project, with nearly \$3 million of funding, is to facilitate a collaborative, cross-sectoral, and sustainable stewardship approach for the Sargasso Sea through improvement of the knowledge base and strengthened frameworks for collaborative management and governance. The grant will allow for the first ever Ecosystem Diagnostic Analysis (EDA) for a high seas ecosystem to be completed. This EDA will form the technical basis for a stakeholder-endorsed Strategic Action Programme (SAP) for future stewardship of the Sargasso Sea.

United Nations Decade of Ocean Science for Sustainable Development (2021–2030)

200. The period from June 2021 to May 2023 covered a critical first two years of implementation of the implementation of the Ocean Decade and was a period of intense activity on numerous fronts. Significant efforts were made on engagement and visibility, building of a strong and supported portfolio of Decade Actions, and the establishment of the central and decentralized architecture for the governance and coordination of the Decade.

201. Building on the [first Call for Decade Actions \(No. 01/2020\)](#) that solicited close to 250 potential Decade contributions, four additional Calls for Decade Actions were launched during this period. Call for Decade Actions No. 02/2021 was launched in October 2021 and closed on 31 January 2022. This Call solicited programmes contributing to Ocean Decade Challenges related to marine pollution, ecosystem management and restoration, and the ocean-climate nexus. The third Call for Decade Actions No. 03/2022 was launched on 15 April 2022 and closed on 30 August 2022 and solicited programmes contributing to Ocean Decade Challenges related to sustainable blue food and sustainable ocean economy, as well as projects for 16 endorsed Decade programmes. This Call also solicited in-kind or financial contributions to support Decade Actions in Africa and Pacific SIDS. Call for Decade Actions No. 04/2022 was opened on 15 October 2022 and closed on 31 January 2023 and solicited programmes related to the digital ocean ecosystem and coastal resilience. Call for Decade Actions No. 05/2023 was opened on 15 April 2023 and will close on 31 August 2023. It is soliciting programmes related to marine pollution, with a focus on the sub-themes of plastic and nutrient pollution; and programmes related to ecosystem management and restoration with a focus on area based management tools, ecosystem restoration and multiple ocean stressors. All Calls for Decade Actions also solicited projects to attach to already endorsed Decade Programmes.

202. As of May 2023, the Calls for Decade Actions have resulted in the endorsement of 47 programmes, 235 projects and 79 contributions. An additional set of Decade Actions including a new programme and over 30 projects is expected to be endorsed in June 2023. The portfolio of Decade Actions covers all ocean basins and all 10 Decade Challenges. It represents the collective work of thousands of individuals, and hundreds of institutions and is an indication of the continued significant and global interest in the Ocean Decade. The first iteration of the Ocean Decade Monitoring and Evaluation Framework was launched in January 2022. and the initial results from reporting by Decade Actions are included in IOC-32/4.12.Doc(1). A key objective over the next period will be to build on this initial framework via the definition of a collective strategic ambition for each of the Ocean Decade Challenges, including definition of measurable milestones and indicators. To achieve this, the Vision 2030 process was launched in April 2023 involving 10 expert working groups. The resulting outcomes will be presented and discussed at the 2024 Ocean Decade Conference (Barcelona, April 2024) before being operationalized in 2024 and beyond.

203. IOC is leading 16 Decade programmes and projects across a range of themes and is substantively involved in several others. There is a significant potential for the IOC contribution to the Decade to reinforce IOC's core programmatic work and human resources. However, additional resources are required to ensure full operationalization of these initiatives. IOC/INF-1425 provides additional information on the IOC contribution to the Decade as well as a summary of resource needs. In addition to the IOC-led Decade Actions, a small number of Actions are being led by other UN entities including FAO and UNEP. IOC/INF-1428 presents the results of an analysis and action plan to build on the expressed interest of other UN entities to engage more fully in the Ocean Decade.

204. Notable geographic gaps exist in the portfolio of Decade Actions. Engagement by partners in SIDS remains very low. Only 6% of Decade Actions report that they are working in SIDS, and of these, less than half are led by partners in SIDS. A similar situation exists in Africa, with only 4% of Decade Actions being led by partners in Africa. Concerted and targeted efforts have commenced to increase engagement in SIDS and Africa including through the development and launching of the Africa Ocean Decade Roadmap and Africa Ocean Decade Taskforce, as well as the development of a co-design training course for African partners. An initial scoping study and resource needs assessment for the establishment of a Decade Coordination Office (DCO) in the IOCAFRICA has been completed and was presented to the IOCAFRICA meeting in March 2023. Similarly, a Tropical Americas and Caribbean Taskforce is being established and will oversee development of a regional Ocean Decade strategy for this region, and an initial scoping for the creation of a DCO in the IOCARIBE office was presented to the IOCARIBE session in May 2023. Work is continuing with partners in the South Pacific to establish a Decade Collaborative Centre. Additional in-kind and financial resources will be required to fully support these efforts in Africa and SIDS and ensure stronger engagement of these countries in the Decade.

205. During this period, two meetings of the Interim Decade Advisory Board were held before this group was disbanded in late 2021. The Decade Advisory Board was established in December 2021 and held its first meeting in January 2022 and then met in-person for its first operational meeting in March 2022. Three online meetings followed in 2022 and early 2023, and the second in-person meeting of the Board was held in May 2023. During their meetings, the Board discussed recommendations related to the endorsement of Decade programmes from Calls for Decade Actions and discussed a range of strategic issues related to measuring progress of the Decade, resource mobilization, the role of indigenous and local knowledge in the Decade, and the means of increasing engagement of SIDS and LDCs. IOC/INF-1426 presents a summary of the work of the Board over this period.

206. During this period, three Decade Coordination Offices (DCOs), six Decade Collaborative Centres (DCCs), and nine Decade Implementing Partners were established. The DCOs and DCCs are playing an essential role in supporting the Decade Coordination Unit to coordinate Decade Actions, catalyze new initiatives, build stakeholder engagement, mobilize resources and communicate on the Decade. The three DCOs are being hosted by IOC (Western Pacific Region—WESTPAC, Data Sharing—IODE, and Ocean Observations—GOOS); The first of these is being supported by Thailand, however additional resources are required for the full operationalization of the Data Sharing and Ocean Observations DCOs. IOC/INF-1425 presents a summary of the IOC contribution to the Decade and the resource needs. DCCs have been established by partners and are fully resourced and funded. IOC/INF-1424 provides information on the existing DCCs. In addition to the DCOs in IOCAFRICA and IOCARIBE that are being scoped to play an essential regional coordination role, discussions are ongoing with partners to establish DCCs for the Southern Ocean, Arctic and South Pacific regions.

207. Thirty-four (34) National Decade Committees have been created and are implementing diverse initiatives to catalyze national interest and resources for the Decade, as well as provide a platform for the discussion of national priorities aligned to the Decade. Notable gaps exist in the global coverage of NDCs, particularly in SIDS. IOC/INF-1429 presents a recent publication developed with the existing cohort of NDCs.

208. A Data Coordination Group was established in December 2021 to support development and operationalization of the data, information and knowledge strategy for the Decade. IOC/INF-1427 presents the data, information and knowledge strategy developed by this group that will guide the development of the envisaged interoperable digital ecosystem as part of the Decade. A Corporate Data Group has been established to explore and develop actions to facilitate sharing of data between private sector and the scientific community. The Strategic Communications Group has been renewed and comprises 25 communications experts who provide advice to the Decade Coordination Unit on communications tools and approaches. The Ocean Decade Expert Roster has been established to create a pool of experts to assist the IOC Secretariat with the identification of strategic targets for Ocean Decade Challenges, in the review of Decade programme submissions, and in regular review processes of the Decade.

209. There were intensive stakeholder engagement and outreach efforts during this period. In-person or hybrid events focusing on different aspects of the Ocean Decade were held at the IUCN World Conservation Congress (Marseille, September 2021), UNFCCC COPs 26 and 27 (Glasgow, November 2021 and Sharm el Sheikh, November 2022), the One Ocean Summit (Brest, February 2022), the UN Ocean Conference (Lisbon, June 2022), the CBD COP15 (Montreal, December 2022), Our Ocean Conference (Panama, March 2023), and UN Water Conference (New York, March 2023). Of these events the most significant was the extensive engagement at the UN Ocean Conference. The Ocean Decade led a high level Ocean Decade Alliance event involving several Patrons of the Alliance, including their Excellencies the Presidents of Kenya, Portugal and Palau. The Decade also ran a highly successful multi-stakeholder event showcasing achievements and partnerships.

210. Engagement in key events will continue in the coming period. Planning is underway for the 2024 Ocean Decade Conference that will be hosted by the Government of Spain in April 2024. This milestone event will provide an important platform for the Ocean Decade community to convene in advance of the 2025 UN Ocean Conference (Nice, June 2025).

211. The revamped Ocean Decade website was launched in October 2021 and continues to be ameliorated. It incorporates the Ocean Decade Network, an online community platform for exchange and collaboration which has over 6,200 registered users and is the digital home to the different groups working as part of the Decade. The GenOcean communications campaign was launched on 4 April 2022 and is the public facing communications campaign of the Decade that aims to incite the general public to take action based on enhanced ocean knowledge. An internal review of this campaign has been undertaken and it will be relaunched in late 2023. Social media followers across all platforms have grown to approximately 45,000.

212. Mobilization of resources remains a key challenge for the Decade during the transition from the planning phase to the action phase. The [Ocean Decade Alliance](#) has grown during this period and now numbers 10 Patrons and 18 institutional members. Alliance members have been strongly engaged in high-level events and in raising visibility of the Ocean Decade amongst their constituencies. Efforts continue to work with Alliance members to develop joint funding or support initiatives for the Decade. Sponsored Calls for Decade Actions have been concluded with AXA Research Fund, MeerWissen Initiatives, JPI Oceans, and national funding agencies in Canada and Norway.

213. There have been significant efforts to engage philanthropic Foundations during this period, and an in-person meeting of the Foundations Dialogue was held on 1–3 June 2022 in Rabat (Morocco) hosted by the Foundation Mohamed VI for the Protection of the Environment and led to the development of new partnerships and initiatives related to co-design, strategic communications and capacity development. The next edition of the Foundations Dialogue will convene over 30 philanthropic Foundations in Monaco in June 2023, hosted by the Prince Albert II of Monaco Foundation.

214. Secondments and loans of staff have been finalized with France, Japan, and Fugro (a private sector partner) and have provided invaluable support to the coordination of the Decade. A private

sector taskforce has been established to support the development of a strategic approach for engagement with industry partners.

215. To maintain the current momentum and level of activity, additional financial or in-kind resources are urgently required to allow the full resourcing and operation of the Decade Coordination Unit (IOC/INF-1424). Significant mobilization of resources will also be required to support Decade Actions; an updated resource needs assessment for Decade Actions is reported in IOC/INF-1425.

IOC Sub-Commission for Africa and the Adjacent Island States (IOCAFRICA)

216. Planning for the implementation of the UN Decade of Ocean Science for Sustainable Development in the region progressed well, with the following activities already organized: Regional Consultations and codesign workshops organized in collaboration with UNEP (Abidjan and Nairobi Convention secretariats), Benguela Current Commission, CORDIO, WIOMSA and GIZ (Nairobi, Kenya, 27–29 January 2020 and online in November 2020 attended by more than 200 participants), Regional Gap Analysis with WIOMSA (June–December 2021) and a series of pre-conference workshops held online on 24–26 January 2022 to identify key priorities and the actions that need to be implemented during the Ocean Decade in the region.

217. The “African Conference on Priority Setting & Partnership Development for the UN Decade of Ocean Science for Sustainable Development” (10–12 May 2022 in hybrid format, with limited physical presence in Cairo, Egypt) presented an opportunity for presenting the regional Ocean Decade Roadmap plan for Africa and the partnerships, co-design and co-delivery processes required for the development of the Ocean Decade Actions to deliver the Science “We Need for the Ocean We Want” in Africa.

218. A special session on “The Ocean Decade: A Framework for Strengthening the Science Policy Interface in Africa” was organized at the 12th Scientific Symposium of the Western Indian Ocean Marine Science Association (9–16 October 2022, Port Elizabeth, South Africa), with two expert panels discussing issues related to: (i) strengthening the Science-Policy-Society Interface via the Ocean Decade in Africa, and (ii) priorities and process for implementation of the Ocean Decade Africa Roadmap. The symposium provided an opportunity to launch a booklet on “The United Nations Ocean Decade for Africa” prepared by a team of Early Career Ocean Professionals from the region under the guidance of WIOMSA and IOCAFRICA.

219. The Africa Ocean Decade Task Force, comprising 14 experts and representatives of 6 organizations was established and commenced its assignment of supporting the development of regional Ocean Decade Actions. The Task Force has proposed the development of a major Decade programme for the region, focussing on “Science and Knowledge for a Resilient and Sustainable Ocean Economy in Africa”. The programme will be built on four pillars: (i) sustainable management of marine resources; (ii) climate change and marine biodiversity; (iii) tackling ocean pollution for enhanced human health; and (iv) extreme events and disaster risk reduction. The envisioned enablers for these pillars are capacity development, technology and innovation, knowledge generation and dissemination, Ocean Literacy, and financing mechanisms and instruments. Ocean observations including data and information will be the foundation of the programme.

IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE)

220. IOCARIBE has the overall responsibility for formulation of policy, principles and strategy, and for planning and coordination of the UN Decade of Ocean Science for Sustainable Development 2021–2030 in the Tropical Americas and the Caribbean Region (TAC). As a result of the planning process for the Ocean Decade that started early 2018, a Regional Planning Group (RPG) for the UN Ocean Decade was established in 2020 to advance and coordinate strategic partnerships and actions for the Tropical Americas and Caribbean Region (TAC) engagement in the Ocean Decade. The WTA RPG established seven Working Groups to promote multi-disciplinary, inclusive co-design and implementation partnerships to achieve each of the six initial Societal Outcomes and one

specific for Capacity Development, recognizing the efforts of the Working Groups and strategy for advancing the Ocean Decade in the Tropical Americas and the Caribbean Region. The seventh societal outcome, an Inspiring and Engaging Ocean, has been addressed as a cross cutting theme.

221. During July–October 2021 period, each Working Group organized a co-design Webinar:

- (safe ocean) Tropical Americas Safe Ocean Co-Design Workshop “Breaking down the Silos for More Effective Early Hazard Warning Services”, 8 July 2021
- (transparent and accessible ocean) A transparent Ocean with open information and technologies access, 29 July 2021
- (Capacity Development) Deep sea Capacity Development needs in the WTA and the ETP for the Ocean we want, 19 August 2021
- (Clean Ocean) The Year 2031, A Clean Ocean - Steps to Success, 31 August 2021
- (healthy and resilient ocean) Co-designing the path to sail the Decade of Ocean Science to reach the knowledge we need for the ocean we want in the Western Tropical Atlantic and the Eastern Tropical Pacific, 9 September 2021
- (predicted ocean) Changing the vibe to predict smooth sailing in the Western Tropical Atlantic: A Theory of Change approach, 23 September 2021
- (sustainably harvested and productive ocean) Co-existing Opportunities and Synergies: Exploring Opportunities for a sustainably harvested and productive ocean in the Western Tropical Atlantic (WTA), 7 October 2021

222. On 16–17 December 2021, IOCARIBE convened jointly with UN Agencies and Partners under the auspices of the Governments of Barbados and Colombia, the Regional Kick-off Conference that marked the launch of the UN Ocean Decade in the Tropical Americas and The Caribbean.

223. The Regional Kick-off Conference aimed to catalyze partnerships among various ocean stakeholder communities in the region and catalyze co-design of transformative ocean science solutions to the Ocean Decade Challenges to achieve the Ocean Decade Outcomes and Sustainable Development Goals. Following the work of Regional Planning Group, a drafting of regional Decade proposals to address the regional challenges identified during the TAC Regional Kick-Off Conference and the WTA Regional Workshops’ series (April–September 2021), seven proposals were submitted from the Tropical Americas and Caribbean Region to the Ocean Decade call for Action 02/2021.

224. Partners and stakeholders reviewed the proposed transformative ocean science solutions and assessed the value, feasibility, and priority of the potential Regional Ocean Decade Actions. The Kick-off Conference highlighted emerging regional engagement in co-designing partnerships for Regional Ocean Decade Actions and mobilized contributions and expressions of interest by UN and regional agencies, governments, industry and private sectors, and other stakeholder groups. Member States, partners and stakeholders called for engaging and inspiring stakeholders to develop and enhance partnerships for co-design and co-delivery of transformative solutions to address critical decadal sustainable development challenges. To strengthen the governance and coordination in the region the Conference called to support the creation of National Committees for the Ocean Decade to mobilize local and national collaboration for co-designing and coordinating local, national and regional actions. In co-designing the Regional Ocean Decade Actions, Member States, partners, stakeholders and experts recognized the cross-cutting nature of capacity development and its importance to achieve transformative solutions.

225. In 2022, following the retirement of Dr Cesar Toro as Secretary of the IOCARIBE office, a leadership transition slowed the implementation of regional initiatives and UN Ocean-Decade—endorsed projects and programmes. The UNESCO Kingston Office, through Dr Jean Paul Ngome Abiaga provided interim secretariat support to the work of IOCARIBE until Dr Lorna Inniss was

appointed in January 2023 as the new Head of the IOCARIBE Secretariat. Despite the delays, all seven endorsed projects have been revitalized and are gaining momentum. Following the celebrations of the Sub-Commission's 40th anniversary, the Board of Officers agreed to a comprehensive review of the Sub-Commission's portfolio, with an emphasis on prioritization. This review was approved at the 17th Session of the Sub-Commission, held in Colombia on 9–11 May 2023.

226. The updated IOCARIBE Medium-Term Strategy Science Plan was presented to Member States, who agreed that it should be completed before the start of the biennium 2024–2025. It was also noted that the Science Plan would guide the alignment of regional programmes with the Ocean Decade. In this context, the Sub-Commission also approved the establishment of a Regional Decade Coordination Office (DCO) within the IOCARIBE Secretariat, which supports the implementation of Ocean Decade activities in the region. To provide oversight and technical advice, a Regions Ocean Decade Task Force will be established during 2023, with a diverse and expanded membership, to ensure that stakeholders are involved in the co-design and co-implementation process.

227. The IOCARIBE-GOOS Regional Alliance was re-established, and the Sub-Commission's biennial Marine Science Conference held on the margins of the IOCARIBE-XVII session focused on ocean observations in the region. Several regional and global partners committed to support the network's establishment, and a Decade—endorsed project will accelerate implementation and mobilize resources for a preliminary regional network.

228. The Caribbean Large Marine Ecosystem Plus project was successfully closed and the follow-on project, Procaribe+ was approved for implementation by the GEF. The project was recognized as transformational for the region's ocean governance, with seven relevant intergovernmental institutions establishing an Interim Coordination Mechanism (ICM) for ocean governance. The new project is expected to advance to a permanent mechanism to reduce duplication, and ensure that organizations work together to support healthy oceans.

IOC Sub-Commission for the Western Pacific (WESTPAC)

Over the last intersessional period, WESTPAC continues to foster ocean science-policy interface, advance ocean knowledge and cooperation, and co-design and co-implement with its Member States a wide range of programmes and activities addressing ocean management and sustainability challenges. The UN Ocean Decade gives new impetus to the Sub-Commission's effort in assisting Member States to achieve the sustainable development.

229. The prolonged pandemic presents an opportunity for the Sub-Commission to demonstrate its value in developing and implementing country-specific activities, delivering knowledge and services to serve the needs of IOC Member States in the region for ocean sustainability. Positive progress in the past intersessional period could be demonstrated by:

- Minimizing and addressing the impacts of ocean acidification, including through enhanced scientific cooperation at all levels; with [an international calibration exercise on pH and Total Alkalinity Measurement](#) conducted in May–November 2022 involving 19 laboratories from 9 countries in the region, and tailored national ocean acidification technical training and stakeholder engagement workshops developed and organized in Malaysia (Penang, 20–22 September 2022), Viet Nam (Nha Trang, 13–15 October 2022), and Thailand (Phuket, 2–4 November 2022);
- Advancing the application of remote sensing for sustainable development, with [an International Webinar Series on “Advancing the application of remote sensing for sustainable development of ocean, marine and coastal resources”](#) organized from 22 November to 20 December 2022 to explore the possibility of developing a long-term cooperative programme, and the demonstration of remoting sensing application to coastal habitat mapping for Thailand authority in 2021–2022;

- Delivering *knowledge and outreach services on harmful jellyfish for public health*, with a Field Guide to the Jellyfish of Western Pacific published in March 2021, and a [General Management Guide for Harmful Jellyfish Stings in the Western Pacific and Adjacent Areas](#) published in December 2022 as a practical knowledge collection about the occurrence of harmful jellyfish and first-aid practices for jellyfish stings in the Western Pacific;
- Accelerating marine spatial planning in the Western Pacific, with the first-ever [Regional MSPforum](#) organized on 16 December 2022, together with IOC Paris, marking the beginning of the implementation of the UN Ocean Decade Action 21: Accelerating MSP in the Western Pacific and adjacent areas; and
- Supporting coral reef marine protected area (MPAs) management, with the development of an integrated coral reef monitoring manual to improve Viet Nam's monitoring and assessment capacity for MPA management effectiveness in supporting fisheries recruitment and tourism services.

230. The Sub-Commission has been taking the lead in the region, motivating and engaging experts, institutions, and countries in the preparation and development of the Ocean Decade. In addition to providing technical and strategic support to Member States, the Sub-Commission develops, coordinates, mobilizes, and implements the Ocean Decade related Actions and activities, including the Ocean Decade Kick-off Conference for the region.

231. [The UN Ocean Decade Kick-off Conference for the Western Pacific and its Adjacent Areas](#) (25–26 November 2021, online), organized by the Sub-Commission and hosted by the Government of Thailand with the participation of nearly 3,000 participants coming from various ocean communities, featured high-level [commitments from national governments and UN agencies](#), ocean stakeholder roundtable dialogue, and [17 Decade Action Incubators](#). The event represented the beginning of the region-wide efforts in the development of substantive Decade Actions.

232. Following the Sub-Commission's decision made at its [13th session](#) (WESTPAC-XIII, 27–29 April 2021, online), the Government of Thailand officially made an offer to host a Decade Coordination Office, as an extension of the current WESTPAC Office which they have been hosting since 1994, with a mandate to develop, coordinate and implement Decade Actions in the region. The offer was accepted in June 2022 as reflected through the IOC Executive Council Resolution EC-55.1 in June 2022.

233. Meanwhile, the Sub-Commission co-developed with the Member States four proposals which were officially registered in April 2022 as UN Decade Actions. The four Actions include three Decade Projects: UN 21–“[Accelerate Marine Spatial Planning in the Western Pacific](#)”; UN 22–“[Stem the tide of Asia's riverine plastic emission into the ocean](#)”; UN 23–“[Accelerating capacity development transformations in the Western Pacific - Regional Network of Training and Research Centers \(RTRCs\) on Marine Science](#)”; and one Decade Programme: UN 24–“[Second Cooperative Study of Kuroshio and Adjacent Regions – from its sciences to human well-being](#).” The four Actions have started their implementation in consultation with interested countries, institutions, and partners.

234. The 14th Intergovernmental Session of the Sub-Commission (4–7 April 2023, Jakarta, Indonesia) brought together national competent governmental agencies, marine scientific communities and other relevant IOC ocean stakeholders in the region, deliberating on further advancing ocean science and innovative technologies in the post pandemic era to accelerate the development of ocean-based solutions for a sustainable ocean and economy.

235. It was the first in-person Intergovernmental Session that the Sub-Commission convened since the outbreak of COVID-19 in early 2020. Considering the central role of the ocean in the post-pandemic recovery effort, and that [the UN Decade of Ocean Science for Sustainable Development \(2021-2030\)](#) enters its third year, the session brought together national competent authorities, marine scientific communities and other relevant IOC ocean stakeholders in the region, aiming to

further foster ocean science-policy interface, advance ocean science and innovative technologies in the post-pandemic era, and ultimately accelerate the development of ocean-based solutions for a sustainable ocean and economy.

236. On 5 April 2023, the Sub-Commission convened [A Senior Governmental Officials Roundtable \(SGOs Roundtable\)](#), as a follow-up to [the high-level commitments at the UN Ocean Decade Regional Kickoff Conference for the Western Pacific](#) (25–26 November 2021). The senior officials from national competent agencies in the region came together, shared their progress, and exchanged views on the development and implementation of the Ocean Decade in the region. The SGOs Roundtable finally culminated in the adoption of [an SGOs Joint Statement](#) (2023 SGOs Jakarta Statement). In addition, a side event on [National Decade Committees Forum](#) was held to share experiences and lessons learned in the NDC development and discuss how NDCs could further demonstrate their value in the Ocean Decade.

237. Member States reviewed the major advances that the Sub-Commission has made in the past intersessional period, deliberated the Sub-Commission's engagement and contributions to the UN Ocean Decade, established new initiatives addressing the emerging ocean issues, and agreed to take concerted actions over the next intersessional period in the region.

IOC Regional Committee for the Central Indian Ocean (IOCINDIO)

238. Following Decision A-31/3.5.6, of the IOC Assembly; the Executive Secretary issued IOC Circular Letter [2872](#) of 4th January 2022 and established the Open-ended intersessional Working Group (OEIWG) on the Status of the IOC Regional Committee for the Central Indian Ocean (IOCINDIO). The following Member States and observers were represented in the group meetings: Australia, Bangladesh, Benin, Côte d'Ivoire, Democratic Republic of Congo, Equatorial Guinea, France, India, Indonesia, Islamic Republic of Iran, Kenya, Kuwait, Madagascar, Maldives, Mauritius, Morocco, Oman, Pakistan, Philippines, Russian Federation, Saudi Arabia, Seychelles, Tanzania, Thailand, Togo, United Arab Emirates, United Kingdom, and United States of America as well as the Vice-Chair of the electoral Group IV of IOC, the Chairpersons of IOCAFRICA and WESTPAC, the former Officers of IOCINDIO, the Regional Coordination Operations Centre (RCOC) based in Seychelles and some individual scientists. The IOC and IOCINDIO Chairpersons co-chaired the seven online meetings of OEIWG from February 2022 to April 2023. The Progress Report of the OEIWG on the status of implementation of Decision A-31/3.5.6 was presented to the 55th Session of the Executive Council in June 2022. The Executive Council welcomed the general support for the establishment of the IOCINDIO Sub-Commission, and also underscored the concerns and diverging views on its areas of geographic scope and the potential undermining of responsibilities of existing Sub-Commissions, notably IOCAFRICA and WESTPAC. The Executive Council adopted the Decision IOC/EC-55/3.5.2, inviting the OEIWG to continue its consultations, including with the IOC Sub-Commissions, and to submit its final report and recommendation for consideration by the IOC Assembly at its 32nd Session, respecting geographic coverage of other IOC Sub-Commissions and defining such necessary specifications of the potential future IOC Sub-Commission for the central Indian Ocean (IOCINDIO) as its title, terms of reference, programme of work with the proposed projects and funding support and the mechanisms for coordination with adjacent Sub-Commissions on geographical areas of common interest, while avoiding duplications and overlaps. The OEIWG successfully concluded its mandate, leading to the unanimous adoption by acclamation of the draft Resolution for the establishment of the IOC Sub-Commission for the Central Indian Ocean (IOCINDIO), which states that IOCINDIO Sub-Commission should maintain the current geographic coverage of the Regional Committee limited to the central Indian Ocean³; based on the clear understanding, with a consensual agreement, that the IOCINDIO Sub-Commission should not overlap and/or interfere with the geographic coverage, undermine, diminish, or weaken the work and/or responsibilities of existing neighbouring IOC Sub-commissions. Adequate coordination

³ For the purposes of this document, "central Indian Ocean" refers to the area of the Indian Ocean adjacent, to the West, with that of IOCAFRICA, and to the East, with that of WESTPAC.

mechanisms with adjacent Sub-commissions help to avoid overlaps, focusing on cooperation, collaboration, and integration of IOC activities for the benefit of all regions.

239. IOCINDIO held its 9th Intergovernmental Session in Dhaka (Bangladesh) on 28–30 March 2023 upon the generous invitation and offer of the IOCINDIO Chairperson supported by the Government of Bangladesh. The Session brought together both, highly qualified scientists from the region and beyond with high-ranking Dignitaries and Plenipotentiary High Commissioners from IOCINDIO Member States. There were two ministerial statements at the session from both, the Honorable M.P., Foreign Minister, and the Honorable State Minister for Foreign Affairs of the People's Republic of Bangladesh. The Executive Secretary of IOC attended and actively contributed to the session with several presentations including "Recent developments within UNESCO and IOC" and "UN Decade of Ocean Science for Sustainable Development (2021–2030)". Highlights from the 9th Session included the Senior Governmental and Regional Officials' Forum, the IOCINDIO Youth Forum and the IOCINDIO Symposium on Capacity Development that brought together High Commissioners and Representatives of Member States, partners Organizations and leaders of the UNESCO Category 2 Centres, Chairs and the Ocean Teacher Academy in the IOCINDIO region and the Youth networks. The session reviewed the IOCINDIO workplan and established three working groups on: Ocean policy, economy, and governance; Coastal vulnerability, Sea-Level Rise, storm surges prediction and forecasting in the Indian Ocean; and Capacity Development (cf the report of the session IOCINDIO-IX/3s for details).

240. IOCINDIO reinforced inter-Regional Cooperation with the IOC Sub-Commissions, notably IOCAFRICA through attendance of and contributions to conferences and workshops between IOCINDIO and IOCAFRICA in 2021, 2022 and 2023. The IOCINDIO Chair attended the Africa Week Conference on Ocean, Peace and Sustainable Development at UNESCO online in June 2021, while the IOCAFRICA Chair participated in and contributed to the IOCINDIO-IX session with an opening statement in 2023.

Key Challenges Encountered in Implementation and Remedial Action Taken

241. A number of important ocean governance process have resumed during the intersessional period in the post COVID-19 (for e.g. BBNJ, UNFCCC, CBD COP 15, SDG 14 Conference). IOC has engaged actively in all these events to communicate about its work and highlight the opportunities that the Ocean Decade offers in terms of delivering transformative science based-solutions for sustainable development.

242. IOC has developed a portfolio of projects that are delivering technical assistance and capacity development through regional interventions (e.g. MSPglobal Initiative, Swedish support to the MSProadmap, GEF LMEs). These are generally dependent on a single donor and have set lifespans. It is therefore important to diversify the source of extrabudgetary donors and develop sustainability strategies for each of these projects. Currently, there are no regular programme staff supporting the MSP and ICAM portfolio, despite the growing demands that Member States put on the Secretariat for technical support.

243. The lack of additional resources made available to the IOC Secretariat to lead and coordinate the implementation phase of the Ocean Decade has remained a challenge over this period. Whilst financial contributions have increased from both Member States and philanthropic foundations, resources have been inadequate to staff the full range of responsibilities anticipated. As such, Decade-related activities have diverted human resources from other core activities under this function. Looking forward, there will be a need to rapidly secure long-term resources for the Decade Coordination Unit so that it can be fully staffed, thus allowing adequate investment by existing Secretariat staff in other core activities under this function. IOC Programmes contributing to the Decade should also be adequately resourced.

244. Regional subsidiary bodies (RSBs) serve as a key arm of IOC in regions, translating the broad spectrum of IOC global objectives into concrete actions at regional and national level. Each of

these are staffed with one single IOC professional. The role of regional subsidiary bodies in supporting Decade coordination at regional level offers both a challenge and an opportunity. This persistent understaffing situation is indeed difficult for RSBs to deliver on the unprecedented demands of IOC Member States.

FUNCTION F: CAPACITY DEVELOPMENT

Develop the institutional capacity in all of the functions above, as a cross-cutting function

245. During the inter-sessional period emphasis, at the global coordination level, was placed on the revision IOC Capacity Development Strategy. An important new related development is the launch of the Ocean CD-Hub that will provide easy discovery of CD opportunities.

246. The OceanTeacher Global Academy has continued offering online, on-site and hybrid courses and the subject area has been further expanded through cooperation with IOC programmes and other organizations.

247. The Government of Flanders (Kingdom of Belgium) continues its support through the Flanders-UNESCO Trust Fund for Science (FUST) as well as the IOC Project Office for IODE (see also Function B, Data Management). In addition, important financial support has been provided by NORAD (Norway).

248. IOC Ocean Literacy activities have had emphasis on the development of resources, approaches and tools for the inclusion of ocean literacy in curriculum frameworks and on the ocean literacy contribution to the UN Ocean Decade. An important achievement is the organization of three international Ocean Literacy Dialogues in Portugal, Brazil and Canada.

IOC Capacity Development Strategy

249. At the third meeting of the IOC Group of Experts on Capacity Development (October 2021), a Working Group on the revision of the IOC CD Strategy was established and tasked to work on the new IOC Capacity Development Strategy for 2023–2030 and present a proposal to the IOC Assembly at its 32nd session in June 2023. The final draft of the IOC Capacity Development Strategy 2023-2030 was presented and subsequently approved by the fourth session of the GE-CD (November 2022) for adoption by the 32nd session of the IOC Assembly. A Working Group on Outreach was also established to prepare an outreach proposal to promote the visibility and reach of the IOC CD Strategy 2023-2030.

250. Through IOC Circular Letter [2906](#) (September 2022), Member States were invited to nominate suitable experts for the renewed membership of the GE-CD. Member States who sent their official nominations included Argentina, Bangladesh, Belgium, Congo, Ecuador, Egypt, Germany, Indonesia, Japan, Kuwait, Malaysia, Mauritania, Morocco, Norway, Pakistan, Portugal, Russian Federation, Trinidad and Tobago, Tunisia, the United Kingdom and the United States of America. The 21 new members were selected by the IOC Executive Secretary, with only one expert per country considering the ideal size as well as the geographic and gender balance in representation of the Group.

251. At the first meeting of the GE-CD Working Group on the revision of IOC CD Strategy (January 2022), the development of an online compendium of capacity development opportunities on ocean science and management was first proposed. Through IOC Circular Letter [2934](#) (February 2023), Member States were informed of the launch of the Ocean CD-Hub (<https://oceancd.org>), a global platform that serves as a central repository for finding capacity development opportunities (e.g., trainings, fellowships, internships, grants, etc.) offered by national, regional and global organizations from all over the world. Member States were invited to contribute information on existing capacity development opportunities in the online database. At this stage, there are 400+ entries in the platform, to be regularly updated to expand the reach and inclusion of additional information on CD opportunities that are not yet entered in the online database. Additional functionalities will also be added to improve the platform.

252. Through IOC Circular Letter [2919](#) (January 2023), Member States were invited to contribute to the 3rd Capacity Development Needs Assessment Survey. The survey was implemented from

January to March 2023 and received contributions from 17 Member States. Full results will be made available online at the survey website <https://surveys.ioc-cd.org> soon.

IODE's OceanTeacher Global Academy

253. The IODE OceanTeacher Global Academy Project has established a global network of Regional Training Centres (RTCs) and Specialized Training Centres (STCs) to deliver customized training for ocean experts and practitioners and to increase national and regional capacity in coastal and marine knowledge and management. OTGA currently has 17 RTCs/STCs (Argentina, Belgium, China, Colombia, Ecuador, Denmark, Fiji, Ghana, India, Indonesia, Kenya, Malaysia, Mozambique, Norway, Portugal, Uruguay/Brazil, and USA). In addition, the IOC Science and Communication Centre on Harmful Algae, University of Copenhagen (Denmark) serves as a Specialized Training Centre for HAB. During the reporting period, OTGA organized 63 online and blended training courses focussing on a range of topics related to IOC programmes, contributing to the sustainable management of oceans and coastal areas worldwide, and relevant to Member States in the regions. Four different languages (English, Spanish, Portuguese and French) were used to deliver training courses depending on audience. All training resources were hosted by the OceanTeacher e-Learning Platform (www.oceanteacher.org). Nearly 10,000 users are registered on the OTGA e-Learning Platform.

254. The OTGA network is delivering training contributing to the sustainable management of the ocean comprising ocean sciences, services and marine data management (including marine biodiversity data and ocean best practices) relevant to the IOC Programmes and Regions. OTGA is contributing to the UN Decade of Ocean Science for Sustainable Development through the implementation of capacity development through the transfer of marine technology, ocean literacy, education and training. OTGA is also contributing to the UN Sustainable Development Goals to build the scientific and institutional capacity needed to achieve the SDGs. OTGA has been endorsed as an activity by the Ocean Decade since October 2021.

255. Additionally, during the reporting period, OTGA also worked with partner organizations, including POGO, EUMETSAT, EAF-Nansen Programme, Early Career Ocean Professional (ECOP) Programme and the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) to organize and deliver 20 online training courses.

256. It is important to recall that in 2018, the IOC Project Office for IODE, host of the OceanTeacher Global Academy, achieved ISO 29990 certification as a Learning Services Provider for non-formal education and training and was accredited by the Belgian Accreditation Body (BELAC) having satisfied the requirements of the International Standard. This certification is a recognition of the quality of learning opportunities offered by OTGA, through the IOC Project Office for IODE, and the high standard of quality learning services delivered that can support all IOC programmes in providing specialized training. This certification was renewed in 2022 against the new ISO standard (ISO 29993:2017 Learning services outside formal education—Service requirements).

257. The third meeting of the Steering Group for OTGA was held in November 2022 to approve the workplan for 2023–2024, including proposed courses and sharing of work package tasks.

Ocean Literacy

258. Recognizing that sustainable development cannot be achieved without ocean literate societies, the launch of the UN Decade of Ocean Science for Sustainable Development (2021–2030) is further accelerating the global reach of Ocean Literacy, as it has been designated a Decade Action and integrated into the framework for the Ocean Decade.

259. The Ocean Literacy With All (OLWA) Programme is being implemented by a group of international partners under the leadership of the IOC/UNESCO. Three editions of the Ocean Literacy Dialogues, a series of public events organized with the aim of enabling knowledge exchange

across different geographical and socio-cultural contexts, were held in Portugal (on the occasion of the second UN Ocean Conference), in Brazil, and in Canada (on the occasion of the IMPAC5 Conference).

260. In January 2023, a new project called “Kindergarten of the Lagoon” an innovative educational project on outdoor education and ocean literacy for pre-school children was launched in Venice.

261. The interactive exhibition called “Ocean&Climate Village” continued to travel in different locations and was enriched with an installation for visually impaired, and blind people called “Feel the change”. An online version is now available: <https://ocv.decenniodelmare.it/>, and a catalogue was published. This project is developed through the support of the Government of Sweden, which allowed the organization of the first Ocean Literacy Training for urban planners, architects and designers, done in partnership with e-platform of Ocean Teacher Global Academy as well.

262. As contribution to the EU4Ocean coalition, and under the three-year partnership signed with the European Commission Directorate-General for Maritime Affairs a training on ocean science communication for youth, and a winter school on ocean literacy and collaboration, with a focus on the Mediterranean, were organized.

263. The new design of the IOC Ocean literacy portal (<https://oceanliteracy.unesco.org>) is an important step to facilitate the interaction and the exchange of information for all stakeholders concerned. A new functionality for teachers was implemented.

264. In accordance to IOC Assembly Decision A-31/3.5.4, -the IOC Ocean Literacy Group of Experts was set-up, and it comprises 20 experts from the following countries: Seychelles, Kuwait, Brazil, France, Malaysia, Ecuador, USA, UK, Italy, Chile, India, Fiji, Belgium, Spain, Kenya and Norway.

IOC Sub-Commission for Africa and the Adjacent Island States (IOCAFRICA)

265. Capacity development continues to be a main area of focus, with three Regional Training Centres for the new phase of the Ocean Teacher Academy programme designated at the University of Ghana (Accra, Ghana), the Eduardo Mondlane University (Maputo, Mozambique) and the Kenya Marine and Fisheries Research Institute (Mombasa, Kenya). Training courses were organized on the following topics: Biological Observations in the Indian Ocean-from Microbes to Megafauna (online from 8–12 November 2021, conducted by INCOIS, India and DFFE, South Africa and attended by 70 students, 28 of them from Africa); Modelling for Ocean Forecasting and Process Studies (online 6–10 December 2021 conducted by INCOIS and ITCOOcean from India and attended by 78 students, 25 of them from Africa); Fundamentals of Ocean Mapping (hosted online by KMFRI from 28 November to 17 December 2021, and attended by 18 trainees all from Africa); Earth Observation data and techniques for fisheries management (24 January–4 February 2022 hosted online by the University of Ghana); Oceanographic data collection techniques and access to free online data (9 May–31 October 2022, Mozambique, hosted online by the Eduardo Mondlane University, Maputo, Mozambique); Vessel-based ocean monitoring with applications to R/V *Dr Fridtjof Nansen* surveys (30 May–17 June 2022, jointly organized with the FAO/EAFNANSEN programme and hosted by the National Marine Information Centre in Swakopmund, Namibia); Remote sensing applied to oceanography (21–25 November 2022, hosted by the Université Félix Houphouët-Boigny, in Côte d'Ivoire).

266. Bolstered by support from NORAD, the development of the regional node for the Ocean Information Hub has progressed well, with two online stakeholders’ meetings held in June 2020 and June 2021. Within the framework of this initiative IOCAFRICA has collected information on Marine policies and legislations, Ocean observations platforms, and marine related projects, experts and institutions which will be used to develop and update databases to be linked to the information hub. The development of a regional portal on training opportunities was completed and is now available at <https://africa.marinetraining.org/>. IOCAFRICA is working with partners, including IUCN, CORDIO,

UNEP (Abidjan and Nairobi Convention secretariats), and WIOMSA on developing interoperability with existing information sources.

267. Marine Spatial planning is another area of focus with a series of national marine spatial planning workshops (including environmental pressures that impact on MSP and decision support tools) were organized with support from the Government of Sweden in 2020/2021 in Cameroun, Comoros, Gabon, Ghana, Kenya, Madagascar, Mauritius, Morocco, Mozambique and Tanzania. A regional workshop was also organized for the Gulf of Guinea region. IOCAFRICA in collaboration with the Swedish Agency for Marine and Water Management implemented case studies on Gender and Poverty perspectives in marine spatial planning in Kenya, Madagascar and Tanzania.

268. IOCAFRICA organized a series of regional workshops on: “Mapping the Sea Floor around Africa” jointly with the GEBCO SeaBed2030 project (online 10 and 24 February 2021 attended by more than 100 participants from 25 countries); two workshops Seaweed Sargassum in 2020 and 2021 with UNEP and IOCARIBE; Tsunami Awareness (online with UNDRR, 5 November 2020); Ocean Related Hazards in the Gulf of Guinea (online October 2021, with NIOMR, Nigeria), Ocean Observations in Africa (online 8 June 2021, with University Félix Houphouët-Boigny, Côte d’Ivoire), Underwater Cultural Heritage (Windhoek, Namibia and online with the UNESCO Culture sector). The Global symposium on Mapping the Gaps (online 30 November–3 December 2021) was jointly hosted with the GEBCO secretariat.

269. Policy briefs were prepared and published, in collaboration with the African Group of Negotiators Experts Support (AGNES) on climate change adaptation in coastal zones of Africa focusing on: (i) Sea Level Rise and Implications for Low-Lying Islands, Coasts and Communities; (ii) Changing Oceans, Marine Ecosystems and Dependent Communities; (iii) Extremes, Abrupt Changes and Managing Risks; and (iv) Climate Change & Ocean Economy.

270. The implementation of projects on “Detection and Early Warning Systems for Harmful Algal Blooms”, and “Ocean Acidification research and observation in Africa” commenced in 2021 with funding from the NORAD.

271. In the context of the Canary Current Large Marine Ecosystem (CCLME) project in North-west Africa, three virtual project meeting have been held with the participation of, among others, experts from Cabo Verde, Gambia, Guinea, Guinea-Bissau, Mauritania, Morocco, Senegal and Spain (Canary Islands).

IOC Sub-Commission for the Caribbean and Adjacent Regions (IOCARIBE)

272. The Revised IOC capacity development strategy continues to guide the main elements of IOCARIBE’s programmes and activities. IOCARIBE has a series of delivery mechanisms used for achieving its capacity development, among them the IOCARIBE Strategic Science Plan (2023–2029), CARIBE-EWS, Procaribe+, OTGA, and HAB-ANCA. Also, IOCARIBE works with a number of partner organizations such as WMO, UNEP, UN-DOALOS, IAEA, FAO, the European Commission, regional organizations and NGOs. Universities and research institutions have been important partners. Strong focus during this reporting period continues to be on Disaster Risk Reduction, Ecosystem Based Management, and Marine Spatial Planning.

273. As a visibility and positioning strategy for the HAB theme, the ANCA group developed five types of products aimed at different audiences: Research papers, an informative book on ciguatera, posters and brochures, participation in seminars, congress, courses, and a virtual reality HAB course. Some countries have initiated a project aimed at managing the risk of HABs. Since it is essential to collect information on the appearance of toxic microalgae and to describe their temporal variability, different monitoring programs are carried out in the Caribbean region. Considering the vulnerability to HABs, it is important to design and apply an early warning system (EWS) for risk reduction. This EWS must include an effective monitoring plan with strategic actions to face and mitigate the challenges of intoxications transmitted by organisms. Thus, training in HAIS-HAEDAT

was held from 22/11/2021 to 6/12/2021. The objective of the course was to train researchers from the Caribbean in the registration of HAB events in the region.

274. The OceanTeacher Global Academy Centre at INVEMAR (Colombia) continued to provide training and capacity development activities to LAC countries and 239 experts were trained during the period July–December 2021. Training continued in 2022, with several online courses available in Spanish. INVEMAR has been establishing partnerships with international and UN organizations to carry out training, seminars, workshops and courses, including the IAEA partnership for ocean acidification workshops.

275. The regional node for Ocean InfoHub LAC component has progressed well, and in the last two quarters of 2021 has significantly advanced with its development building on the CHM-TMT designed by INVEMAR and in the Caribbean Marine Atlas experience. There was an acknowledgement of the need to assess gaps in capacity, and build a regional programme for filling those gaps.

276. Marine Spatial Planning (MSP) is a priority for SIDS in the Caribbean region, and several IOC MSP programmes are underway within Member States. During December 2022, the 1st MSP Regional Forum was held in the region, which mobilized participants to request additional support for the MSP process. The region's Member States welcomed the Draft Rolling Operational Strategy for SIDS and, recognizing their limited capacity for ocean science, agreed to mobilize resources for regular forums on MSP and other priorities for SIDS.

277. ODINCARSA counts with 10 NODCs, 7 ADUs (5 OBIS) and 1 AIU, and they carry their activities individually. ODINCARSA is actively participating in the development of the LAC OIH. OIH held 7 coordination meetings through 2021 and hosted one webinar. The region has 3 RTCs and 1 STC of OTGA. In 2021, 13 training courses were delivered with a total of 490 participants. Closer coordination with the TAC UN Decade Regional Planning Group may result in increasing activities and benefits for the region.

278. IOCARIBE continued working with partners to further develop: (i) the Sargassum Information Hub, as a centralized location for information sharing related to Sargassum; (ii) regular and sustained Atlantic-wide monitoring products and inundation reports that is being developed within the framework of the IOC of UNESCO and NOAA (USA) June 2021 MoU; (iii) comprehensive guides on best management practices for Sargassum management; and, (iv) trans-Atlantic collaboration between IOCARIBE, IOCARIBE GOOS, GEO Blue Planet and IOCAFRICA, UN Environment, Cartagena and Abidjan Convention Secretariats, AtlantOS, the AIR Centre and other partners are working to create a Sargassum community of practice.

IOC Sub-Commission for the Western Pacific (WESTPAC)

279. Capacity development has been an integral part of each WESTPAC programme and activity. To assist Member States achieving the SDG 14, the Sub-Commission endeavours to accelerate transformations in capacity development through the integration of training and research, an enhancement of endogenous capabilities and ownership of Member States, and the well-established mutual assistance and cooperation in the region. Over the last intersessional period, WESTPAC continuously co-designed and co-implemented its capacity development activities with Member States in the region.

280. The Sub-Commission continues to implement the IOC Capacity Development Strategy (2015–2023), and fulfill its voluntary commitment to the UN Ocean Conference—“[Develop research capacity and transfer of marine technology through the UNESCO/IOC Regional Network of Training and Research Centers \(RTRCs\) on Marine Science](#)” (#OceanAction15266), and the UN Decade Action 23: “[Accelerating capacity development transformations in the Western Pacific - Regional Network of Training and Research Centers \(RTRCs\) on Marine Science](#)”. Over the last intersessional period, the Regional Training and Research Centre on Marine Biodiversity and Ecosystem Health

(RTRC-MarBEST) in Indonesia organized its [6th International Training on Mangrove Monitoring](#) (29 October–6 November 2021, virtual), in partnership with the Coral Reel Rehabilitation and Management Program -Coral Triangle Initiative (COREMAP-CTI), UNDP, and the Archipelagic & Island States (AIS) Forum. The Regional Training and Research Centre on Ocean Dynamics and Climate (RTRC-ODC) conducted its 10th International training on the regional application of coupled climate models online from 5–16 July 2021. The Regional Training and Research Center on Coral Reef Restoration and MPAs in the Philippines just organized [a training workshop on Coral Larval Reseeding](#), 1–11 April 2023. Meanwhile, another two RTRCs, namely on Marine Toxin and Food Security, and Plastic Marine Debris and Microplastics, have taken the pandemic as an opportunity to co-design with other stakeholders and partners their training modules and plans. They shall soon receive young scientists from within and outside the region.

281. The RTRCs initiative gained wide recognition and support from Member States in the region. In mid-2022, a proposal was made by the State Key Laboratory of Marine Pollution (SKLMP) in the City University of Hong Kong for a Regional Training and Research Centre on Coastal Contaminant Monitoring and Marine Innovative Technologies (Coastal COMMIT). In light of the region-wide consultations and excellent evaluation results, all Member States expressed their unanimous support at the 14th Intergovernmental Session (4–7 April 2023), and thus approved the SKLMP to host the RTRC-Coastal COMMIT. Since late 2023, the RTRC-Coastal COMMIT will assist countries, particularly the developing nations in the region, in strengthening their monitoring capacity for marine pollution focusing on chemical contaminants monitoring, phycotoxin producing algal species monitoring; promote the development of marine innovation technologies; and facilitate international research collaboration to promote marine environmental protection and sustainable development.

282. Since the pandemic, the Sub-Commission continuously demonstrates its unique value for IOC in turning the COVID-19 into an opportunity to address Member States' specific needs. Since June 2021, technical assistance has been provided to Indonesia, Malaysia, Thailand, the Philippines, and Viet Nam to enhance their research capacity for ocean acidification. A series of national ocean acidification training and/or engagement workshops have been co-developed and been conducted, during October 2021–June 2022, in Malaysia, Thailand, and Viet Nam, respectively.

283. Remote sensing is becoming an important tool for mapping marine habitats. In response to the demands of Thailand and Viet Nam, and with the support of UNESCO/Japanese Funds-in-Trust, WESTPAC works closely with national/local authorities in Viet Nam and Thailand, building their capacity in remote sensing to map seagrass meadows for marine protected area management. To this end, a total of four national trainings and workshops have been conducted for Thailand stakeholders and authorities, during May 2021–April 2022. Meanwhile, technical consultations have been made regularly with relevant research institutions and authorities in Viet Nam on the application of remote sensing to its MPA demonstration sites.

284. The Western Pacific is also a hotspot of jellyfish diversity. The need to enhance capacity for jellyfish identification becomes more urgent now due to the increasing incidences of jellyfish stings. As part of its jellyfish research project, the Sub-Commission, in partnership with the Japan Society for the Promotion of Science, conducted a hybrid training on Jellyfish Identification, 17–18 March 2022.

285. To improve the regional and national capacity for molecular techniques for resources management and biodiversity conservation, in late 2019 the Sub-Commission kicked off the third phase of a UNESCO/Korean Funds in Trust project “Enhance the Capacity for Species Identification and Genetic Analysis on Marine Organisms in the Coral Reef Ecosystems in the Western Pacific”. In addition, WESTPAC also started the implementation of another UNESCO/Japanese Funds-in-Trust project aiming to accelerate the transfer of marine technology for marine biodiversity conservation and seafood safety, particularly on coastal habitat conservation, marine toxins and seafood safety, and other hotspot biodiversity related issues, such as the impact of ocean acidification and climate change, and coral reef restoration.

IOC Regional Committee for the Central Indian Ocean (IOCINDIO)

286. The IOC Regional Committee for the Central Indian Ocean considers that Capacity Development (CD) cannot and should not be a stand-alone programme, action or activity. It is not once in a life programme and action, but rather a long-term, dynamic and evolving cross-cutting mechanism. Subsequently, IOCINDIO uses an approach based on Training-Through-Research based on both permanent academic and on-job training and career development. IOCINDIO established cross-cutting Capacity Development Working Groups on critical issues in the region, including: (i) Ocean policy, economy, and governance; (ii) Coastal vulnerability, Sea-Level Rise, storm surges prediction and forecasting in the Indian Ocean; (iii) Cross-cutting Capacity Development and Recommendation. More generally, CD cuts across the entire Workplan of IOCINDIO.

287. IOCINDIO joined hands with Mercator Ocean International for enhanced operational ocean sciences, technologies, innovations and services in the Indian Ocean. In fact, the First Mercator Regional Team meeting for the Indian Seas will be held online on 3 May 2023.

288. The OCEANS'2022, jointly organized by IOCINDIO, the IEEE Oceanic Engineering Society, the Indian Institute of Technology Madras/Chennai, the Marine Technology Society, Chennai, 21–24 February 2022. The Conference brought together about 2,000 participants including global marine researchers, technologists, engineers, industrial leaders, policy-makers and students and fostered exchanges of best practices and critical thoughts on current trends in marine technologies. The Conference helped to create awareness on advanced research areas, practices, and policies in marine field. IOCINDIO organized a dedicated exhibition on IOC Programmes and the UN Ocean Decade. Full details of the Conference available at its [website](#).

289. IOCINDIO workshop on “Methodologies and Approaches of Coastal Vulnerability and Advances in Operational Oceanography Science and Technology in the Indian Ocean”, organized at the International Training Centre for Operational Oceanography (ITCOOcean) hosted on the campus of the Indian National Centre for Ocean Information Services (INCOIS) in Hyderabad, 13–17 December 2021. This activity was jointly sponsored by the IOC-UNESCO Secretariat, the Government of India through the Ministry of Earth Sciences of the Government of India, About 40 delegates from various Member States including Bangladesh, Comoros, India, Iran, Kuwait, Maldives, Myanmar, Pakistan, Qatar participated. Member States of the South Asia Co-operative Environment Programme (SACEP) were represented by the Director-General. Participants well represented diversified sectors including governmental organizations, academia, research institutes, student networks. African scientists and mid-career professionals were also welcomed at the workshop. As a result, several IOCINDIO Member States has developed, improved and/or reinforced their national coastal vulnerability strategy and plan including assessment of coastal inundation; coastal erosion; preparedness for tsunami and storm surge hazards and the impact of climate change on sea level and shoreline changes. The workshop also addressed socio-economic, human and environmental impacts and offered methodologies and guidance to Member States Member states representatives to develop their national guidelines for mitigation purposes.

290. Ocean Teacher Global Academy (OTGA) Regional Training Centre has been established in India (INCOIS) and is very active with a strong training programme, providing courses, seminars and workshops throughout years for various stakeholders and communities in the region. One online training course was held during the reporting period: OTGA/RTC INCOIS: Discovery and use of operational ocean data and products (25 October–5 November 2021).

291. IOCINDIO Summit on Ocean (Blue) Economy in the Indian Ocean towards the United Nations Decade of Ocean Science for Sustainable Development (2021–2030), which is the first in its nature bringing together Member States, stakeholders and partners in the entire Indian Ocean basin and beyond (online, 6 May 2021).

UNESCO Category 2 Centres (C2C) and Chairs in ocean-related fields

292. The two Category-2 Centres (C2Cs) under the auspices of UNESCO in the fields of competence of the IOC, namely the Regional education and research Centre on Oceanography for West Asia (RCOWA) in Islamic Republic of Iran and the International Training Centre for Operational Oceanography (ITCOOcean) in India and the UNESCO Chairs in Iran, Oman, and Qatar conducted several research and training activities in ocean sciences, operational oceanography, data management and tsunami warning and mitigation. Both C2Cs duly and timely reported to UNESCO through the dedicated online reporting platform and webpage <https://en.unesco.org/ocean-category-2-centres>.

293. The International Centre for Capacity Development: Sustainable Use of Natural Resources and Societal Change (GRO) in Iceland is the first UNESCO cross-sectoral Category 2 Centre. It is jointly coordinated by the Natural Science sector and the IOC Secretariat and has been sustained despite COVID-19 like the other IOC related C2Cs. The Centres comprehensive training programme in 'Science for sustainable fisheries' is offered in collaboration with the IOC and aspires to contribute to the UN's SDGs by promoting the sustainable use of living aquatic resources in less developed countries. The training programme in science for sustainable fisheries has 25 years of experience, graduated to date 464 fellows, supported 66 countries, and held 52 short courses and workshops. There is dialogue with IOCAFRICA and with OTGA view a view to announcement of training opportunities and usage of the OTGA platform in the FTP activities.

294. There is a number of UNESCO Chairs in the fields of competence of the IOC, notably in Australia, Benin, Brazil, Canada, Chili, Germany, Iran, Latvia, Oman, Portugal, Qatar, Russian Federation, Senegal, Spain, Tanzania, the United Kingdom, and Uruguay.

295. However, the administrative and reporting line of the UNESCO Chairs is under the Education sector which is the overall coordinating sector for the UNESCO UNITWIN/Chairs programme. In addition, the reporting mechanism of the Chairs is such that they do not report annually. Thus, it makes difficult for the IOC Secretariat to monitor, quantify and evaluate the direct contribution of the Chairs to the IOC programmes. This appears to be somehow, a common issue for UNESCO in general because recently, many Chairs have been closed due to lack of reporting for several years.

296. On the positive note, it should be noted that the IOC Secretariat contributed to the organization of the international Conference which celebrated the 30 years anniversary of the UNITWIN/Chairs Programme on the theme: "Transforming Knowledge for Just and Sustainable Futures to mark the 30th Anniversary of the UNITWIN/UNESCO Chairs Programme", UNESCO House, Paris, France, 3–4 November 2022. In this context, the IOC Secretariat convened the first global meeting of the IOC related Chairs on the theme: "Ocean Science and Knowledge for Sustainable Development: Towards a Global UNITWIN Network of UNESCO Chairs and Category 2 Centres (C2C) under the auspices of UNESCO in Ocean and Climate Sciences, Technology and Governance". The Secretariat plans to establish the network that will bring relevant Chairs together to foster collaboration and synergies.

Key Challenges Encountered in Implementation and Remedial Action Taken

297. Staffing allocated to central capacity development coordination has remained at only 0.2 FTE but was complemented by a consultant funded from extra-budgetary resources. This remains insufficient to reach the ambitions of IOC in terms of implementation of the CD strategy and reaching IOC's full potential. Moving forward, effective implementation will depend on the availability of substantial extrabudgetary support both at the global coordination and regional level.

298. The secretariats of the regional subsidiary bodies are understaffed and under-resourced. Secondments/loans of personnel from Member States are being actively sought to support the work of all regional subsidiary bodies.