



## Ocean Affairs and the Law of the Sea

### Contribution of the Intergovernmental Oceanographic Commission of UNESCO to the Report of the Secretary-General

#### DEVELOPMENTS IN THE FIELD OF OCEAN AFFAIRS AND THE LAW OF THE SEA

Pursuant to United Nations General Assembly Resolution 76/72: Oceans and the law of the sea as of 9 December 2021, entitled “Oceans and the law of the sea” the information below represents the contribution of the Intergovernmental Oceanographic Commission of UNESCO (IOC) to the report of the Secretary-General.

#### MAIN DEVELOPMENTS OVER THE PERIOD

- Significant progress has been made in the implementation of the UN Decade of Ocean Science for Sustainable Development. Endorsed Decade Actions now number 43 programmes, 146 projects and 51 contributions. Five Decade Collaborative Centres have been established and will provide essential coordination support to the Decade Coordination Unit housed within IOC-UNESCO. The Decade Advisory Board was established and met twice throughout this period to review programme submissions and provide strategic advice to Decade implementation. 28 National Decade Committees are now operational and there is significant action at the regional level, including via the launch of the Ocean Decade Africa Roadmap.
- A first pilot State of the Ocean Report (StOR) was prepared and presented to the 55<sup>th</sup> Session of the IOC Executive Council in June 2022. This report is intended to complement the World Ocean Assessment process and is proposed to be prepared on a regular basis to provide accessible information on the state of the ocean and its management.
- IOC has continued its strong engagement in blue carbon. In addition to its role as co-sponsor of the Blue Climate Initiative, IOC now co-hosts with Australia the secretariat for the coordination of the International Partnership for Blue Carbon. Activities in ocean acidification including via the framework of the endorsed OARS Ocean Decade programme. A scientific summary for policy makers on multiple ocean stressors was launched. A Best Practice Guideline for the Study of Harmful Algal Blooms (HAB) and Climate Change was published in February 2022, and the first Global HAB Status Report was published. Significant progress was made in the collection of new data by Member States for SDG indicators 14.3.1 and 14.a.1 for which IOC is the custodian agency.
- GOOS continues to grow and is strongly engaged in the Ocean Decade. The in-situ Global Ocean Observing System now numbers more than 8,900 ocean observing platforms across 12 global ocean observing networks. A report on ocean observations in areas under national jurisdiction was released by GOOS in early 2022 and was discussed at the 55<sup>th</sup> Session of the IOC Executive Council. GOOS was an important contributor to the Open-ended Informal Consultative Process on Oceans and Law of the Sea in June 2022.
- The International Data Conference organised by IOC took place in February 2022 and discussed regional and global strategies to achieve an interoperable digital ecosystem, and to identify future

directions in ocean data and information management. The IODE network now comprises 93 national data centre. The Ocean Biodiversity Information System (OBIS) now has 99.98 million occurrences of 159,965 species from over 4,000 datasets.

- Against the backdrop of the January 2022 tsunami that affected Tonga and that was responded by the Pacific Tsunami Warning Center, tsunami exercises and drills have continued across coastal communities. The IOC Ocean Decade Tsunami Programme is being developed and has the aim of making 100% of at-risk communities prepared for and resilient to tsunamis by 2030. World Tsunami Awareness Day was celebrated across the world on 5 November 2021.
- Activities on marine spatial planning continued and 2021 saw the completion of the joint IOC-European Commission MSPglobal Initiative. This three-year programme left a strong legacy of knowledge products that will be essential for future actions in MSP and sustainable ocean planning. IOC-UNESCO is one of the leading technical institutions of the Ocean Action 2030 coalition that was borne out of the High-Level Panel for a Sustainable Ocean Economy and that has a goal to increase global capacity and action in sustainable ocean planning.
- Capacity development was another major focus of IOC's work. The update of the IOC Capacity Development Strategy has started. The Ocean Teacher Global Academy now regroups 17 regional and specialised training centres and is delivering training contributing to sustainable ocean management. In January 2022, a new toolkit or educational policy makers on ocean literacy was released and the IOC ocean literacy portal was revamped.

## **UNITED NATIONS DECADE OF OCEAN SCIENCE FOR SUSTAINABLE DEVELOPMENT (2021–2030)**

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1. The period from June 2021 to May 2022 represented a period of intense activity for the Ocean Decade. In June 2021 the first results of the [first Call for Decade Actions \(No. 01/2020\)](#) that solicited close to 250 potential Decade contributions were announced, with other announcements following throughout the period as submissions were analysed and endorsement decisions made. To date, 170 Decade Actions have been endorsed through the first Call for Decade Actions. These Actions cover all ten Ocean Decade Challenges and are being implemented by lead partners from over 40 countries.

2. The second 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. It also solicited projects for 25 endorsed Programmes. In addition, funding streams from the AXA Research Fund and the MeerWissen Initiative were integrated into the Call for Decade Actions via a sponsored Call for Decade Actions mechanism. 38 Programme submissions and 134 project submissions from lead partners in 33 countries were received in response to this Call. Approximately 70 additional submissions were received in response to the sponsored elements of the Call. The submissions are currently being reviewed and the first set of endorsement decisions of four new programmes, 38 projects and five new contributions.

3. The third Call for Decade Actions No. 03/2022 was launched on 15 April 2022 and is soliciting 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 solicits in-kind or financial contributions to support Decade Actions in Africa and Pacific SIDS.

4. Two meetings of the Interim Decade Advisory Board were held during this period, in September and December 2021. These meetings considered and made recommendations on the endorsement of Decade programmes, as well as providing advice on the conceptual framework for monitoring and evaluation for the Decade and commencing preparation of the second Call for Decade Actions in 2021.

5. The IOC Assembly at its 31st session approved the Terms of Reference for the Decade Advisory Board on the basis of Document [IOC-31/3.7.Doc\(1\)](#), including the selection process of its members. Between 5 July and 22 September 2021 a call for nominations was opened for 15 expert members of the Board. Via this process 243 nominations were put forward either by Member States of IOC-UNESCO, United Nations, United Nations entities, or intergovernmental organizations, as well as self-nominations. A Selection Panel was convened by the IOC Executive Secretary and composed of the IOC Chair and IOC Officers representing the five IOC electoral groups. With the technical support of the Decade Coordination Unit, this Panel was tasked with the selection of the 15 expert members of the Decade Advisory Board. In its evaluation the Panel undertook to ensure that the expert members have sufficient skills, knowledge, influence and impartiality regarding the vision and objectives of the Decade and are able to undertake the work outlined in the terms of reference. Diversity across sectors was a key consideration including a mix of members from the scientific community, the private sector, philanthropy and government. Expert members were also selected with due consideration to expertise, geographic, generational, and gender balance.

6. In addition to the 15 expert members, UN Legal Counsel/DOALOS, which is the Secretariat and focal point of UN-Oceans and the United Nations Convention on the Law of the Sea, will have one permanent seat on the Decade Advisory Board. The IOC Secretariat as coordinator of the Decade will also have a permanent seat on the Board. Three more seats were reserved for UN Agencies. In January 2022, following a process agreed with UN-Oceans that called for Expressions of Interest from UN Agencies for a rotating seat on the Board, the United Nations Environment Programme, World Meteorological Organization and the International Seabed Authority were all confirmed as UN Agency representatives for 2022.

7. The Decade Advisory Board was convened in January 2022 for an initial briefing session and then met in-person for its first operational meeting in March 2022. At this meeting, the Board discussed recommendations related to the endorsement of Decade programmes from Call for Decade Actions No. 02/2021 and discussed a range of strategic issues related to measuring progress of the Decade, resource mobilisation, the role of indigenous and local knowledge in the Decade, and the means of increasing engagement of Small Island Developing States and Least Developed Countries. A set of rules and procedures for the Board is presented in IOC/INF-1414.

8. During this period, Expressions of Interest for 7 Decade Collaborative Centres and 4 Decade Implementing Partners were received (IOC/INF-1413). The Decade Collaborative Centres are currently undergoing review including an independent Feasibility Study as per the process set out in the DCC operational guidelines ([IOC/2021/ODS/23 Rev](#)). Two of the four Decade Implementing Partners have been approved and the remaining two applications are being reviewed.

9. As part of its contribution to the Decade (IOC/INF-1418), IOC is leading 13 of these Decade Actions (out of a total of 15 UN-led Decade Actions), and is substantively involved in two other endorsed Decade Actions that are not led by UN partners. In response to Call for Decade Actions No. 02/2021, IOC is substantively involved in 9 submissions. IOC is also proposing to host 3 Decade Coordination Offices; one focused on observations linked to GOOS, one focused on data linked to IODE, and one regional coordination office in WESTPAC. These structures are described in IOC/INF-1418, together with information on resource needs for their operationalisation.

10. Twenty-eight (28) National Decade Committees have been created and six regional taskforces are convening partners in the development and operationalisation of regional Action Plans and programmes. An African regional taskforce is being established to oversee implementation of the Ocean Decade Africa Roadmap. Four thematic Communities of Practice regrouping endorsed Decade Actions are operational, and several others are in the final stages of preparation.

11. Meetings of informal working groups on communications, technology and innovation, and monitoring and evaluation provided valuable input during this period. A Data Coordination Group was established in December 2021 to support development and operationalisation of the data, information and knowledge strategy for the Decade. 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.

12. 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 COP 26 (Glasgow, November 2021), and Monaco Ocean Week (Monaco, March 2022). The Ocean Decade had a central role in the One Ocean Summit in Brest, February 2022. The revamped Ocean Decade website was launched in October 2021 and incorporates the Global Stakeholder Forum, an online community platform for exchange and collaboration which has over 4,000 registered users. 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.

13. Mobilisation 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 nine Patrons and 15 institutional members. Alliance Sherpas meet regularly and are developing a workplan for the Alliance and prepare for strong visibility of this group during the UN Ocean Conference in Lisbon (June 2022). In addition to the sponsored Calls for Decade Actions included in the Call for Decade Actions No. 02/2021, three sponsored Calls have been developed and launched mobilizing close to USD10 Million.

14. There have been significant efforts to engage philanthropic Foundations during this period, and an in-person meeting of the Foundations Dialogue was held from 1–3 June 2022 in Rabat, Morocco hosted by the Foundation Mohamed VI for the Protection of the Environment. Secondments and loans of staff have been finalized with France 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.

## **OCEAN RESEARCH**

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### **Understanding climate change and its effects on the world ocean**

15. 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 2022 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.

16. Through decision IOC/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 Rev.). Over the past 6 months the group focused on formulating the best way to contribute to and engage with relevant programmes and projects in the context of the United

Nations Ocean Decade and an updated workplan is expected to be delivered during the fourth quarter of 2022.

17. 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 provides the methodology guiding scientists and countries in terms of 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 is included in the annual 14.3.1 assessment (308 stations in 35 countries reported in 2022). However, the current coverage remains inadequate, with gaps in observations and data in all areas. The rate of change in ocean acidification, its pattern and scale, show great regional variability. The latest results from the IOC SDG 14.3.1 reporting will be published on the UN DESA website in July 2022.

18. 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. A workshop organized by IOC in April 2021 brought together more than 20 experts from all over the world, including representatives of global ocean carbon data products and databases, e.g. EMODNET, ICOS, GLODAP, NCEI, and SOCAT. It was the starting point for the establishment of a federated system to facilitate data submission and collation. The second workshop in May 2022 was used to promote wider application and installation of the related server technology of the federated system for ocean acidification data by the other previously mentioned data bases.

19. GOA-ON has now more than 970 members, from 104 countries (2015 comparative: 150 scientists, 31 countries) and is constantly growing. Currently 19 SIDS and 24 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.

20. IOC also contributed to the preparation of the 5th Symposium on the 'Ocean in a High CO<sub>2</sub> 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 industries and on human wellbeing. In order to ensure the engagement of the OA community during a pandemic IOC supported the organization of a second OA week, 13-17 September 2021. Together with partners from GOA-ON, IOC co-organized five events during the UNFCCC COP-26 (1–13 November 2021, Glasgow, Scotland). 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.

21. IOC was invited to contribute with Ocean Acidification data to the *WMO Statement on the state of the Global Climate* in 2021. The preliminary statement for 2021 was made available on the 31 October 2021 and the final statement in April 2022.

22. 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.

23. 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 7 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.



24. In addition to continuing to co-sponsor the Blue Carbon Initiative (BCI) with Conservation International and IUCN, IOC now co-hosts together with Australia the secretariat for the coordination of the International Partnership for Blue Carbon (IPBC). A revised Strategic Plan of the IPBC and website was published and a new engagement strategy drafted.

25. Several Blue Carbon events were organized at COP-26 and the profile of Blue Carbon for Climate Action was raised. The BCI Scientific working group established new task groups focusing on seagrass and seaweed. Following the working group meeting, the BC community met to discuss 'Blue Carbon beyond the inventory' during an international conference in Edinburgh, Scotland. As a result, IOC is now involved in the preparation of a BC Ocean Decade programme. The development of a BCI OTGA course got delayed due to COVID-19 and is expected to have a first version published before the end of 2022.

26. IOC and IUCN led the preparation of the Marrakesh Partnership Ocean and Coastal Zones pathway published in December 2020. A new updated version considering broader stakeholder review was published just before COP-26. This work was key in engaging non-party stakeholder in the UNFCCC process and in helping Member States to improve the use of coastal wetlands in their Nationally Determined Contributions in the upcoming years.

27. 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.

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

28. As reflected in the IPCC Special Report on the Ocean-s 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 Global Ocean Oxygen Network (GO2NE). The GO2NE series of monthly webinars continues to be a huge success with on average more than 100 participants. Over the past year scientists and other stakeholders from 95 countries joined.

29. 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. Planned actions and activities will raise 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. It is envisaged that GOOD will be implemented through several projects carried out by different consortia in different regions of the world ocean. In addition, GO2NE contributed to the Ocean Observing System Report Card 2021 (OceanOPS) published in July, which focused on ocean oxygen.

30. 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.

31. The IOC Executive Council at its 51st session agreed to establish a new IOC working group focusing on multiple stressors. A draft scientific summary for policy-makers, introducing the issue of multiple stressors on marine ecosystems, was presented at the IOC Assembly at its 30th session in June 2019. With some delay due to the COVID-19 pandemic, the final version of the scientific summary for policy-makers was published in March 2022 as IOC/INF-1404 (DOI: <http://dx.doi.org/10.25607/OBP-1724>). This publication attempts to provide a conceptual overview of multiple ocean stressors, their controls and potential effects, supported by illustrative examples. The objective is to advance science to enable the transition from passive observation of the problem—impacts of multiple ocean stressors on marine life—to proactive engagement in finding solutions. Further elucidating multiple ocean stressors will be fundamental to inform ecosystem-based management and dedicated research actions within the framework of the UN Decade of Ocean Science for Sustainable Development.

32. 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 is co-convening the Open Science Conference on Eastern Boundary Upwelling Systems (EBUS): Past, Present and Future & the Second International Conference on the Humboldt Current System on 19–23 September 2022 in Lima, Peru.

### **The 2<sup>nd</sup> International Indian Ocean Expedition (IIOE-2)**

33. The IIOE-2 currently includes 45 projects, including 3 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 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 the Indian National Centre for Ocean Information Services (INCOIS)..

34. 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.

35. IIOE-2 was submitted for consideration as an Ocean Decade Action. Discussions are underway between the Decade and IIOE-2 leadership on how IIOE-2 can maximize its delivery to sustainable development.

36. 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).

## **OBSERVING SYSTEM & DATA MANAGEMENT**

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37. The Global Ocean Observing System (GOOS) coordinates sustained ocean observing activities across the global ocean to support the delivery of information to those taking decisions across climate adaptation and policy, regarding hazard warnings and weather, for marine resource management, and for marine transport and operations. 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 pandemic-related constraints.

### **Ocean observing implementation and COVID-19**

38. The global 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 50% of the original reference lines thanks to the cooperation of commercial shipping companies and their crew. Many of these systems will not return to pre-pandemic data reporting levels for some time, and the RAMA array of open ocean buoys in the Indian Ocean is currently in critical condition, with a number of inactive buoys. Restrictions on research vessel operations have hindered the deployment and replacement of the RAMA measuring equipment, and this requires concerted international cooperation to resolve.

### **Sustaining, strengthening, and expanding implementation of GOOS**

39. The *in situ* Global Ocean Observing System now numbers more than 8,900 ocean observing platforms across 12 global ocean observing networks, with some 84 countries contributing to the system. There are also 12 BioEco ocean observing networks that are now strengthening. This System supplies essential data and products to communities and weather, climate, and ocean forecasters in support of safety of life and property at sea, maritime commerce, sustainable fisheries, and the well-being of coastal communities. It is also foundational for monitoring long-term climate change and the increasing stress on the ocean from human activities.

40. GOOS and its partners recently identified knowledge gaps on the status of marine life in a [study](#) published in *Frontiers in Marine Science* journal. 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.

41. OceanOPS is pursuing the vision of its 5-year Strategic Plan ([GOOS Reports, 250](#)), 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. 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 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.

42. OceanOPS increased its capacity in 2021, with the hiring of a new OceanOPS manager, a regular-funded position supported through 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.

43. The Ocean Observing System Report Card continues to be recognised 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, with an article on ocean oxygen, and the 2022 Report Card, due for release in June 2022, will broaden its focus again to include Biological and Ecological Essential Ocean Variables (EOVs) and networks.

44. 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 so vital to continued strengthening of the observing system.

### **Connecting ocean observations to international frameworks**

45. GOOS presented on ocean-climate priorities at the 26<sup>th</sup> session of the UNFCCC Conference of the Parties ([COP-26](#)) in Glasgow, Scotland. 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 CO<sub>2</sub> reduction measures and climate mitigation action.

46. In March 2022, the GOOS Ocean Observation Physics and Climate Panel (OOPC) was invited to help write the next GCOS Implementation Plan. The OOPC is a scientific expert advisory group charged with making recommendations for a sustained global ocean observing system for climate in support of the goals of its sponsors. GCOS's regular reports on the state of the global climate observing system ("status" or "adequacy" reports) are submitted to the United Nations Framework Convention on Climate Change (UNFCCC). Increasingly, particularly after COP-26, the UNFCCC and WMO have been pushing for more ocean observing because this is the only way to mitigate against the impact of extreme weather such as hurricanes, underpin sound carbon budgets, and support governments in adapting to the impacts of climate change on coastal communities and marine resources.

### **Moving towards frictionless data flow**

47. The data flows of the 12 global *in situ* ocean observing networks have been mapped, for near-real time, delayed mode and metadata required for data flow, supporting network management functions and FAIR data delivery. This will aid the development of an Observation Coordination Group (OCG) Data Implementation Plan (May 2022) to support all networks' frictionless data flow, ensuring the data from the global ocean observing networks reaches an end point that is harvestable for the future of federated data systems. This work is integrated with developments in IODE and WMO, and also aims to integrate with developments under the Ocean Decade such as Digital Twins of the Ocean.

## **Strengthening knowledge and exchange around services to boost local uptake**

48. The Expert Team on Operational Ocean Forecasting Systems (ETOOFS) is completing the development of its Guide to *Implementing Operational Ocean Monitoring and Forecasting Systems*. This Guide, initiated under JCOMM, due for release in June 2022, will be a corner stone of ETOOFS' aim 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 and open to IOC Member States' experts, which trained 110 participants from 53 countries.

## **Ocean observing in waters under national jurisdiction**

49. 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 a 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.

50. 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,, forty years after UNCLOS provided clear guidance on access to EEZs for scientific purposes, managers of the sustained ocean observing system raise concerns about inconsistencies in how governments regulate scientists' access to their national waters. These inconsistencies are constraining scientific enterprise and severely impair the implementation of the Global Ocean Observing System, needed to deliver essential information for sustainable development, safety, well-being and prosperity. Inhibiting the access of scientific teams and ocean observing networks to EEZ could constrain the development of a truly global ocean observing system, resulting in major gaps in our ability to mitigate climate change, improve weather forecasts and warnings for hazards.

51. Since the release of its [Open Science recommendations](#) in 2021, UNESCO has called on countries to increase scientific collaborations and information sharing, making all scientific data and knowledge openly available, accessible and reusable for the benefit of society. The Open Science approach, which is also supported by the new [Unified Data Policy](#) of the WMO, asks governments to work on developing an enabling policy environment for open science and to promote international cooperation in order to reduce digital, technological and knowledge gaps. Such actions are fundamental for facilitating ocean observations within areas under national jurisdiction such as the EEZs.

52. The Ocean Observations in Areas under National Jurisdiction Workshop Report defines 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). The report proposes a number of recommendations and this important issue and actions by IOC will be discussed under the dedicated agenda item of IOC EC-55.

## **GOOS at the heart of the Ocean Decade**

53. GOOS observations and predictions and a fit-for-purpose ocean observing system are fundamental to achieving the ambition of the UN Ocean Decade. In 2021, GOOS responded to the 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 unified ocean observing and forecasting system, whilst leading key areas of transformation for GOOS in observing and forecasting capacity, observing system co-design and transforming service delivery in coastal ocean. *Observing Together* will transform ocean data access and availability by connecting ocean observers and the communities they serve through enhanced support to both new and existing community-scale projects. *Ocean Observing Co-Design* will improve our ocean observing system design process through user-focused co-design, developing tools that will allow

all stakeholders to benefit from better knowledge, products and services delivery and providing evaluation capability to inform investment. Finally, the *CoastPredict* will innovate the science of observing and predicting the Global Coastal Ocean by enabling systems designed in a global framework to be implemented locally in coastal locations worldwide. Programme brochures have been published and can be found here: [Observing Together](#), [CoastPredict](#), [Ocean Observing Co-Design](#).

54. GOOS recognised the need to provide support to lift the programmes by investing resources to fund one full-time role divided across the three programmes. Much has been achieved with limited resources to progress the programmes and tangible actions are already underway. The first [Ocean Observing Co-Design Workshop](#) will be held in June 2022, which will be a key 'kick-start' event to progress development of co-design processes with the observing and modelling communities, and key user stakeholders. The workshop will also support the development of the first exemplar co-design projects in key user need areas, including carbon budgets, biodiversity for local and global ocean resource management, marine heatwaves and hurricane forecasts.

55. Eleven endorsed ocean observing projects are supported under the Co-Design Programmes, which target key advances across the ocean observing system. The Observing Together Programme has engaged and initiated support for 5 capacity development projects. The CoastPredict Programme has 68 partner organizations contributing to the CoastPredict Steering Committee, and 4 endorsed projects, and 3 core projects submitted, contributing to 6 thematic areas for action in the global coastal ocean. In addition, the University of Bologna (Italy) has submitted a proposal for a Decade Collaborative Centre (DCC) for Coastal Resilience in a Changing Climate. Funded by the regional environmental agency this will support the work of CoastPredict and other Decade Actions under this Decade challenge area.

56. There are now over 121 endorsed Ocean Decade Programmes and Projects, a significant number of which (56%) are directly contributing to meeting the Ocean Decade Challenge 7 related to observations. This speaks both to the urgent need for an expanded ocean observing system to meet pressing societal needs, as foreseen in the [GOOS 2030 Strategy](#), and also to the importance of active coordination across these actions. GOOS and the Ocean Decade Coordination Unit (DCU) have worked together in the last months to develop a proposal for a Decade Coordination Office for Ocean Observations. This will be managed by GOOS to support Challenge 7. It will enhance the collaboration across the actions focused on Challenge 7, and with other coordination and collaboration centres for data, modelling, and coastal resilience. It will also support the transformation of GOOS through integrating new observations into existing infrastructure to strengthen the legacy of the Decade investments and highlighting gaps. It will also work on data flow as a priority across all the ocean observing actions. A proposal for the Decade Coordination Office for Ocean Observing is being submitted to the IOC EC-55 for approval under the Ocean Decade agenda item.

57. Support is required to drive the ambitious level of collaboration and innovation required within the GOOS Programmes and for the Decade Coordination Office for Ocean Observations, supporting these and the broad array of Decade actions focused on transforming our ability to deliver ocean information and to meet the Decade Challenge 7. Investment in these is investment in the core of what the Ocean Decade must transform.

### **Focus on GOOS Regional Systems**

58. The Tenth GOOS Steering Committee Part 2 (GOOS SC-10-2) held online in 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. The GOOS SC-10-2 decided to initiate a sub-task, under the GOOS Governance Task Team, to assess the current (2013) GOOS Regional Policy, highlighting gaps, assessing links, evolving the vision for the GRAs, and to develop

a proposal for an updated GOOS Regional Policy 2022, in line with the evolution of societal needs for ocean information and the implementation of the 2030 Strategy.

### **Eleventh meeting of the GOOS Steering Committee: evolving GOOS**

59. The Eleventh meeting of the GOOS Steering Committee (SC) was held online across 26, 27 and 29 April, and 3 May 2022.

60. Supported by its [2030 Strategy](#), GOOS continues its work 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. At this Steering Committee Meeting there was a focus in four key areas: governance, communications and fundraising, and implementation planning for actions across GOOS, including across the Ocean Decade Actions.

61. Guidance was sought from the Steering Committee on the scope of what GOOS will govern for a future Evolve GOOS Governance Task Team. The scope, to act as a starting point for this task team, was identified as the Global Ocean Observing System (GOOS). This is focused mainly on ocean observations, data and metadata flow that is supported by the ocean observing community, and the strategic coordination of operational ocean forecasting systems. The task team will also contribute to maintain the appropriate connections to enable a fully integrated, sustainable, ocean observing system, as envisioned in the Global Ocean Observing System 2030 Strategy, with the goal of serving users across climate, weather and hazard warnings, and ocean health, increasingly with a focus on coastal areas and regional seas. The process for evolving GOOS governance, and the Terms of Reference and members for this Evolve GOOS Governance Task Team can now be finalised and reviewed with the GOOS sponsors. Guidance was also sought by the Steering Committee on the forming of a Decade Coordination Office (DCO) for Ocean Observations (as noted above). The SC additionally 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 DCOs, to lift the capacity of GOOS to deliver quality ocean information from more sources. The DCO as envisioned will undertake this and other vital work towards meeting Challenge 7.

62. A draft GOOS communications plan was presented, this aims to enhance GOOS's ability to be an advocate both for the pressing need for ocean observations and for the value of creating a fit for purpose observing system, through the design, coordination, strengthening, infrastructure and partnership work that the GOOS Core Team undertake. With clearer communications, this message can reach a wider audience and have greater impact on raising the profile and role of ocean observing in aiding society in making sound decisions around climate mitigation, the management of marine resources and sustainable blue economic growth. Preliminary work from a specialist consultancy on developing funding sources in the philanthropic sector was presented, this work offers both exciting and challenging potential for GOOS. There is work ahead to hone the messaging and to develop interest in this sector towards funding for societal transformation through projects or elements within the Global Ocean Observing System. This is a new area with potential to support transformational ocean observing, it will however take resource and time to develop.

63. The GOOS Implementation Plan actions are now managed across GOOS within a project management software system, enabling analysis and identification of priorities for action. The Steering Committee discussed the types of information required from this project management tool to enable them to provide guidance and assess overall implementation towards the GOOS 2030 Strategic Objectives. Key actions being developed within the implementation plan were highlighted including a paper detailing the GOOS EOVI framework and how this could evolve to meet the observing community needs; work under development on Ocean Indicators, which aims at better defining the concept and providing an overarching framework for developing ocean indicators, undertaken with across GOOS and with many partners; a University of New Mexico-OECD-GOOS Paper on valuing ocean observations, which will outline an economic model and best practice in valuing ocean observations; and the development of an Integrated Marine Debris Observing System



(IMDOS) and associated Marine Debris EOVS, in partnership with key organizations working in this area including GESAMP, UNEP and the satellite community. This may become an action under the Ocean Decade.

### **GOOS and its co-sponsor WMO**

64. 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 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 new policy follows the WMO's earth system approach and encompasses all relevant Earth system data—weather, climate, hydrology, atmospheric composition, cryosphere, ocean and space weather. For the first time, ocean data are explicitly included in the policy, covering *in situ* and remotely-sensed observational data both in and above the ocean and at the sea-surface, from the open ocean to the coast. The ocean data aspects of the policy were developed in collaboration with the GOOS community, and 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 EOVS and ECV data.

65. The Global Basic Observing System (GBON) of 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 GBON is based on a global design that has been agreed between all WMO Members. Currently marine observations are not a part of GBON, however at WMO Congress in October 2021, a number of amendments to the Technical Regulations related to establishment of the GBON were approved, including a request to WMO Infrastructure Commission to 'Explore, in collaboration with the Joint WMO-IOC Collaborative Board, possible initiatives to strengthen the exchange of surface-based Earth system observations over the global ocean, for example via an extension of GBON into this domain'. At the SC-10 Part 2, in November 2021, the SC decided to request WMO to include some of the mature GOOS networks that would presently be able to deliver against the GBON obligations, in the WMO GBON (SC-10 Part 2 Report – [here](#)). Inclusion in GBON could help increase support from the meteorological community for ocean observing.

66. Following the disbandment of JCOMM, IOC and WMO have been working to ensure that functional and strategic connections between the two organizations are maintained. This means for example that OCG/OceanOPS are participating to the working group on WIS2.0, and observing networks closely related to meteorological measurements are connected to the relevant WMO Expert Teams. However, a clear overview of priority and forward looking connections, and how they will be supported, has been lacking. The development of this overview is currently being undertaken; first within the Joint WMO-IOC Collaborative Board (JCB), which met in March 2022 and through joint presentations by theme leads of the IOC and WMO on observations, data, forecasting, services, research, regional activities and capacity development, a series of gaps and areas for strengthened collaboration was identified. Secondly, GOOS and IODE representatives are participating in the WMO Study Group on Ocean Observations and Infrastructure Systems (SG-OOIS) which will deliver its recommendations on functional connections to the WMO Commission for Observation, Infrastructure and Information Systems (INFCOM) in the next months.

### **GOOS contribution to United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea (6–10 June 2022)**

67. Pursuant paragraph 356 of resolution 76/72 of 9 December 2021, the twenty-second meeting of the United Nations Open-ended Informal Consultative Process on Oceans and the Law of the Sea, focused its discussions on the theme "Ocean observing". Its session was held at United Nations



Headquarters in New York from 6 to 10 June 2022. The IOC Chair, GOOS Co-Chairs, and several members of the GOOS Core Team have been invited to participate as panellists. The Informal Consultative Process was established by the General Assembly in 1999 in order to facilitate its annual review of developments in ocean affairs and the law of the sea. The ocean is at the core of key challenges facing society: food security, overfishing, climate change, extreme events, loss of biodiversity, and poor management of coastal ecosystems, challenges that have the potential to destabilize regions and impoverish billions of people. This is an important opportunity to highlight where coordinated support from member states can have a powerful global impact on meeting these challenges through targeted and impactful development of the sustained Global Ocean Observing System (GOOS), to deliver ocean information to those that need it for climate mitigation and to open the door to sustainable economies and blue growth.

### **The International Ocean Data Conference**

68. The International Ocean Data Conference took place in Sopot, Poland, between 14 and 16 February 2022 as a hybrid event and was attended by over 590 online and 60 on-site participants. Organized jointly by the Government of Poland through the Institute of Oceanology of the Polish Academy of Sciences (IOPAN), the IODE Programme of the IOC and the Decade Coordination Unit, the conference was set to achieve its main objectives: to consider regional and global strategies and policy needed to achieve the digital ecosystem; to discuss existing and required technological developments and their implementation, and to identify future directions in ocean data and information management. The mentioned objectives will furthermore be considered within the multi-sectoral vision of the UN Ocean Decade.

69. During the conference several important recommendations were made jointly by the global ocean data and information management community: (i) need for increased efforts in standardisation, best practices and harmonization as well as wider application of FAIR and CARE principles; (ii) increase the widest community engagement including citizen science, indigenous knowledge and improving data literacy; (iii) need to increase efforts in global data and information system interoperability and networking to achieve a global ocean digital commons and data ecosystem, also achieving interconnection and integration of data systems (digital twins) from different disciplines and sectors (including private sector) related to the ocean; (iv) foster integrated multi-hazard warning systems within Earth System Observation, Research, and Prediction programmes, not only aiming at ocean health, but manifesting the seven Decade's societal outcomes underlining the qualities of the ocean and of the people.

70. In the context of the UN Ocean Decade, the global ocean data and marine value chain community will have collectively enabled a 'living' ocean digital ecosystem: data provenance will be fully traceable via a common set of metadata enriched with thematic/sector/uptake relevant tagging information e.g., relevance to EOVs, SDGs. The ocean digital ecosystem will be fully machine searchable and actionable, meaning that when data or metadata are updated, it will be automatically streamlined and available throughout the data pipeline and via the global digital commons.

### **New IODE Data Centres**

71. The Marine Environmental Data and Information Network (MEDIN, United Kingdom) has joined IODE as an Associate Data Unit in February 2022. The IODE network now comprises 93 data centres (18 in Africa, 10 in Latin America and 9 in the WESTPAC region), of which 9 are accredited NODCs and 1 is an accredited ADU. There are 32 ADUs and 5 AIUs (Associate Information Unit). IODE has 90 IODE national coordinators for data management and 40 IODE national coordinators for marine information management.

### **2022 Meeting of the IODE Management Group**

72. The 2022 Meeting of the IODE Management Group took place at the IOC Project Office for IODE, Ostend, Belgium, on 21–22 March 2022 as a hybrid meeting. It reviewed all action items of IODE-XXVI (March 2021) and revised the work plan until IODE-XXVII (February/March 2023) taking

into account reduced financial revenue and continuing impact of COVID-19 on the ability to have face-to-face meetings. The Management Group recommended that all IODE Projects will be continued.

### **Renewal of the MoU between the Flanders Marine Institute and IOC**

73. 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, negotiations were held between November 2021 and April 2022 resulting in the drafting of the new MoU (expected to be signed in April/May 2022). In addition, VLIZ and the Project Office will move to new facilities (InnovOcean Campus) in September 2022.

### **IODE Contribution to the UN Ocean Decade**

74. IODE submitted five decade actions: (i) e-DNA expeditions in marine World Heritage sites (in collaboration with the UNESCO WHC); (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); and (v) OceanData-2030. In addition, four proposal actions 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 (ii) CoastPredict: observing and predicting the global coastal ocean; (iii) Ocean Observing Co-Design: evolving ocean observing for a sustainable future; and (iv) Marine Life 2030. In addition, IODE submitted a proposal for the establishment and hosting (by the IOC Project Office for IODE, Oostende) of a Decade Coordination Office (DCO) focusing on ocean data and information. The proposal was formally submitted to the DCU after its approval by the 2022 meeting of the IODE Management Group.

### **Revision of the IOC data policy**

75. As a follow-up of its establishment through Decision A-31/3.4.2 (International Oceanographic Data and Information Exchange), sub-section III, IOC Circular Letter [2864](#) (9 November 2021) was issued, explaining the 8 steps that will be taken towards the submission of a revised IOC data policy to the 2023 Session of the IOC Assembly. The IOC Inter-sessional Working Group on the Revision of the IOC Oceanographic Data Exchange Policy (IWG-DATAPOLICY) met for its first meeting on 5-6 April 2022 at the IOC Project Office for IODE, Oostende, Belgium as a hybrid event. It agreed on a workplan for the writing of a first draft and the timing for the next steps.

### **IODE cooperation with other IOC Programmes**

76. IODE is continuing and further developing its collaboration with, and support to, other IOC programmes and activities, including the GOOS BioEco panel, GOSR, HAB, 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)**

77. During July 2021–May 2022, the IODE/GOOS Ocean Best Practices System (OBPS) project (<http://www.oceanbestpractices.org>) has been collaborating with individuals and programmes around the world to transform the way ocean methodologies are managed and used. The number of records in the repository has increased by 25%; our annual workshops continue to attract more than 450 global participants. With EU and USA project funding, our repository technology has been enhanced to offer a best practices endorsement process. This year, the focus is on broader inclusion of ECOPs in the Steering Group and the team more generally. There have been new Task Teams on Omics, Value chain and KPIs, Best Practice adaptation for LDC (expanding the emphasis on LDC, remote regions and Indigenous Peoples) and a proposed Decision Trees to implement best

practices more efficiently. Importantly the Ocean Decade endorsed the 'Ocean Practices for the Decade' Programme which will facilitate building a Community of Practice and take forward a Federated Network of methodological management systems in a co-design exercise with the Ocean InfoHub Project. Best practices are a major tool for training the next generation of ocean researchers. In 2021, OBPS stepped up to the challenge of building best practices resources for capacity development and capacity sharing. Overall, the OBPS is receiving widespread international support and is being included in many science and research infrastructure proposals. The support includes collaborations with Ocean Decade Programmes.

### **The Ocean Biodiversity Information System (OBIS)**

78. The Ocean Biodiversity Information System (OBIS, <https://www.obis.org>) acts as the global data platform for biological and ecosystem EOVS under GOOS and GEO's Marine Biodiversity Observation Network (MBON) with the aim to bring more of the data from these facilities fully online and become interoperable and reusable as part of an integrated global ocean observing system. OBIS has been running for 22 years now, and in the last year, despite COVID-19, has seen an exponential growth in the amount of data. Between May 2021 and April 2022, 29.5 million presence records were added to OBIS from 584 new datasets, providing 5,650 new marine species to OBIS. In terms of new records, this is the same amount OBIS would normally publish in a decade. Some of this growth can be explained by the recently added capability to publish DNA derived occurrence data in OBIS. In total, OBIS now has 99.98 million occurrences of 159,956 species from 4,453 datasets. Thanks to support received from NORAD, the OBIS Capacity Development task team is developing new training resources to support Member States in managing, sharing and using marine biodiversity data. These short tutorials—notebooks and videos of max 5 mins, linked to a step-by-step guide—will be posted on the OBIS [YouTube channel, on the OBIS GitHub](#), and will be available for OBIS training courses on the OTGA e-Learning Platform.

79. OBIS also assumed new responsibilities supporting the Biology and Ecosystems panel of GOOS and has set up a portal to manage and integrate metadata provided by biological observing systems, networks and programmes. This work is done in close collaboration with the BioEco panel as well as with other parts of GOOS that have a similar function, e.g., the physical and biogeochemistry domains, which include the Observation Coordination Group (GOOS OCG) and OceanOPS in Brest (France). The ability to share relevant information automatically across GOOS fields and groups for an integrated view is important to establish supportive and continuous systems.

80. In 2021, the joint Biodiversity Information Standards (TDWG) and Genomics Standards Consortium (GSC) working group on Genomic Biodiversity (GBWG) produced a mapping between the Minimum Information about any (x) Sequence (MIxS) and Darwin Core standards. In parallel, a Darwin Core extension specification was created to allow inclusion of DNA sequences as well as related MIxS terms in Darwin Core biodiversity datasets. The OBIS data platform was updated to be able to index and provide access to sequence data published using the new extension. An open source bioinformatics pipeline was developed to process raw sequence data from eDNA samples collected by the Pacific Islands Marine Bioinvasions Alert Network (PacMAN) project into taxonomically annotated species observations.

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

81. 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 1 May 2022) contains now 3085 entries of on-line content sources covering 16 content types. 2175 of those entries have already been quality controlled and this quality control process will continue in the future. The database itself has been expanded to contain a closer link with the EOVS and will in a next iteration also contain links to SDGs. ODISCat is supporting the Ocean InfoHub (OIH) and Ocean Data and Information System (ODIS) projects as a planning and engagement tool, helping to identify potential areas of collaboration within these projects. It will be

the start point for discovering sources that are compliant with the ODIS-Architecture that is defined in the Ocean InfoHub project.

82. As invited by IOC-XXX ([Decision IOC-XXX/7.2.2](#): Ocean Data and Information System [ODIS]) the fully detailed and costed project proposal for the ODIS has been prepared for submission to IODE-XXVI and IOC-XXXI. The proposal defines the major components of the ODIS digital ecosystem, and clarifies the roles of the ODISCat catalogue of sources, Ocean InfoHub, and Partnership Centre for ODIS within the higher-level ODIS project, and provides a budget forecast to the end 2025. The IOC Ocean Data and Information System (ODIS) will be 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.

83. The Ocean InfoHub (OIH) Project (<https://oceaninfohub.org/>) is a three-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. The project will not be establishing a new database, but will be supporting discovery and interoperability of existing information systems. The OIH Project commenced in April 2020 with the recruitment of a project manager and a number of national and regional stakeholder consultations. Since June 2020, three regional communities of practice (Africa, LAC and PSIDs) have been established, a virtual Steering Group meeting was held over two sessions, and a Chair of the Steering Group was elected in an online voting process.

84. An expert technical working group has been expanded from 20 to over 60 technical experts (led by a chair and co-chair) with working platforms on Slack and Github. Consensus was achieved by this group on a way forward for the development of the ODIS-architecture, and this is now in development by two subcontractors. The training component of the project commenced implementation in 2021 jointly with the OTGA. Several newsletter articles have been written, numerous presentations have been given at (virtual) international forums, conferences and meetings, and a website has been developed for the project. In total, the project has either convened, or been represented at over a hundred planning and consultative meetings. 29 Pilot partner organizations are working with the project to demonstrate proof-of-concept of the ODIS architecture, and nine of these are now ODIS-architecture compliant and can be discovered through the ODIS network. A back-end search demonstration site is used for testing and a global front-end OIH search portal is currently in development (to be completed in July 2022).

## **EARLY WARNING AND SERVICES**

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### **Tsunami Warning Systems**

85. 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).

86. In the IOTWMS an Intersessional Meeting of the Intergovernmental Coordination Group for the Indian Ocean Tsunami Warning and Mitigation System [Online] was organized on 23–24

November 2021 (88 participants, 18 Member States). Several other online working sessions were organised including Working Group 2; Task Team Scientific Tsunami Hazard Assessment Makran Subduction Zone; IGCP 740 West Makran Paleo-tsunami Investigation; First Workshop for West Makran Paleo-tsunami Investigation; IOWAVE20 Task Team, and Intersessional Meeting of the Subregional Working Group for the North West Indian Ocean (WG-NWIO). Moreover, IOTWMS organised two regional Media training workshops on Standard Operating Procedures (SOP) for Tsunami Early Warning and Emergency Response in the North-West Indian Ocean (NWIO) region (7–9 September and 26–28 October 2021).

87. 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 organised including of the Task Team on Operations and the Steering Committee.

88. ICG/CARIBE-EWS-XVI was convened as an in presential meeting on 7–10 June 2022, hosted by the Government of Aruba, Kingdom of Netherlands, with the option of online participation for specific agenda items (Cf. ICG/CARIBE-EWS-XVI/3)

89. In the Pacific Ocean, the Twenty-ninth Session of the PTWS ICG (ICG/PTWS-XXIX, online) was organised 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 organised. 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 organised (56 participants).

90. The UNESCAP funded project on “Strengthening Tsunami Early Warning in the North West Indian Ocean region through Regional Collaboration” implemented in India, Iran, Pakistan and Oman, continued to engage with the participating member states via online national consultations and regional workshops. The second regional DMO tsunami early warning and emergency response SOP workshop was organized as a hybrid event on 12 to 14 October 2021 and the launching of the Phase 2 of the project approved by ESCAP was organised in April 2022. Further, discussions are ongoing to extend the Partnership Agreement between UNESCO/IOC and BMKG on the support for Indian Ocean Tsunami Information Centre for the period 2022–2027.

91. 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 Turkey, 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.

## **Tsunami Exercises**

92. 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.

93. 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 organised in the other basins in 2020–2021 and will be organised in the second half of 2022 and in 2023.



## Tsunami Events

94. 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).

95. The 15 January eruption was preceded the day before (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.

96. 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.

97. 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 1st 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.

98. 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.

99. 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 Centre and the Technical Secretary of the ICG for the

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**

100. 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.

101. In the Indian Ocean two communities in India have received the TR Recognition in 2021. In addition, 29 communities are in the process to become TR recognized in Indonesia (7) and India (22), respectively.

102. 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 twelve 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.

103. 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 5 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.

104. The Tsunami Ready Recognition Programme 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.

105. Through Decision IOC-XXXI/3.4.1, the IOC Assembly at its Thirty first session (14–25 June 2021, online) approved the establishment of the IOC Ocean Decade Tsunami Programme. The Ocean Decade Tsunami Programme includes the aim of 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 and other initiatives. The implementation of the Tsunami Ready Recognition Programme will be a key contribution to achieving the societal outcome 'A Safe Ocean' of the Ocean Decade.

106. The Fifteenth 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 55<sup>th</sup> session 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.

107. 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](http://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**

108. 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.

109. 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 2022.

### **World Tsunami Awareness Day**

110. 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.

111. 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 ChESEE 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, Turkey 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.

112. In the Indian Ocean, IOTIC and 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.

113. 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.

114. 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.

115. At global level there were major events in New York (UN Headquarters), Asia Pacific, Africa and the Caribbean. 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.

116. The WTAD 2022 theme is 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.

## Support for enabling research and policy development

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

118. The Tsunami community contributed actively to the development of the approved Implementation Plan for the UN Decade of Ocean Science for Sustainable Development and continue to participate in key events and in regional meetings including the Safe Ocean Laboratory (5–7 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.

119. The TOWS-WG fifteenth Meeting (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 sixteenth meeting in February 2023.

## Harmful Algal Bloom programme

120. 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.

121. 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 HAB and GlobalHAB activities.

122. 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 newsletter on harmful algae and algal blooms published 3-4 times a year since 1992. The two latest issues were published in October 2021 and February 2022. 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).

123. 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.

124. GlobalHAB is also focusing on HAB event modelling, with a strong training component including the development of an online textbook on HAB modelling. This was scheduled for May 2020, but has been postponed due to COVID-19 until 9–13 May 2022. The GlobalHAB Modelling and Prediction of Harmful Algal Blooms workshop to be held in Glasgow, United Kingdom with open attendance.

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



126. A new 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 organizing an Open Science Meeting (OSM) 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 results of the OSM will be published as a white paper or in a peer-reviewed journal and will form the basis for GlobalHAB's and GESAMP's future engagement in the *Sargassum* issue. However, due to COVID-19, the event, initially planned to be held in Mexico, will instead be conducted as an on-line stakeholder consultation.

127. The comprehensive undertaking to develop the first Global HAB Status Report (GHSR) based on data compiled in the Harmful Algal Information system (HAIS) is now 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.

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

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

130. 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 on-line due to the COVID-19 situation, but the hands on training is resuming 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**

131. 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.

132. During 2021, the Flanders-funded Pacific islands Marine bioinvasions Alert Network (PacMAN) project, which is developing a national invasive species monitoring system as well as an

early-warning decision-support tool for Pacific SIDS, has developed strong relationships across the marine stakeholder community in Fiji. An operational arrangement between the Biosecurity Authority of Fiji (BAF) and the PacMAN project gives the project access to quantitative Polymerase Chain Reaction (qPCR) facilities at BAF and strengthens collaboration on marine biosecurity in Fiji. Continuing support from Fiji Ports Corporation enabled the identification of sampling sites at the Suva harbour focusing on the high-risk areas in terms of incoming international vessels, as well as access and use of port infrastructure for sampling. Together with the international scientific experts the PacMAN monitoring plan was drafted including a port baseline survey, a list of high-risk marine invasive species, and a sampling plan for routine monitoring. The monitoring plan was accepted by the full advisory board, chaired by the Ministry of Fisheries and Forests of Fiji. With the strong backing of the local community and scientific expertise, sampling was initiated in November 2021, and the first samples for metabarcoding and voucher specimens have been collected.

133. 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 on-line in 2021 and will in 2022 meet on-line 2–4 May 2022 with Okko Outinen (Finland) as Chair.

134. 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 new project was launched in January 2019, the GEF-UNDP-IMO GloFouling Partnerships, to develop suitable tools and provide capacity building on biofouling management in twelve 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 coastal infrastructure sectors.

135. Under the leadership of the IOC, GESAMP has established a Working Group on Biofouling Management (WG44) with the overall objective to build a broader understanding on introduction and spread of NIS via biofouling across all maritime industries. The Working Group will provide 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 NIS. The Working Group comprises experts (members) from various disciplines and sectors which are related to impact and management of biofouling and worked by e-mail correspondence throughout 2021 to deliver a first draft of their global overview.

## **ASSESSMENT & INFORMATION FOR POLICY**

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### **Sustainable Development Goals (SDG)**

136. 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 both these indicators for inclusion in the UN Secretary General's Progress Report towards the SDGs in 2020 and 2021.

137. 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) 2020* online questionnaire—the basis for 14.a.1 reporting and the newly established ocean acidification data portal for 14.3.1 reporting.

Hosted in Ostend, this new 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 2020 and February 2021 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).

138. 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 Goal 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 has been elaborated by the IOC N-CIRP Group of Experts in 2017. The work will require funding for two postdoctoral scholars and an expert workshop to validate models and will extra-budgetary funding. Identifying funding proved a hard challenge but was solved late 2021 as a combination of funds from UNEP via a UN to UN agreement as well as Norwegian (NORAD) funding. The work is now initiated and will be completed second quarter 2023.

### **World Ocean Assessment**

139. 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.

140. 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.

141. The Ocean Biodiversity Information System (OBIS) secretariat contributed to two chapters of the 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)**

142. 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).

143. 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 Decade of Ocean Science for Sustainable Development and within various fora, including by providing evidence to support the World Ocean Assessment process.

144. 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.](#)

145. A draft Pilot StOR has been completed for presentation to the 55<sup>th</sup> Session of IOC Executive Council. The Pilot StOR builds on data drawn from IOC programmes as examples and serves to illustrate the potential of a fully developed StOR with contributions on all relevant parameters from IOC networks and external groups, organizations and entities. The Pilot StOR is also intended to provide guidance and inspiration for all contributors to the full StOR foreseen for 2023–2024, provided the required resources are identified.

### **General Bathymetric Chart of the Oceans (GEBCO)**

146. 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 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.

147. 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 in Paris, UNESCO HQ).

148. The 38<sup>th</sup> Meeting of the GEBCO Guiding Committee (GGC) took place in Monaco at the IHO on 20–22 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. Recognising 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 will be 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 will be presented to this session of IOC Executive Council under the Executive Secretary's report.

## **SUSTAINABLE MANAGEMENT & GOVERNANCE**

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### **Sustainable Development Goals – Preparation for the 2022 UN Ocean Conference**

149. In Spring 2019, the UN General Assembly agreed to host the 2020 UN Ocean Conference on SDG 14 which was initially planned to take place in Lisbon, Portugal, in June 2020, hosted by Portugal and Kenya. The central theme of the Conference is "Scaling up Ocean Action based on science and innovation for the period 2020–2030: stocktaking, partnerships and solutions". The Conference that was rescheduled from 27 June to 1 July 2022 will also provide input to the review of SDG 14 by the High Level Policy Forum that will meet in July 2022.

150. 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.

151. IOC had also advanced in planning of a series of high-level events to be held during the conference proceedings related to the Decade. This series of events will focus on the Ocean Decade



Alliance and provide a space for the announcement of high-level commitments to the Decade agenda.

152. The IOC Executive Secretary took part in the Expert Group Meeting on SDG 14 in preparation for HLPF 2022, on 10–11 May 2022 organised by UN DESA. The objective of this meeting was to take stock of progress towards achieving SDG 14, and to assess: what has changed since the SDG was last reviewed in 2017, including in relation to the COVID-19 pandemic; progress and next steps regarding SDG 14 targets that have now expired; and the role of ocean science and technology in achieving this SDG. The meeting also considered interlinkages with other SDGs and opportunities to leverage synergies and minimize trade-offs; share knowledge about success stories, good practices and challenges; identify particular areas of concern; and suggest ways forward in terms of policies, partnerships and coordinated actions at all levels.

### **Biodiversity in Areas beyond National Jurisdiction (BBNJ)**

153. IOC actively contributes 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 OceanInfoHub project. The fourth Intergovernmental Conference (IGC-4) took place in New York on 7–18 March 2022. The conference papers are available online at <https://www.un.org/bbnj/igc-4th-conference-room-papers-crps>. The 4th IGC did not conclude its work and a 5th IGC will be conducted in New York on 15–26 August 2022. There is currently no consensus yet on the management and modalities of the Clearing-House, however there is some convergence that the Clearing-house be managed by the BBNJ Secretariat, potentially with support from other bodies (including IOC), and that it should have a coordinating function, linking with other platforms and databases. The specific modalities for the operation will likely be determined by the Conference of the Parties, once established.

### **Convention of Biological Diversity**

154. The Convention on Biological Diversity is currently preparing the Post-2020 Global Biodiversity Framework (GBF). 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 fifteenth 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 fourth 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.

### **Integrated Coastal Area Management, including Marine Spatial Planning**

155. 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-UNESCO 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 organised 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 ten technical reports, six policy briefs and the new “[MSPglobal International Guide on Marine/Maritime Spatial Planning](#)”, published first in English but with following versions finalised in French, Spanish and Arabic. The guide was collaboratively developed with the support of [MSPglobal experts](#) from Africa, the Americas, Asia and Europe. The next desired step by IOC Secretariat is the development of a multilingual online training on OceanTeacher Global Academy based on the MSPglobal Guide, although budget for this task was not yet identified.

156. 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 MSP 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 addressing the following themes: I. inter-institutional and cross-border cooperation; II. blue economy; III. ecosystem approach; IV. research, development, innovation and training; and V. participation and communication. The WestMED Initiative Steering Committee decided to endorse the Western Mediterranean Roadmap at their meeting on 30 June 2021.

157. Another key MSPglobal legacy is the IOC-UNESCO knowledge platform on MSP [www.mspglobal2030.org](http://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 with the information shared by Member States when answering the [IOC Circular Letter, 2794](#). IOC Secretariat is currently developing some new methods to improve the regular assessment on the status of MSP globally. Together with two MSPglobal experts, an MSP typology criteria were drafted in early 2022 and presented in the “*Pilot StOR*”. Such typology will help IOC-UNESCO to assess whether there are commonalities, differences and/or trends in the adoption of MSP worldwide.

158. Since 2019, the Government of Sweden has provided additional support to the IOC Secretariat to assist the MSProadmap through the organization of meetings, workshops and trainings in countries and regions not covered by the MSPglobal pilots (in Africa, the Caribbean, East Asia and Latin America). During the second semester of 2021, with the support of national authorities as well as regional and international organizations, IOC-UNESCO jointly organised 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, Morocco and Kenya, 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.

159. IOC-UNESCO and the European Commission's Directorate-General for Maritime Affairs and Fisheries (DG MARE) are working to update their joint MSP Roadmap, which will be announced during the UN Ocean Conference, in Lisbon, in June 2022. A new 2-year project is under development and will start in early 2023 and funded through the [European Maritime, Fisheries and Aquaculture Fund Work programme for 2022 and 2023](#). It will support the implementation of two new pilot projects as well as the re-establishment of the [International MSPforum](#). The institutions are also discussing the organization of the 3<sup>rd</sup> International Conference on MSP for the second part of 2022.

160. The Government of the Netherlands committed to donate 12 additional MSP challenge board games (MSPglobal Edition in Arabic, Chinese, English, French, Portuguese, Russian and Spanish) to IOC-UNESCO regional and national partners in support of the updated MSP Roadmap and its new project under development. The game material was co-developed by IOC-UNESCO and partners, and is a relevant training material to organise practical sessions during capacity building activities.

161. 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-organised 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 MSPglobal Initiative.

162. 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.

## **Sargasso Sea**

163. IOC, working in close collaboration with UNDP and the Sargasso Sea Commission, finalised 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 overall objective of the Project is the facilitation of a collaborative, cross-sectoral ecosystem-based sustainable stewardship mechanism for the Sargasso Sea through improvement in the knowledge base and strengthened frameworks for collaborative management and governance. A full size project was submitted to the GEF in November 2021.

## **IOC Sub-Commission for the Western Pacific (WESTPAC)**

WESTPAC continues to take a lead in the region in promoting and engaging individuals, institutions and countries into the UN Ocean Decade, as demonstrated by the organization of a series of the Decade national engagement workshops/campaigns in the region in 2021 and [the 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, the conference attracted nearly three thousand participants coming from various ocean communities – research, government, business and private sectors, international organizations, NGOs and civil society, youth, and foundations. They came together to reflect on and honor the essential but usually unrecognized role of ocean, and more importantly, to put their heads together to co-design transformative ocean science solutions to ocean health and its sustainable development in the Western Pacific and its adjacent areas.

[The two-day event](#) featured [high-level commitments](#) from national governments and UN agencies in the region, an [Ocean Stakeholders Roundtable Dialogue](#) among various ocean communities, and

seventeen UN Decade Action Incubators—a region specific enabling mechanism for fostering partnerships and nurturing new ideas into concrete Decade Actions. Over 1,500 participants joined these Incubators and a launch event for the UN Decade endorsed COASTAL-SOS project, which covers a variety of ocean priority issues in the region, including the most important marine biodiversity and ocean ecosystem health such as coral reefs and conservation of marine mammals and sea turtles; multiple stressors such as climate change, marine heatwaves, ocean plastic pollution and harmful algal blooms; coastal inundation and erosion; the most interactive areas between the ocean and human activities such as the Asian Marginal Seas and the largest ocean circulation system in the Pacific—Kuroshio; and the new development and application of tools and ocean technology such as remote sensing, ocean forecasting and service system, and marine spatial planning.

WESTPAC has been mobilizing actions from various stakeholders, and developing potential proposals for Decade Actions. Building on the tangible results of the Decade Action Incubators, the Sub-Commission has developed and submitted, in January 2022, four proposals for registration as the Decade Actions, namely, “Explore the strongest ocean current in the Western Pacific: the 2nd Cooperative Study of Kuroshio and Adjacent Regions – from its sciences to human well beings”, “Accelerate Marine Spatial Planning in the Western Pacific”; “Stem the tide of Asia’s riverine plastic emission into the ocean”, and “Accelerating capacity development transformations in the Western Pacific - Regional Network of Training and Research Centers (RTRCs) on Marine Science”.

As is the case for WESTPAC, the prolonged pandemic also presents an opportunity to demonstrate its value in taking adaptive approach to programme implementation. Considering the varying COVID-19 development and preventive measures in different countries, WESTPAC intensifies its effort in developing and implementing country-specific activities to serve the needs of IOC Member States in the region for ocean sustainability.

WESTPAC continues to support IOC Member States in the region preparing for and responding to ocean acidification. To further enhance capacity of Member States for ocean acidification monitoring and analysis, and eventually achieve the SDG 14.3, WESTPAC conducts, in October 2021–June 2022, an intercalibration exercise on pH and Total Alkalinity Measurement, with the participation of 19 laboratories from 9 countries, most of which are from developing countries. Tailored national ocean acidification technical training and engagement workshops have been developed and conducted in Aug 2021–June 2022, in response to the demands of several countries in the region.

To support its Member States in conserving marine biodiversity and important habitats, WESTPAC has been co-designing with local and national ocean authorities in Thailand and Viet Nam, promoting application of remote sensing technologies to coastal habitat mapping. During June 2021–April 2022, collective consultations were made with relevant stakeholders to better understand their management requirements and develop practical science actions. To further advance remote sensing technologies and its applications, a series of webinars are under development, to be conducted in June–August 2022.

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

164. 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.

165. 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.

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

166. 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 7 Working Groups to promote multi-disciplinary, inclusive co-design and implementation partnerships to achieve each of the 6 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.

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

- WG on safe ocean: Tropical Americas Safe Ocean Co-Design Workshop “Breaking down the Silos for More Effective Early Hazard Warning Services” – 8 July 2021
- WG on transparent and accessible ocean: A transparent Ocean with open information and technologies access – 29 July 2021.
- WG on Capacity Development: Deep sea Capacity Development needs in the WTA and the ETP for the Ocean we want – 19 August 2021.
- WG on Clean Ocean: The Year 2031, A Clean Ocean - Steps to Success 31 August 2021.
- WG on 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
- WG on predicted ocean: Changing the vibe to predict smooth sailing in the Western Tropical Atlantic: A Theory of Change approach – 23 September 2021
- WG on 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

168. 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.

169. The Regional Kick-off Conference aimed to catalyse partnerships among various ocean stakeholder communities in the region and catalyse 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.

170. 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 recognised the cross-cutting nature of capacity development and its importance to achieve transformative solutions.

171. The IOCARIBE Medium Term Strategy Science Plan is being updated. The updated Plan is taking into consideration existing Environmental Agreements in the region, the recommendations that emerged from the UN Ocean Decade TAC Webinar series, the Kick-off Conference, and proposed Regional Ocean Decade Actions. The unprecedented circumstances due to COVID-19 pandemic in 2020 and 2021 led to the search of new opportunities to strengthen member States science capacities. The UN Ocean Decade is a catalyzer to reach new communities and stakeholders. Through the work accomplished by the TAC Working Groups over thousand experts and stakeholders had the opportunity to contribute to the co-design of TAC Regional Ocean Decade Actions and will continue working for the co-delivery of those Actions during the forthcoming biennia.



## **IOC Regional Committee for the Central Indian Ocean (IOCINDIO)**

172. Following Decision A-31/3.5.6. of the IOC Assembly, the Executive Secretary issued the Circular Letter, [2872](#) inviting Member States to nominate their representatives to the open-ended intersessional Working Group on the Status of the IOC Regional Committee for the Central Indian Ocean (IOCINDIO). Together with the Circular Letter, draft Terms of Reference for the Working Group were also submitted. The invitation stressed the importance of gender balance in the nominations of Member States Representatives. While IOC Member States bordering the Indian Ocean are directly concerned, all IOC Member were invited to participate in and contribute to the Working Group. Thus, with the view to ensure the widest participation possible, the Circular Letter was sent not only to the Official National Coordinating Bodies for liaison with the IOC, but also to Permanent Delegates, Observer Missions to UNESCO of IOC Member States, the Chair of IOC, Vice-Chairs, Chairs of IOCAFRICA, IOCINDIO, and WESTPAC and the National Commissions for UNESCO of IOC Member States. Both the IOC Secretariat and the IOCINDIO Chairs followed up with reminders to Member States. As a result, 23 Member States responded and nominated Representatives. The IOCAFRICA and WESTPAC Chairs were also invited and effectively attended the Working Group meetings as well as the past officers of the IOCINDIO. The Regional Coordination Operations Centre (RCOC) based in Seychelles also nominated a Representative as an observer.

173. The first meeting, which was held 28 February 2022 online, adopted the Terms of Reference of the Working Group and a tentative timeline of the work of the Working Group. The IOC Chair and the IOCINDIO Chair accepted to act as the Co-Chairs and led the meetings of the Working Group. 35 participants in the meeting represented 15 IOC Member States, IOCAFRICA, WESTPAC and RCOC. The IOCINDIO Chair together with the IOC Vice Chair for Group IV (Asia and Pacific) presented ongoing programmes and activities in the region, enabling participants to understand the advances and interests of Member States from the region in ocean sciences.

174. The second meeting of the Working Group was held on 31 March 2022. This meeting adopted the Report of the first meeting. The IOC Chair made a presentation which was focused on the Report of the first Session of IOCINDIO held in Islamabad, Pakistan, 3–7 July in 1988. The aim was to recall the historical background with reference to the geographical scope adopted at that first IOCINDIO Session in Islamabad and which was further adopted with Terms of Reference by the Fifteenth Session of the Assembly of IOC in 1989.

175. The Executive Secretary also prepared a presentation referred as “*Steps towards IOCINDIO: Elements for establishing IOCINDIO as an IOC Sub-Commission*” including the geographic scope of the future Sub-Commission for IOCINDIO, to cover the entire Indian Ocean as per the limits established by the International Hydrographic Organization (IHO) in its publication S-23, Draft 4<sup>th</sup> Edition of 2002 on “Limits of Oceans and Seas”.

176. Due to time constraints, discussions at the 2<sup>nd</sup> meeting were focussed on the geographical scope without reaching conclusions. Several Member States from Africa expressed concerns on the geographic scope of the future Sub-Commission for IOCINDIO. Dominant views were that the future Sub-Commission for IOCINDIO should not cover the entire Indian Ocean but should rather be restricted to the current composition of IOCINDIO because the extended limit of IOCINDIO may jeopardise further development and cohesion of IOCAFRICA. Concerns were also expressed about limits of IOCINDIO as per the IHO publication S-23. The IOCAFRICA Chair made a statement indicating that while WESTPAC is in support for the establishment of a Sub-Commission for IOCINDIO, it is not in favour of inviting African Member States to become members of the potential Sub-Commission of IOCINDIO. Full information on the work of the Working Group is produced in the IOCINDIO Progress Report.

177. IOCINDIO reinforced inter-Regional Cooperation with the IOC Sub-Commissions, notably IOCAFRICA through attendance of conferences and workshops between IOCINDIO and IOCAFRICA in 2021 and 2022. The IOCINDIO Chair attended the Africa Week Conference on Ocean, Peace and Sustainable Development at UNESCO online in June 2021. It is also expected

that IOCINDIO will participate and contribute to the IOCAFRICA kick off Conference of the UN Decade of Ocean Sciences for Sustainable Development in Egypt, 10–12 May 2022.

178. The IOCINDIO Chair informed Member States at the first meeting of the IOCINDIO Open ended Intersessional Working Group that Bangladesh is willing to organize the kick-off meeting of the UN Decade of Ocean Science for Sustainable Development for the Indian Ocean, likely in the last quarter of 2022.

## **CAPACITY DEVELOPMENT**

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179. The past year saw a considerable reinforcement of the IOC's Capacity Development (CD) activities. With the dedicated pool of resources bolstered by new funding from NORAD, the Secretariat could better focus its efforts, including a better coordination of CD tasks of the Decade Coordination Unit. In 2021, these activities focused on: (i) Priority Africa (ocean acidification and harmful algae, development of a database on training opportunities); (ii) tsunami ready communities in the Caribbean region; (iii) improved access to and sharing of ocean data and information in the Indian Ocean and Pacific region; (iv) development of video tutorials related to the Ocean Biodiversity Information System (OBIS); (v) development of the Index for Coastal Eutrophication Potential (ICEP) as the Indicator for Sustainable Development Goal 14.1.1 on Eutrophication (in cooperation with UNEP); and (vi) support to strengthen the coordination of IOC capacity development efforts.

180. Three more nodes of the Ocean InfoHub will be supported, in partnership with National Oceanographic Data Centres in Africa and Asia. A pilot portal will also be established for Areas Beyond National Jurisdiction.

181. 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).

### **IOC Capacity Development Strategy**

182. The IOC Assembly adopted the [IOC Capacity Development \(CD\) Strategy, 2014–2021](#) through [Resolution XXVIII-2](#) and agreed that the IOC global and regional programmes should develop programmatic and regionally relevant capacity development workplans based on that strategy and related needs assessments conducted in a consistent manner, building on ongoing activities and making use of existing training and education facilities. At the first session of the Group of Experts (2018) it was decided to establish two task teams: one on CD requirements of Member States (with special attention to SIDS), and one on the implementation of the Transfer of Marine Technology/Clearing House Mechanism “portal”.

183. As a follow-up, a project proposal (August 2019) was successfully submitted to the Government of Flanders/Kingdom of Belgium (FUST) for funding. It is entitled “The IOC Ocean InfoHub: development of an IOC CHM/TMT powered by a proof-of-concept ODIS architecture” which will, *inter alia*, “establish and anchor a network of regional and thematic nodes that will contribute to the transfer of marine technology (TMT) by enhancing shared scientific and technical capacities to render a wide range of data and information products and services”. Reference is made to Function B for more information on this project. The project implementation started on 1 April 2020. It is noted that due to COVID-19 the face-to-face global and regional start-up meetings are being replaced by online meetings.

184. Through IOC Circular Letter, [2793](#) (27 January 2020), Member States were invited to designate national IOC focal points for capacity development. This resulted in 23 additional focal points (March 2020) bringing the total to 31.

185. The full results of the 2nd Capacity Development Needs Assessment Survey, which was conducted from September 2020 to February 2021, were reported at the third meeting of the Group of Experts (GE-CD) held between 1 and 2 December 2021. Responses were received from 25 IOC

focal points and 10 CD focal points. Full results were made available online at the survey website <https://surveys.ioc-cd.org>.

186. The IOC Assembly (IOC Decision A-31/3.5.3) extended the current IOC CD Strategy to July 2023 and revised the terms of reference of the GE-CD to allow a continuation of the work on the revision of the IOC Capacity Development Strategy. At the third meeting of the Group of Experts, 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.

### **IODE's OceanTeacher Global Academy**

187. 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, acts as a Specialized Training Centre for HAB. During the reporting period, OTGA organized 24 online training courses involving over 1,100 participants. Courses focused 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. Three different languages (English, Spanish and Portuguese) were used during the different training courses and workshops depending on venue, and all training resources were hosted by the OceanTeacher e-Learning Platform ([www.oceanteacher.org](http://www.oceanteacher.org)). More than 10,000 users have registered on the e-Learning Platform.

188. 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. Since October 2021 OTGA is an endorsed activity by the Ocean Decade.

189. Additionally, during the reporting period, OceanTeacher supported the organization of another two training courses (Marine Data Management, Governance and the MEDIN toolset, AWI Culturing and microscopy techniques for the analysis of phytoplankton diversity).

190. 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 will be renewed in 2022 against the new ISO standard (ISO 29993:2017 Learning services outside formal education—Service requirements).

191. OTGA continues to adapt to the current conditions. Through the use of the OceanTeacher e-Learning Platform, the project has successfully delivered 24 training courses for the period June 2021 to December 2021, all of which have been fully online. The second meeting of the Steering Group for OTGA was held online in November 2021 to approve the workplan for 2022, including proposed courses and sharing of work package tasks.

## Ocean Literacy

192. 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.

193. The Ocean Literacy With All (OLWA) Programme is promoted by a wide network of marine education and conservation organizations. As suggested by the name, the focus of the programme is to advance participatory Ocean Literacy approaches through research and activities across the globe that are developed by and for diverse stakeholders. Coordinated by IOC and implemented by a global network of Ocean Literacy practitioners, in its early years OLWA will focus on charting the status and needs of Ocean Literacy research to identify common research priorities; and grow inclusive networks worldwide.

194. In July 2021, a new partnership with the watchmaking company Panerai was launched to advance ocean literacy globally.

195. On the occasion of the UNFCCC pre-COP-26, the interactive exhibition called “Ocean&Climate Village” was launched at the Triennale Museum of Milan. Ocean and Climate Village is the first traveling, interactive and educational exhibition dedicated to ocean and climate. The second edition of the exhibit was held in Venice in partnership with the Municipality and with the Italian Council of Research and the University Ca’ Foscari. In total 3,000 people visited the exhibit. An online version is now available: <https://ocv.decenniodelmare.it/>.

196. On the occasion of UNFCCC COP-26 a series of webinars for journalists were developed with the support of the Government of Sweden. The webinars were delivered in English, but French and Spanish interpretation was provided to a total of 209 participants from 25 countries.

197. In December 2021 a new 3-year partnership was signed with the European Commission Directorate-General for Maritime Affairs to expand the EU4Ocean coalition, including the further development of the Blue Schools Network and the Youth4Ocean Forum.

198. In January 2022, on the occasion of the International Day of Education, the “A New Blue Curriculum: a toolkit for policy-makers” was prepared, with the support of AXA XL and in collaboration with the UNESCO International Bureau of Education. The toolkit was then launched on the occasion of the One Ocean Summit held in Brest (9–11 February 2022). Initial discussions are being held with IOCAFRICA and the Indian Ocean Commission to present the toolkit to Member States of the region.

199. The second edition of the Sea Beyond project, developed with the support of the Prada Group, was launched in September 2021 and concluded in May 2022. Students from different countries, including Brazil, Peru, South Africa, UK, Italy, and China, took part in a series of webinars on the Ocean Decade challenges, and then developed original projects on how to tackle those challenges.

200. 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 called “Meet an Expert” is developed to allow teachers and young ocean professionals to get in touch with experts from all around the world, and be able to organize lectures, as well as short mentoring sessions.

201. By building sustainable blue finance practices into their decision-making processes, and engaging with their clients on the topic, the financial sector has a unique opportunity to steer ocean industries towards sustainability. In order to inform these types of initiatives with scientifically sound information and ocean literacy, training for the finance sector is being developed, building on the work done in the context of the Sustainable Blue Economy Finance Initiative and coordinated by the



UN Environment Programme Finance Initiative, as well as the work done on Sustainable Ocean Economy by OECD. In addition to the short videos on ocean literacy, two live webinars on ocean data & risk management and Blue Finance (with a focus on insurance and blue bonds) took place in March 2022 with 450 participants. On 6 April 2022 a Peer Learning Session on SDG 14 was co-organized with UNEP on Ocean Literacy and Blue Economy in the context of the UNECE Forum on Sustainable Development).

202. In accordance to IOC Assembly Decision A-31/3.5.4, IOC Circular Letter, [2887](#) was sent to Member States to seek proposals for nominations of members of the Ocean Literacy Group of Experts.

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

203. 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.

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

204. 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).

205. 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.marinetraing.org/>. IOCAFRICA is working with partners, including IUCN, CORDIO, UNEP (Abidjan and Nairobi Convention secretariats), and WIOMSA on developing interoperability with existing information sources.

206. 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.

207. 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.

208. 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.

209. 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.

210. 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)**

211. The IOC capacity development strategy has long been a major element of IOCARIBE's programmes and activities. IOCARIBE has a series of delivery mechanisms used for achieving its capacity development, among them IOCARIBE Strategic Sciences Plan (2017–2026), a draft capacity development strategy; a number of programmes and projects such as IOCARIBE-GOOS, CARIBE-EWS, ODINCARSA, CLME, OTGA, 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.

212. [The IOCARIBE Medium Term Strategic Science Plan \(2017–2026\)](#) objectives are to: (i) support strategic planning of IOCARIBE Member States in relation to the development of marine sciences, oceanic observations and associated services; (ii) facilitate a coherent management of regional programmes related to the marine-coastal environment and its resources; and (iii) strengthen scientific basis supporting regional programmes. IOCARIBE SSP Lines of Action are: (i) oceans and climate; (ii) ocean science, technology and sustainable use of coastal and ocean resources with special emphasis on large marine ecosystems and integrated coastal area management; (iii) and extreme natural hazards.

213. The IOCARIBE HAB ANCA Group designed and developed a virtual 3D reality training at a lab that is available in Spanish (English version to follow) as an App “FAN - Florecimientos Algales Nocivos,” available for iPhone and Smartphones. Also, members of the IOCARIBE HAB ANCA Group published a book in Spanish “Ciguatera – A Potential Risk for Human Health. Frequently Asked Questions” and working with MS Health Authorities and in a campaign to raise awareness of the ciguatera impact on human health, a series of posters in Spanish and English were published and shipped to MS for local distribution. A 3-day Session Training Course in Spanish and English on the Use of and Data Uploading to the HAIS-HAEDAT of IOC HAB Programme was held online on December 6, 2021 and 92 participants attended from IOCARIBE Member States, including from 12 SIDS. The Sub-Commission organized in close cooperation with the IOCARIBE HAB-ANCA Group of Experts and the National University of Colombia the first virtual HAB training course online using virtual reality on 25 February 2022.

214. The OceanTeacher Global Academy Center 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. 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.

215. The IODE Ocean InfoHub LAC component is being developed and in the last two quarters of 2021 has significantly advanced with its development building up on the CHM-TMT designed by INVEMAR and in the Caribbean Marine Atlas experience.

216. 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.

217. The Caribbean Marine Atlas (CMA) continues to develop as an online digital platform that stores and provides access to geospatial information (and related documents) on the "Marine Environment and Human Societies in the Wider Caribbean Region". Its two primary objectives are: (i) to support regional-level Integrated Ocean Governance; and (ii) to support Integrated Coastal Zone Management (ICZM) in IOCARIBE Member States.

218. The IOCARIBE-GOOS Steering Group has been re-organized and it is taking the lead to develop a framework for an observing system and for facilitating joint ocean observing missions among IOCARIBE Member States to measure variables related to severe weather forecasting and climate trends and develop proposals for regional implementation through the relevant TAC Ocean Decade Regional Working Groups (TAC WGs); and support and participate in the Coastal Inundation Forecasting Initiative.

219. 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.

220. IOCARIBE, and partners NESDIS-NOAA, GEO Blue Planet, RAC-REMPEITC Caribe, and Trinidad & Tobago Institute of Marine Affairs (IMA) and Ministry of Energy (ME) successfully completed in November 2021 the first phase of the Regional Pilot Programme for Satellite Oil Spill monitoring for the IOCARIBE Region with the training and transfer of know-how to IMA and T&T ME, now operational for a part of the Eastern Caribbean Region monitoring. The next country to participate in this Regional Pilot Programme will be Colombia with INVEMAR that will start early 2022.

221. IOCARIBE continues participating and chairing the "Interim Coordination Mechanism for the Sustainable Management, Use and Protection of Shared Living Marine Resources in the Caribbean and North Brazil Shelf Large Marine Ecosystems", created in 2017 through the CLME+ Project as a predecessor for the "Coordination Mechanism."

222. The CLME+ project successfully ended in October 2021 creating a Coordination Mechanism for the Management of the CLME+ Transboundary Marine Resources. A new Project Proposal (the PROCARIBE+ Project) was submitted and a GEF PPG was approved in September 2021. The objective of the GEF PPG Procaribe+ project is to develop the project concept into a full project: "Protecting and Restoring the Ocean's natural Capital, building Resilience and supporting region-

wide Investments for sustainable Blue socio-Economic development (PROCARIBE+)”. The new PPG aims to build on the results from the CLME (2009–2014) and CLME+ (2015–2021) Projects, and to give continuity to the implementation of a 10-year regional SAP. IOC of UNESCO / IOCARIBE participate in this new proposal. GEF Grant 17.2 million with ca. 59% for the MSP and Blue Economy component. IOCARIBE should closely follow up this initiative and consolidate its participation by establishing a UN2UN contractual arrangement and lead the MSP and Blue Economy component.

223. Also, in the GEF-supported Project “Strengthening the Stewardship of an Economically and Biologically Significant Area-the Sargasso Sea” IOC is the Executive Agency, and IOCARIBE is an Implementation Partner.

### **IOC Sub-Commission for the Western Pacific (WESTPAC)**

224. The Sub-Commission endeavours to accelerate transformations in capacity development through the integration of training and research, enhancement of endogenous capabilities and ownership of Member States, and the established mutual assistance and cooperation in the region. As a result of the prolonged pandemic, WESTPAC continued its adapted capacity development modality with a focus on tailored trainings at local/national levels.

225. The Sub-Commission continued to fulfil its voluntary commitment to the UN Ocean Conference, the IOC Capacity Development Strategy (2015–2023), and the UN Ocean Decade - “Develop research capacity and transfer of marine technology through the IOC-UNESCO Regional Network of Training and Research Centers (RTRCs) on Marine Science” (#OceanAction15266). Over the last intersessional period June 2021–April 2022, 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, online), in partnership with the Coral Reel Rehabilitation and Management Program – Coral Triangle Initiative (COREMAP-CTI), UNDP, and the Archipelagic & Island States (AIS) Forum.

226. The Regional Training and Research Center on Ocean Dynamics and Climate (RTRC-ODC) conducted its [10th International training on the regional application of coupled climate models](#), 5–16 July 2021, online. Meanwhile, other three RTRCs, respectively on Reef Management and Restoration, Marine Toxin and Food Security, and Plastic Marine Debris and Microplastics, take the pandemic as an opportunity to co-design with other stakeholders and partners their training modules and plans. They shall receive young scientists from within and outside region as soon as the pandemic ends.

227. During 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.

228. 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 site.

229. 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.

### **IOC Regional Committee for the Central Indian Ocean (IOCINDIO)**

230. The IOC Regional Committee for the Central Indian Ocean organized “The Central Indian Ocean (IOCINDIO) workshop on Methodologies and Approaches of coastal vulnerability and Advances in Operational oceanography science and technology in the Indian Ocean”, on 13–17 December 2021. The workshop was hosted and supported by the Indian National Centre for Ocean Information Services (INCOIS) and the International Training Centre for Operational Oceanography (ITCOOcean). About 40 delegates from various IOCINDIO Member States including Bangladesh, Comoros, India, Iran, Kuwait, Maldives, Myanmar, Pakistan, Qatar participated together with South Asia Seas Programme and South Asian Cooperative Environment Programme (SACEP). Experts from the region and beyond reviewed the status and progress on coastal vulnerability related to specific impacts erosion, flooding, sea level rise, preparedness for tsunami and storm surge hazards and the impact of climate change on sea level and shoreline changes. The workshop addressed various dimensions of coastal vulnerability such as physical, socio-economic, human and environmental; and assisted Member States to develop their national guidelines for mitigation purposes.

231. In terms of international cooperation, the IOCINDIO joined hands with the IEEE Oceanic Engineering Society and other partners and co-sponsors, notably the Indian Institute of Technology Madras/Chennai, the Marine Technology Society for the organization of the OCEANS’2022 CHENNAI, 21–24 February 2022. This activity was earlier approved by IOCINDIO at its Eighth session and further endorsed as a UN Decade activity. IEEE OCEANS is a bi-annual event for global marine researchers, technologists, engineers, students, and policy-makers. The researchers and industrial leaders gathered for four days to highlight, discuss, and exchange topics and current trends in marine technologies. The Conference helped in creating awareness of advanced research areas, practices, and policies for the marine field. More than 2,000 participants attended the Conference including several IOCINDIO stakeholders and partners. IOCINDIO organized a dedicated exhibition on IOC Programmes and the UN Ocean Decade. Full details of the Conference available at the website: <https://chennai22.oceansconference.org>. One OTGA Regional Training Centre has been established in India (INCOIS) to provide training courses for 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).

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

232. The two Category-2 Centres 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 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.

233. The UNESCO Category 2 Regional Education and Research Centre on Oceanography for West Asia (RCOWA) organised its Fifth Session of the Governing Board on the 14<sup>th</sup> February 2022 online and reported on the extensive activities including the following: (i) Regional Training Course on Data Analysis and Ocean Observing Instruments (online) 29–31 August 2021; (ii) Regional Training Course on Coastal Desalination Intake and Brine Disposal System Planning, Design and Implementation (online) 27–29 October 2021.

234. The International Training Centre for Operational Oceanography (ITCOOcean) organized 28 International training courses for 924 national and foreign experts. Both C2C duly and timely reported to UNESCO through the dedicated online reporting platform.

235. The activities of the first UNESCO cross-sectorial category 2 Centre (Iceland), namely the International Centre for Capacity Development: Sustainable Use of Natural Resources and Societal Change ([GRO](#)), providing a comprehensive training programme in 'Science for sustainable fisheries', have been sustained, despite COVID-19 and synergies with other IOC activities continue to be explored.