



## OCEANS AND THE LAW OF THE SEA: REPORT OF THE SECRETARY-GENERAL (2020)

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### CONTRIBUTION BY THE WORLD METEOROLOGICAL ORGANIZATION (WMO) TO THE IMPLEMENTATION OF GA RESOLUTION 74/19 'OCEANS AND LAW OF THE SEA'

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Pursuant to United Nations General Assembly [Resolution 74/19](#) of 10 December 2019, entitled “Oceans and the law of the sea”, the information below represents the contribution of the World Meteorological Organization (WMO) to the report of the UN Secretary-General, between September 2019 and June 2020.

#### 1. INTRODUCTION

The World Meteorological Organization (WMO) is the authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the land and ocean, the weather and climate it produces and the resulting distribution of water resources. The ocean provides essential natural resources to humankind and regulate the global climate. WMO contributes to ocean-related issues through the observation and monitoring of the ocean and climate; research on the climate and connected Earth systems; development and delivery of services for disaster risk reduction (DRR), including marine hazards; capacity development and training; and the provision of science-based information and tools for policymakers and the general public at regional and global levels.

#### PART A: ACTIVITIES, INCLUDING ADOPTION OF MEASURES, DEVELOPMENT OF PROGRAMMES ETC WHICH HAVE BEEN UNDERTAKEN OR ARE ONGOING IN THE IMPLEMENTATION OF SPECIFIC PROVISION OF GENERAL ASSEMBLY RESOLUTION 74/19

Of high global significance, since September 2019, WMO released its *15th Greenhouse Gas Bulletin 2018* in November 2019. Results showed that the trend remains: the levels of greenhouse gases continue increasing. The latest analysis showed that globally averaged concentrations for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) reached new highs in 2018, with CO<sub>2</sub> at 407.8 ± 0.1 parts per million (ppm), CH<sub>4</sub> at 1 869 ± 2 parts per billion (ppb) and N<sub>2</sub>O at 331.1 ± 0.1 ppb, which corresponds to respectively 147%, 259% and 123% of pre-industrial (before 1750) levels. The increase in CO<sub>2</sub> from 2017 to 2018 was very close to that observed from 2016 to 2017 and practically equal to the average over the last decade.

More than 90% of the excess energy accumulating in the climate system as a result of increased concentrations of greenhouse gases goes into the ocean. The *WMO Annual Global Statement on Climate* for 2019, released in March 2020, and indicates that:

- Oceans are warming

- Ocean acidification is increasing: Sea water is 26% more acidic than at the start of the industrial era
- Ocean acidification and marine heatwaves harmed marine life, ecosystems and coral reefs
- Sea level rise is accelerating due to the melting of ice sheets in Greenland and Antarctica
- Ocean heat content and the global mean sea level reached the highest values on record

Together with ocean acidification and an accompanying deoxygenation, ocean warming is leading to dramatic changes in marine ecosystems and the wellbeing of people that depend on them.

In September 2019, the WMO released its final report on the *Global Climate 2015-2019*. The continuing and accelerated trends have predominated among other key climate indicators, including an acceleration of rising sea levels, a continued decline in the Arctic sea-ice extent, an abrupt decrease in Antarctic sea ice. More heat is being trapped in the ocean. Higher sea-surface temperatures endangered marine life and ecosystems. Among all weather-related hazards, tropical cyclones were associated with the largest economic losses, floods, landslides, and loss and damage. Seawater is becoming more acidic. Observations from open ocean sources over the last 20 to 30 years have shown a clear trend of decreasing average pH, caused by increased concentrations of CO<sub>2</sub> in seawater.

Also in September 2019, the WMO and UN Environment's Intergovernmental Panel on Climate Change (IPCC) released a *Special Report on the Ocean and Cryosphere (SROCC)*. It showed that since 1993, the rate of ocean warming has more than doubled, as has the frequency of marine heatwaves, which are becoming more intense. In addition, sea level rise, sea ice loss, and more frequent storm surge and severe weather events are other climate related hazards impacting on coastal communities.

For the first quarter of 2020, WMO reports that the ocean heat was second warmest on record.

## II Capacity Building

WMO is bolstering the capability of meteorological services to provide better marine early warnings and forecasts, and to understand their customer needs for impact-based forecasting. With significant gaps in every region for marine service delivery, WMO has designed a unique course to help meteorological services self-assess their marine capabilities. The Spanish speaking central and south American countries have been the first to attend the new course, having completed their 3-month online assessment in June. The course will be expanded globally over the next 4 years.

WMO further continues to develop the capacity of meteorological services in the area of impact-based forecasting for coastal early warnings. Since September 2019 there has been focus on the Pacific Island SIDS. In November 2019, Fiji became the first Pacific Island to have an operational coastal inundation forecasting system which allows for the early warning of a combination of storm surge, swell, waves and river flooding. Training continues to ensure the meteorological forecasters have the capacity to use the new system.

Training courses on tropical cyclone forecasting and warning were organized in the WMO Regional Centres in Miami, Fiji and La Reunion with the participation of all the Members of the respective Tropical Cyclone Committee, including SIDS of the Caribbean, Pacific, and South-West Indian Ocean.

Early warning forecasts require data from ocean observations. The WMO-IOC Data Buoy Cooperation Panel (DBCP) have progressed capacity development workshops in the Pacific Islands, with the aim to identify gaps and enhance the awareness of available data products and predictive capability of observing systems. The workshop achieved improved assessment of capacities and requirements of Pacific Islands Nations in ocean observations and data applications for environmental, economic and social benefits, including the forecasts of tropical cyclones track and intensity, hazardous waves, and other ocean related natural disasters. DBCP integrates the vandalism prevention information in the capacity building workshops and to create a repository of education material available nationally for broader use. The workshop trained more than 40 participants from 13 Pacific Islands States and explored indigenous knowledge in the sustainable management of the ocean and coasts. The workshop also attracted new instrumentation support from leading partners and witnessed contributions of WMO Climate Risk and Early Warning Systems (CREWS) and WMO coastal inundation forecasting projects to the Pacific Islanders in ocean observations.

Related to both the observation needs, and coastal early warnings, WMO has been delivering in the Pacific Islands, communication material to improve public awareness of the impacts of coastal inundation and enhance the understanding of what marine meteorological warnings and forecasts mean. WMO has produced two public awareness videos in 2019 and 2020 to encourage public understanding of the dangers of coastal flooding, and of vandalism to ocean monitoring equipment. The animated videos are made freely available across the Pacific Islands, and are being translated, where possible, into local languages to enable wider use. They will be adapted to other regions in the future.

## **VIII Maritime safety and security and flag State implementation**

WMO continues its collaboration with the International Maritime Organization (IMO) and the International Hydrographic Organization (IHO) for coordinated and standardized metocean<sup>1</sup> information, forecasts and warning services for safety of life and property at sea, improved marine environment and sustainable management of natural resources, with due focus on Polar Regions.

WMO continuously works with its partners relating to international shipping by its WorldWide Metocean Information and Warning Service (WWMIWS) as a contribution to the Global Maritime Distress and Safety System (GMDSS). The WWMIWS ensures daily forecasts covering the 21 METAREAs across the globe. This fulfils the obligation of WMO Members who are contracting parties to the SOLAS Convention.

The First *International Symposium on Extreme Maritime Weather - Towards Safety of Life at Sea and a Sustainable Blue Economy* was held in IMO Headquarters, London, UK, on 23-25 October 2019. Jointly organized by the WMO and the IMO, over 200 participants from over 40 different countries attended, representing both private and public sectors, and including Ministers and Ambassadors. It provided a key platform for WMO to identify best practices and improve services for safety and risk reduction, emergency response, sustainable shipping practices and greater collection and sharing of ship observations.

This Symposium also highlighted the need to tighten connections in the value chain between the collection of metocean data and data assimilation, marine weather forecasting, and the dissemination of marine forecasts and services to users and stakeholders. It also demonstrated the value in looking to the research community to inform operational and policy and decision making, from which the results can in turn inform subsequent research priorities. Participants observed that a formalized collaboration between WMO and IMO regarding extreme maritime weather issues would help attain the needs and goals. Ad hoc thematic entities might be needed to solve specific issues. The full report of the Symposium is available on the WMO library [here](#).

## **IX Marine environment and marine resources**

WMO and the Global Atmosphere Watch (GAW) has been a long-time sponsor of GESAMP's Working Group on The Atmospheric Input of Chemicals to the Ocean (WG 38). WG 38 has published numerous studies related to the impact of atmospheric deposition of anthropogenic nitrogen to the ocean. A preliminary planning meeting was held for a possible new WG 38 workshop in 2020 entitled "The Atmospheric Input of Chemicals to the Ocean – Management and Policy Implications". This workshop would bring together appropriate players to discuss the management and policy implications of current knowledge about atmospheric inputs of nutrients and possibly other substances to the ocean and their interactions and impacts within the marine environment. The proposal was supported by the 46th session of GESAMP and the workshop is in a full planning phase.

An important task for science is to inform decision-makers on the design and evolution of future observational networks. Nowadays monitoring and prediction systems are evolving fast and becoming more

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<sup>1</sup> metocean: Meteorology and (physical) Oceanography

integrated across ocean, atmosphere and land. A relevant example is the Arctic where the air-sea-ice interaction determines a significant part of the variability of the Arctic environment. So, improving Arctic monitoring and prediction systems needs a careful design of joint modelling and observational campaigns. The WMO Polar Prediction Project (PPP) 2013-2022 is a World Weather Research Programme (WWRP) initiative, promoting cooperation across the international scientific community focusing on the data and knowledge gaps for in the Arctic and Antarctic. Development of seamless weather and climate products information and services to support service delivery could be a solution for combating against, and adapting to, changes.

The associated Year of Polar Prediction (YOPP) (2017-2019) wrapped up during 2019. It aims to make recommendations to WMO and national meteorological services on the future configuration of the observing system in polar regions, with particular consideration on the design. The impact of the additional observations will be assessed through a range of techniques. "Forecast Sensitivity to Observations" (FSO) is a technique using diagnostics from a data assimilation scheme to compare the impact of different observation types. Observing System Experiments (OSEs), also referred to as 'data denial experiments' is a more comprehensive approach to assess the impact of observations by running sets of analyses and forecasts with and without particular subsets of operational data. The coordinated analysis of observations and model simulations obtained in the associated YOPP will facilitate the design of a future cost-effective and sustainable Polar Observing and Forecasting System. The outcomes of YOPP and the PPP have been used by the two Arctic Science Ministerials.

The Intergovernmental Panel on Climate Change (IPCC), a body jointly created by WMO and UNEP for assessing the science related to climate change, released its Special Report on the Ocean and Cryosphere in a Changing Climate (SROCC) in September 2019. This landmark report provides fresh perspectives on the observed changes and impacts related to the ocean. The global ocean has indisputably warmed unabated since 1970 and has taken up more than 90% of the excess heat in the climate system. Global mean sea level (GMSL) is rising, with acceleration in recent decades due to increasing rates of ice loss from the Greenland and Antarctic ice sheets, as well as continued glacier mass loss and ocean thermal expansion. Marine heatwaves have doubled in frequency since 1982 and are increasing in intensity. By absorbing more CO<sub>2</sub>, the ocean has undergone increasing surface acidification. Cryosphere and associated hydrological changes have impacted terrestrial and freshwater species and ecosystems in high mountain and polar regions through the appearance of land previously covered by ice, changes in snow cover, and thawing permafrost.

Since 2009, WMO has coordinated and implemented the Coastal Inundation Forecasting Demonstration Project (CIFDP) a multi-hazard warning system that promotes an integrated approach in the enhancement and delivery of early warnings, no matter what the causes for coastal inundations are, in line with the concept of impact-based forecasting and the UN Sendai Framework for Disaster Risk Reduction (DRR). In 2019, the CIFDP was endorsed at the 18<sup>th</sup> World Meteorological Congress as an ongoing activity now known as the Coastal Inundation Forecasting Initiative (CIFI) with integration as a key component to a flooding and severe weather MHEWS. The CIFI, among other programs at WMO, are tailored to assist Members, to protect livelihoods and support the sustainable development of coastal communities' vulnerable hazards. The last of the CIFDP projects was completed in November 2019, for Fiji. Notably, it was successfully used to provide early warnings for coastal communities struck by Tropical Cyclone Harald in April 2020. The [WMO Bulletin Vol.68\(2\)-2019](#) published an article about the successful decade of the coastal inundation work trialling an innovative approach never done before. Implementation demonstrated how integrated coastal inundation forecasting and warnings can be improved and effectively coordinated by the National Meteorological and Hydrological Services (NMHSs).

WMO continued strengthening regional coordination mechanisms through the organization and conduct of sessions of the regional Tropical Cyclone (TC) Committees (TCC). Lessons learnt from the management of the episodes especially related to TC Idai (South West Indian Ocean, March 2019), TC Fani (Bay of Bengal, April 2019) and Hurricane Dorian (North Atlantic, September 2019) were addressed during the sessions of the respective regional TCCs<sup>2</sup>. Members of the TCC of the WMO African Region wrote a statement to be addressed to the African Union Commission. It stressed that the "climate change projections indicate a likely increase in the frequency of tropical cyclones of high intensity which will further exacerbate their effects, in particular coastal inundation and flooding due to sea level rise and increased rainfall. More generally,

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<sup>2</sup> [Reports of the Tropical Cyclones Committee sessions](#)

weather-related disasters in Africa will continue to grow year-on-year.” A set of recommendations covering three topics; improved communication, capacity building; and opportunities and priorities for the national hydro-met services was developed by the WMO Tropical Cyclone Committee for the Southwest Indian Ocean.

WMO continues to contribute to the global development agenda through its programmes and initiatives. Aside from those mentioned above, it also includes the programmes for Marine Meteorology and Oceanography, Public Weather Services, Tropical Cyclone, Small Island Developing States (SIDS), Least Developed Countries (LDC), Disaster Risk Reduction, Education and Training, Capacity Development and Voluntary Cooperation. The Climate Risk and Early Warning Systems Secretariat is hosted by the WMO and contributes to the global development agenda, and of note, funding for the early warning in SIDS has been increased in June 2020. WMO carries out its work within the context of the Sendai Framework for DRR (2015). WMO with multiple stakeholders in the UN system and beyond advocated to substantially increase the availability of and access to multi-hazard early warning systems and disaster risk information and assessments, including for marine hazards, by 2030. WMO works extensively on engaging interested stakeholders, partners and organizations to develop and facilitate the International Network for MHEWS (IN-MHEWS).

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## **XI Marine science**

Sustained oceanographic and marine meteorological observations and their free and unrestricted exchange are critical to address meteorological hazards, strengthen resilience in the face of climate change and variability, and build the scientific knowledge base for sustainable development.

WMO continues strengthening the global observing systems through implementation of the WMO Integrated Global Observing System (WIGOS) and WMO Information System (WIS) and observing networks with partners. Through three key co-sponsorship initiatives, the WMO also contributes to climate and ocean observations, monitoring and research:

- The WMO-International Science Council (ISC)-Intergovernmental Oceanographic Commission (IOC)-UN Environment together co-sponsor the Global Climate Observing System (GCOS) and the Global Ocean Observing System (GOOS).
  - GCOS serves the requirements of Members for comprehensive, continuous, reliable climate data and information, for climate monitoring, research, projections and assessments, to provide climate information and to promote sustainable development.
  - GOOS coordinates observations around the global ocean for three critical themes: climate, operational services, and marine ecosystem health
- The WMO-IOC-UNESCO-ISC World Climate Research Programme (WCRP) facilitates analysis and prediction of Earth system change – including the ocean - for use in a range of practical applications of direct relevance, benefit and value to society. Its priorities include examining the ocean’s contributions to energy, heat, water and carbon budgets; the role of the ocean in transient climate sensitivity; physical and biogeochemical interactions in the coastal ocean; and changes to local sea level under a changing climate.

The JCOMM in situ Observation Programme Support Centre (JCOMMOPS) that supports the implementation of the global ocean observations, formally became a WMO regional office in 2019.

The WMO’s Global Atmosphere Watch (GAW) continues its contribution on the latest trends and atmospheric burdens of the most influential, long-lived greenhouse gases (LLGHGs). Results are published in WMO/GAW Annual Greenhouse Gas (GHG) Bulletins. WMO released its *Greenhouse Gas Bulletin 2018* in November 2019. The latest analysis of observations from the WMO/GAW network shows that globally averaged concentrations calculated from this in situ network for carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) reached new highs in 2018, with CO<sub>2</sub> at 407.8 ± 0.1 parts per million (ppm), CH<sub>4</sub> at 1 869 ± 2 parts per billion (ppb) and N<sub>2</sub>O at 331.1 ± 0.1 ppb, which corresponds to respectively 147%, 259% and 123% of pre-industrial (before 1750) levels. The increase in CO<sub>2</sub> from 2017 to 2018 was very close to that observed from 2016 to 2017 and practically equal to the average over the last decade.

The Integrated Global Greenhouse Gas Information System (IG<sup>3</sup>IS)<sup>3</sup> expands the observational capacity for GHGs, extending it to the regional and urban domains, and develops the information systems and modelling frameworks to provide information about GHG emissions to society. The implementation of IG<sup>3</sup>IS fundamentally relies on the globally harmonized observations of GHGs, including in the ocean, and will require the development of high resolution and complex observing systems, modelling tools and data assimilation techniques. The WMO IG<sup>3</sup>IS Science Implementation Plan is guiding the work. IG<sup>3</sup>IS is a framework used by Subsidiary Body for Scientific and Technological Advice<sup>4</sup> (SBSTA) to improve estimates of GHG concentrations and fluxes. The WMO-UN Environment IPCC has also adopted refinements to the 2006 Guidelines<sup>5</sup> for National Greenhouse Gas Inventories.

With regards to space-based observations of the ocean, the WMO Space Programme interfaces with relevant discussions in the Coordination Group for Meteorological Satellites (CGMS) and with the Committee on Earth Observation Satellites (CEOS).

Forecasting for navigation in the polar and marginalized regions (e.g. Great Lakes) requires, among others, reliable data and products on sea-ice. While sea ice concentration and extent have been monitored from space for several decades, and these products are generally accurate and robust, information on ice thickness and snow depth-on-sea ice are also critical to forecasting and navigation. This is due to their integrated measure of changes in the energy budget, while snow on sea ice adds a key insulating layer and, in the Antarctic, it contributes to sea-ice volume via snow-ice formation.

WMO through its Global Cryosphere Watch (GCW) has initiated an international coordinated effort to evaluate, intercompare and make recommendations on the available satellite products on sea ice thickness and snow on sea ice, to take place between 2020 and 2023. The project will engage and address individual end-user requirements and other data performance critical to their application (e.g., operational users are likely to require (near) real-time [(N)RT]; data assimilation and Numeric Weather Prediction (NWP) groups are likely to need NRT data, This project will provide the framework for increased coordination and standardization of sea ice observing and data exchange best practices, recognizing the distribution of these activities across many communities, and the strong role played by the scientific communities.

The WMO-IOC DBCP continues to lead efforts to reduce data buoy vandalism, including an annual reporting of vandalism events on data buoys to track progress toward implementation of the vandalism preventative measures. Some countries are working towards agreements with neighbouring countries to collectively act on vandalism event through law enforcement. Further, WMO continues to encourage Members to actively engage, support and collaborate in the efforts of the DBCP to collect existing education and outreach materials related to national or regional mitigation of data buoy vandalism efforts.

The joint WMO-IOC Marine Climate Data System (MCDS) coordinates the activities of existing ocean data systems, in order to have compiled coherent met-ocean climate datasets of known quality, extending beyond the GCOS Essential Climate Variables (ECVs). The data will be of known quality collected from multiple sources to be served on a free and unrestricted basis to the end users through a global network of data centres covering different data domains. A number of data centres, namely, the [World Ocean Database](#), the [Coriolis data centre](#), the [Atlantic Oceanographic & Meteorological Lab](#) were certified to be part of the MCDS.

WMO Global Telecommunication System (GTS) is the communications and data management component of the WMO Information System, managed by the NMHSs that collects and distributes information critical to WMO service delivery. Due to its complex nature, access to the GTS is limited and not straight forward for the majority of the ocean observing community who are not directly connect with the NMHSs. To resolve this issue a pilot project on "Open Access to GTS" was initiated primarily focusing on data providers and data users that did not already have direct or easy access to the GTS. The pilot project proved to be an overwhelming success. This will be part of the demonstration projects of WIS2.0 which is the next generation single coordinated global infrastructure responsible for the telecommunications and data management functions of WMO.

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<sup>3</sup> WMO, 2016. "Integrated Global Greenhouse Gas Information System (IG3IS)". <http://www.wmo.int/pages/prog/arep/gaw/ghg/IG3IS-info.html>

<sup>4</sup> See <https://unfccc.int/documents/196717>

<sup>5</sup> See <https://www.ipcc-nggip.iges.or.jp/public/2019rf/index.html>

The WMO Global Data-Processing and Forecasting System (GDPFS) is composed of three types of centres distributed around globe providing information at global, regional and national level. These centres include World Meteorological Centres (WMCs), Regional Specialized Meteorological Centres (RSMCs) including Regional Climate Centres (RCCs) and National Meteorological Centres (NMCs). The standards for data-processing and forecasting are represented in the Manual on GDPFS (WMO-No. 485) which is considered as the single source of technical regulation for all operational data-processing and forecasting systems operated by WMO Members, including designation of specialized centres. In this context, there are 24 RSMCs for marine meteorological services covering METAREAs, four RSMCs for numerical ocean wave prediction and six RSMCs for tropical cyclone forecasting, including marine-related hazards. Since mid 2019, WMO is moving toward an Earth System Modelling and Prediction (ESMP) approach, which implies more integration of ocean parameters into ESMP. This responds to various ocean users' needs (coastal issues, shipping, fishing and etc.) and will improve the access to and use of marine products for protection of life and property at sea and along the coast.

### **XIII Regional Cooperation**

The WMO has been engaged as an expert service provider by the Green Climate Fund (GCF) to enhance the use of scientific methodologies for adaptation planning and vulnerability assessment in climate sensitive sectors. In response to the Paris Agreement call for "Strengthening scientific knowledge on climate in a manner that informs climate services and supports decision-making (Article 7, paragraph 7 (c))", the GCF initiated an integrated approach to facilitate the generation and use of climate information in decision-making.

Under the service contract, WMO is developing the concept, scientific methodology, data, tools and associated technical resources for enhancing the climate science basis for GCF funded projects, activities and National Adaptation Plans (NAPs). The project aims to facilitate the formulation of a capacity development programme at the country and local level(s) to support the application of methodology, data and tools.

WMO organized workshops with key stakeholders (national, regional and international) in Saint Lucia, Cabo Verde and Congo DRC and analysed climate and ocean data for coastal management and fisheries. The climate science basis methodology and its constituent materials were field tested in these countries during the workshops and produced the following outcomes: 1. Case study reports on fisheries and coastline management for further use in a National Adaptation Plan (NAP) or a GCF project in the country context; 2. Feedback and lessons learned to inform GCF/WMO guidelines methods, data and support needed for further climate rationale preparation globally; 3. Expanded understanding and knowledge of climate rationale requirements and preparation within the region.

### **XV Coordination and Cooperation**

#### **UN Ocean Decade**

The WMO is committed to participating in the Ocean Decade. In October 2019, the WMO and IMO jointly held an *International Symposium on Extreme Maritime Weather – Safety of Life at Sea and Sustainable Blue Economy* in London at the IMO HQ. The event, with an opening address by UN Special Envoy Peter Thomson, was an official contributing event to the Decade. WMO has provided comments to the *Draft Ocean Decade Implementation Plan* indicating the need for greater focus on the role the ocean in weather, climate and climate change; ocean and DRR; and more attention required on Polar regions.

#### **WMO reform**

The 18<sup>th</sup> World Meteorological Congress (June 2019) was a significant moment in WMO history with the reform of the organisation, and which has embraced a more comprehensive Earth system approach, with a

stronger focus on water resources and the ocean, more coordinated climate activities and a more concerted effort to translate science into services for society. It has paved the way for greater engagement with the rapidly growing private sector and more structured collaboration with development agencies. The Congress approved a new WMO strategic plan to achieve its overarching vision: “By 2030, a world where all nations, especially the most vulnerable, are more resilient to the socioeconomic impact of extreme weather, water, climate and other environmental events; and empowered to boost their sustainable development through the best possible services, whether over land, at sea or in the air.” Since Congress, WMO has been implementing the new structures, and which has also reflected a reorganization of the Secretariat. The ocean plays an increasingly important role in all WMO activities and needs to be mainstreamed in its technical and scientific work under an Earth system perspective. Considering this, the collaboration between the meteorological and oceanographic communities is expanding and this requires a higher level of coordination and a strategic interface with both the governing bodies and the technical and scientific bodies of WMO and IOC. A new WMO Oceans Coordinator was appointed to ensure the streamlining of the cross-cutting nature of the various ocean activities. As well, the position will act as the Focal Point for WMO’s international cooperation on oceans.

The former Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (active since 1999) was formally disbanded, also in agreement with the IOC-XXX Assembly (July 2019). A Research Board, and two new Technical Commissions have been established: Services (SERCOM) and Infrastructure (INFCOM). Within these, the JCOMM functions continue via different teams including the Standing Committee for Marine Meteorology and Oceanography (SC-MMO) in the SERCOM amongst others. Both the WMO and IOC agreed for a new mechanism of partnership through the WMO-IOC Joint Collaborative Board (JCB), which has commenced meeting in April 2020 and is developing a Joint WMO-IOC Collaborative Strategy. A History of JCOMM was published by WMO in June 2020 for World Oceans Day, as part of the WMO 70<sup>th</sup> Anniversary Series and as well, honouring the 60<sup>th</sup> Anniversary of the IOC.

Through the reform process, World Meteorological Congress also decided that WMO would host a GOOS node office at WMO HQ, which would strengthen the connection to ocean observations by NMHSs. The lead office for GOOS remains in Paris at the IOC.

## **JCOMMOPS**

The joint IOC-WMO Centre for Oceanography and Marine Meteorology Observation Programmes Support (JCOMMOPS), officially became a WMO office in Brest/France in December 2019 through a formal agreement between the WMO and France. It is responsible for the implementation of IOC Resolutions XX-6 and EC XLI-4. JCOMMOPS maintains a real-time warning and notification system to inform Coastal States through their designated national focal point of the drift of Argo profiling floats from high seas into their Exclusive Economic Zones (EEZ).

JCOMMOPS provides as well support and guidance to Members for the application of UNCLOS and deployment of observing systems into their EEZ through: i) the recalling of rules to implementers and support to clearances requests; ii) the opportunistic seeking of global concurrences for deployment into EEZ; iii) the fostering of international and regional cooperation through data buoys donor programmes and other capacity building initiatives; iv) the assistance to the retrieval and securing of beached instruments; v) the assistance to data distribution and access

Hence, JCOMMOPS provides transparency on the ocean observing system implementation for coastal states. Members can check the systems operating in their EEZ (past, present and future) through the on-line monitoring dashboard [www.jcommops.org](http://www.jcommops.org). It is planned to include marine observations from EEZ in the Global Basic Observing Network (GBON) monitoring system.

JCOMMOPS strongly advocates for practical and multilateral solutions to facilitate the routine deployments of ~2500 ocean observations instrumentations per year, globally and regionally, and is ready to expand its support to keep enhancing the marine observations in Exclusive Economic Zones for Members benefits.

## **COP25**



COP25 (December 2019, Madrid) was focused on the ocean and known as 'Blue COP'. Discussion focussed on seeking solutions to combat the ocean issues outlined in the IPCC SROCC. The WMO provisional statement on the state of the global climate in 2019 was also issued on 3 December at the COP and received widespread international media attention along with announcements by the WMO and UN Secretary Generals. The Provisional Statement indicates that sea level rise has accelerated since the start of satellite measurements in 1993 partly because of the melting of ice sheets in Greenland and Antarctica. Oceans are warming and becoming more acidic. Deoxygenation is increasing. The UN Special Envoy for the Ocean, Ambassador Peter Thomson, said: "Let us remember this as Blue COP". Many events highlighted concern for climate change impacts on Polar regions and SIDS, which are being hit hard by sea level rise, marine heatwaves and impacts on coral reefs and fisheries. A UN Ocean Side Event 'Raising the ocean ambition in climate' included a presentation from Agnes Kijazi, WMO 3<sup>rd</sup> Vice President and Permanent Representative of Tanzania. A WMO-IPCC-Food and Agriculture Organization (FAO) side event focused on "State of climate services report: lessons learned and ways forward for "leaving no one behind" in SIDS". WMO also organized a side event on "Ocean Regions and a Changing Climate: Polar and SIDS Perspectives" with a panel including the WMO SG, the UN Special Envoy Peter Thomson, and the Heads of the Meteorological Services (and IPCC Focal Points) for Iceland and Fiji. This offered the opportunity to highlight the concerning issues of rapid change in the ocean state and fragile marine ecosystems, in the Polar and SIDS ocean regions, where populations are reliant on the blue economy and vulnerable to changes in climate.

### **OceanObs'19**

The 3<sup>rd</sup> Decadal Ocean Observations Conference (OceanObs'19) (September 2019) brought together 1500 participants and produced 135 Community White Papers to provide a status report and forward planning for observing system priorities to meet science and societal requirements. The GOOS-GCOS-WCRP Ocean Observations Panel for Physics and Climate (OOPC) played a key role in organizing the conference and is leading the development of internationally-agreed observing priorities for the next decade as well as for the UN Decade of Ocean Science for Sustainable Development, covering climate, ocean health, and operational services.

### **UN Oceans Conference**

WMO is engaged in the preparations for the 2<sup>nd</sup> UN Ocean Conference – which has been postponed to a later date.

### **World Oceans Day**

WMO joined the global community in marking World Oceans Day on 8 June (2020) with the theme: *Innovation for a Sustainable Ocean*. WMO particularly highlighted its commitment to action in supporting the global priority to understand the changing state of the ocean and its role in weather, climate, climate change and hazards. Also, it emphasised working across the UN Ocean family, especially the partnerships with the IOC and IMO for improving global sustainable development. WMO released a history of the marine partnership between WMO and the IOC-UNESCO, celebrating WMO's 70th Anniversary and the 60th Anniversary of the IOC. WMO also released the new public awareness animation explaining the value of ocean buoys and the need to protect them from damage, in order to contribute to everyone's safety, and the release of the coastal flood awareness videos in French, Hindi and Fijian for the Pacific region. More information about the WMO ocean activities highlighted on World Ocean Day are [here](#).

## PART B: COVID19 IMPACT ON OCEAN ACTIVITIES

Maritime transportation is an essential sector to the global economy during the COVID-19 situation. All WMO marine partners have urged their Members or Member States to recognize all seafarers as 'key workers' and call for continuous accurate maritime weather services'. The WMO-IMO WWMIWS is operating without major impact during COVID-19, to help the global maritime community in combating this pandemic. At the meantime, COVID-19 complicates the management of weather, climate and water-related hazards and makes early warnings systems against multiple hazards even more important, especially in the tropical cyclone (TC) seasons. Examples like TC Harold across the Pacific Islands region (April 2020), and the TC Amphan in Bay of Bengal (May 2020) showed the benefit of the well-established WMO regional coordination mechanisms for tropical cyclone forecasting and warnings, that enabled Members to receive reliable and timely information based on impacts and in multi-hazard approach. As well, the newly operational coastal inundation forecasting system in Fiji was used for the first time in a cyclone and proved successful in anticipating storm surge and wave impacts. It provided early warnings for vulnerable coastal communities.

Limited immediate impact on ocean observation data flows, observations from commercial ships reduced by 20%, risk of degrading autonomous platforms, drifters show a 60% decline per year, profiling floats a 20% decline per year, which will degrade forecasts and create gaps in the climate record. The WMO-IOC JCOMMOPS office is maintaining a watch on the drops in data, deployments, cruises, etc. The tracker can be seen at: <http://www.jcommops.org/board/wa/DataTrackingModule>

## 2. ACRONYMS

CEOS	Committee on Earth Observation Satellites
CG	World Meteorological Congress
CGMS	Coordination Group for Meteorological Satellites
CIFDP	Coastal Inundation Forecasting Demonstration Project
CIFI	Coastal Inundation Forecasting Initiative
COP	Conference of Parties
CREWS	Climate Risk & Early Warning Systems
DBCP	Data Buoy Cooperation Panel
DRR	Disaster Risk Reduction
EC	Executive Council
ECVs	Essential Climate Variables
EEZ	Exclusive Economic Zones
ENSO	El Niño–Southern Oscillation
ESMP	Earth System Modelling and Prediction
FAO	Food and Agriculture Organization
FSO	Forecast Sensitivity to Observations
GAW	Global Atmosphere Watch
GBON	Global Basic Observing Network
GCF	Green Climate Fund

GCOS	Global Climate Observing System
GCW	Global Cryosphere Watch
GDPFS	Global Data-Processing and Forecasting System
GESAMP	Group of Experts on the Scientific Aspects of Marine Environmental Protection
GHG	Greenhouse Gas
GMDSS	Global Maritime Distress and Safety System
GMSL	Global Mean Sea Level
GOOS	Global Ocean Observing System
GTS	Global Telecommunication System
IG <sup>3</sup> IS	Integrated Global Greenhouse Gas Information System
IHO	International Hydrographic Organization
IMO	International Maritime Organization
INFCOM	Commission for Observation, Infrastructures and Information Systems
IN-MHEWS	The International Network for Multi-Hazard Early Warning System
IOC-UNESCO	Intergovernmental Oceanographic Commission of UNESCO
IPCC	Intergovernmental Panel on Climate Change
ISC	International Science Council
JCB	Joint WMO-IOC Collaborative Board
JCOMM	Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology
JCOMMOPS	The JCOMM insitu Observations Programme Support Centre
JPL	NASA Jet Propulsion Laboratory
LDC	Least Developed Countries
LLGHGs	Long-Lived Greenhouse Gases
MCDS	Marine Climate Data System
METAREA	Geographical sea region for the purpose of coordinating the transmission of meteorological information to mariners on international voyages through international and territorial waters
Metocean	Meteorology and (physics) Oceanography
MHEWS	Multi-Hazard Early Warning System
NAPs	National Adaptation Plans
NASA	National Aeronautics and Space Administration
NMC	National Meteorological Centre
NMHS	National Meteorological and Hydrological Services

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NRT	(Near) Real-Time
NWP	Numerical Weather Prediction
OceanObs'19	Decadal Ocean Observations Conference 2019
OOPC	Ocean Observations Panel for Physics and Climate
OSEs	Observing System Experiments
PPP	Polar Prediction Project
RCC	Regional Climate Centres
RSMC	Regional Specialized Meteorological Centre
SBSTA	Subsidiary Body for Scientific and Technological Advice
SC-MMO	Standing Committee on
SERCOM	Commission for Weather, Climate, Water and Related Environmental Service Applications
SIDS	Small Island Developing States
SOLAS	International Convention for the Safety of Life At Sea
SROCC	Special Report on the Ocean and Cryosphere in a Changing Climate
TC	Tropical Cyclone
TCC	Tropical Cyclone Committee
TCP	WMO Tropical Cyclone Programme
TMA	Tropical Moored buoy Array
TPOS	Tropical Pacific Observing System
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	UN Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WCRP	World Climate Research Programme
WG	Working Group
WIGOS	WMO Integrated Global Observing System
WIS	WMO Information System
WMC	World Meteorological Centre
WMO	World Meteorological Organization
WWMIWS	World-Wide Metocean Information and Warning Service
WWRP	World Weather Research Programme
YOPP	The Year Of Polar Prediction