



## **Oceans and the law of the sea Report of the Secretary-General**

### **Part I**

#### **“Oceans and sustainable development: integration of the three dimensions of sustainable development, namely, environmental, social and economic”**

#### **Contribution by the World Meteorological Organization**

6 February 2015

#### **Executive summary**

1. WMO and its 191 Members, whose National Meteorological and Hydrological Services and other competent institutes address multidisciplinary ocean-related issues in cooperation with other specialized agencies of the United Nations. WMO contribution falls primarily in the domains of climate and ocean observations, including related data processing and telecommunication infrastructure; research on atmosphere-ocean-land interactions, with particular regard to the climate system; services for disaster risk reduction, including from marine hazards; and development of technical standards and information documents for policymakers and the public at large. WMO programmes and projects address global societal needs directly related to sustainable development, for: improved protection of life and property; poverty eradication, sustainable livelihoods, food security, sustainable access to water and energy, and economic growth; sustainable use of natural resources and improved environmental quality. The benefits to society from these initiatives are multifold. Societal benefits: contribution to the safety and well-being of society through the provision of information on the impacts on lives and livelihoods of natural hazards, improving the safety of transport, including at sea, and contributing to human and environmental health outcomes. Economic benefits: accurate, timely and impact-based weather, climate, water and related environmental services are a significant contribution to economic stability, efficiency and growth in many sectors, including coastal and marine. Improved climate products and services offer significant economic benefits. Environmental benefits: monitoring the environment over time, providing insight into possible impacts on our climate, food and water security, natural ecosystems and human health. Among others, weather and climate services for the reduction of risks of disasters from coastal and marine hazards represent important examples for the integration of the different pillars of sustainable development. Natural disasters are recognized as a critical impediment to social and economic development and poverty eradication. Coastal inundation, including from storm surges, wind-driven waves and tsunamis, is among the most significant natural hazards, affecting several million people globally each year, especially in SIDS and many coastal regions of developing countries. As a practical example, through the Coastal Inundation Forecasting Demonstration Project (CIFDP) WMO aims to improve the safety of coastal communities and support their sustainable development by enhancing coastal inundation forecasting and warning systems that are embedded in national disaster management. The vulnerability of coastal regions to marine hazards from meteorological, geophysical and climatic origin and the exposure of growing population and valuable assets suggest increased cooperation and coordination of specialized agencies to strengthen the resilience of coastal populations to such hazards.

## I. Scope of WMO activities related to oceans

2. The World Meteorological Organization (WMO)<sup>1</sup> is the United Nations system's authoritative voice on the state and behaviour of the Earth's atmosphere, its interaction with the oceans, the climate it produces and the resulting distribution of water resources.

3. WMO is the expression and represents the interests of its 191 Members (185 States and 6 Territories), which National Meteorological and Hydrological Services and other competent institutes, in many cases, have direct competences in ocean-related issues. The activities of WMO dealing with ocean issues are of a multidisciplinary nature and are largely carried out in cooperation with other specialized agencies of the United Nations. They fall primarily under the following domains:

### Observations

- WMO coordinates, with the co-sponsorship of the Intergovernmental Oceanographic Commission of UNESCO (IOC/UNESCO), the United Nations Environment Programme (UNEP) and the International Council for Science (ICSU), the **Global Climate Observing System (GCOS)**<sup>2</sup>, a long-term, user-driven operational system to monitor the whole climate system for comprehensive climate observations including physical, chemical and biological properties, and atmospheric, oceanic, terrestrial, hydrologic, and cryospheric components. WMO is also a co-sponsor, equally with IOC/UNESCO, UNEP and ICSU, of the Global Ocean Observing System (GOOS)<sup>3</sup> and the related Ocean Observations Panel for Climate (OOPC)<sup>4</sup>.
- Based on observations collected by its Members, WMO publishes annually a **Statement on the status of the global climate**<sup>5</sup>, which contains key findings related to the state of the ocean (sea ice, sea level rise, sea surface temperature, ocean acidification). Through coupling of ocean and atmospheric observations, WMO issues periodic **El Niño/La Niña Updates**<sup>6</sup>, expert-based summaries of the current situation and outlook for the development of El Niño/Southern Oscillation phenomena.
- WMO observing systems and the contributions of WMO to co-sponsored observing systems are integrated through the **WMO Integrated Global Observing System (WIGOS)**<sup>7</sup>, an overarching framework for the evolution of these systems which will continue to be owned and operated by a diverse array of organizations and programmes, and which provides interfaces with other data management systems from other climate-sensitive sectors.

### Research

- WMO coordinates the **World Climate Research Programme (WCRP)**<sup>8</sup>, co-sponsored by IOC/UNESCO and ICSU, whose work on sea level rise or on changes in northern hemisphere storm tracks reflects the complexity and interactions among the major components of the planet – ocean, atmosphere, land and ice. WMO coordinates also the **Global Atmospheric Watch (GAW)**<sup>9</sup>, which publishes annually a **Greenhouse Gas Bulletin** that reports on the latest trends and atmospheric burdens of the most influential, long-lived greenhouse gases. Through collaboration with IOC/UNESCO and the International

<sup>1</sup> [http://www.wmo.int/pages/index\\_en.html](http://www.wmo.int/pages/index_en.html)

<sup>2</sup> <http://www.wmo.int/pages/prog/gcos/index.php>

<sup>3</sup> <http://www.ioc-goos.org/>

<sup>4</sup> <http://ioc-goos-oopc.org/>

<sup>5</sup> [http://www.wmo.int/pages/themes/climate/status\\_global\\_climate.php](http://www.wmo.int/pages/themes/climate/status_global_climate.php);

<sup>6</sup> <https://drive.google.com/a/wmo.int/file/d/0BwdvoC9AeWjUeEV1cnZ6QURVaEE/edit>

<sup>7</sup> [http://www.wmo.int/pages/prog/wcp/wcasp/enso\\_updates.html](http://www.wmo.int/pages/prog/wcp/wcasp/enso_updates.html)

<sup>8</sup> [http://www.wmo.int/pages/prog/www/wigos/index\\_en.html](http://www.wmo.int/pages/prog/www/wigos/index_en.html)

<sup>9</sup> <http://www.wcrp-climate.org/>

<sup>9</sup> [http://www.wmo.int/pages/prog/arep/gaw/gaw\\_home\\_en.html](http://www.wmo.int/pages/prog/arep/gaw/gaw_home_en.html)

Atomic Energy Agency (IAEA), the 2013 edition of the *Bulletin* has included an insert on ocean acidification<sup>10</sup>.

- As part of the Joint Group of Experts on Scientific Aspects of Marine Environmental Protection (GESAMP)<sup>11</sup>, WMO contributes to marine environmental assessments, including on **atmospheric inputs of chemicals to the ocean** and impacts of dust transport and deposition on marine productivity (Working Group 38<sup>12</sup>).
- In collaboration with the Food and Agriculture Organization (FAO), WMO, through JCOMM, supports studies on the **impacts of climate change on marine productivity and fisheries**<sup>13</sup>.

## Services

- WMO is active in operational ocean forecasting in collaboration with IOC/UNESCO through the Joint WMO-IOC Technical Commission for Oceanography and Marine Meteorology (JCOMM)<sup>14</sup>. WMO cooperates with the International Maritime Organization (IMO) and the International Hydrographic Organization (IHO), to provide **marine safety services**, in particular the World-Wide Metocean Information and Warnings Service as part of the Global Maritime Distress and Safety System (GMDSS)<sup>15</sup>.
- Under the umbrella of WMO, Regional Specialized Meteorological Centres (RSMCs) and Tropical Cyclone Warning Centres (TCWCs) and NMHSs issue **advisories and warnings for severe weather** affecting their respective countries or regions, in many cases in the coastal zone<sup>16</sup>.
- Through the Global Telecommunication Service (GTS)<sup>17</sup>, WMO is supporting the **transmission of tsunami advisories and early warnings** coordinated by IOC/UNESCO. WMO participates also in the Joint Task Force with the International Telecommunications Union (ITU) and IOC/UNESCO to investigate the use of submarine telecommunications cables for ocean and climate monitoring and disaster warning<sup>18</sup>.
- WMO is currently working to improve **forecasting and warning services for coastal inundation** to address the needs of coastal states, especially Small Island Developing States (SIDS), through the Severe Weather Forecasting Demonstration Project (SWFDP)<sup>19</sup> and the Coastal Inundation Forecasting Demonstration Project (CIFDP)<sup>20</sup>.
- WMO is also engaged to develop **climate services for marine and coastal communities**, including for coastal adaptation and disaster risk reduction. In this regard, the Global Framework for Climate Services (GFCS)<sup>21</sup>, a UN partnership led by WMO, guides the development and application of science-based climate information products tools and services in support of decision-making. The GFCS has four initial priority sectors, agriculture and food security, water, health and disaster risk reduction, which address directly climate-

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<sup>10</sup> [http://www.wmo.int/pages/prog/arep/gaw/ghg/documents/GHG\\_Bulletin\\_10\\_Nov2014\\_EN.pdf](http://www.wmo.int/pages/prog/arep/gaw/ghg/documents/GHG_Bulletin_10_Nov2014_EN.pdf)

<sup>11</sup> <http://www.gesamp.org/>

<sup>12</sup> <http://www.gesamp.org/work-programme/workgroups/working-group-38.jsessionid=F5A45FC088A04A2B1AF1B52EA64CF0F7>

<sup>13</sup> [http://www.jcomm.info/index.php?option=com\\_oe&task=viewGroupRecord&groupID=273](http://www.jcomm.info/index.php?option=com_oe&task=viewGroupRecord&groupID=273)

<sup>14</sup> [http://www.jcomm.info/index.php?option=com\\_content&view=featured&Itemid=100001](http://www.jcomm.info/index.php?option=com_content&view=featured&Itemid=100001)

<sup>15</sup> <http://weather.gmdss.org/>

<sup>16</sup> <http://severe.worldweather.wmo.int/>

<sup>17</sup> [http://www.wmo.int/pages/prog/www/TEM/GTS/index\\_en.html](http://www.wmo.int/pages/prog/www/TEM/GTS/index_en.html)

<sup>18</sup> <http://www.itu.int/en/ITU-T/climatechange/task-force-sc/Pages/default.aspx>

<sup>19</sup> <http://www.wmo.int/pages/prog/www/swfdp/>

<sup>20</sup> [http://www.jcomm.info/index.php?option=com\\_content&view=article&id=167](http://www.jcomm.info/index.php?option=com_content&view=article&id=167)

<sup>21</sup> <http://gfcs.wmo.int/>

related ocean and coastal issues. A GFCS-SIDS initiative has been launched to address the SIDSs specific challenges.

## II. Contribution of WMO ocean-related activities to the pillars of sustainable development

4. As per its Strategic Plan 2016–2019<sup>22</sup>, WMO intends to address three global societal needs directly related to sustainable development through its programmes and project initiatives:

- **Improved protection of life and property** by mitigating the impacts of hazardous weather, climate, water and other environmental events and addressing the need for improved safety of transport on land, at sea, and in the air;
- **Poverty eradication, sustainable livelihoods, food security, sustainable access to water and energy, and economic growth** by making available weather, climate, water and related environmental services to support the post-2015 sustainable development agenda, climate risk management, climate resilience, green economy, disaster risk reduction, food security, improved health and social well-being of citizens, water management, and tapping renewable energy resources such as hydro-, solar- and wind-power;
- **Sustainable use of natural resources and improved environmental quality** by designing weather, climate, water and related environmental services to manage atmospheric, terrestrial and water resources at all time-scales, and the development and management of other natural resources.

5. The benefits to society<sup>23</sup> from these programmes and initiatives can be characterized as follows:

- **Societal benefits:** WMO and its Members' NMHSs contribute to the safety and well-being of society through their efforts to provide information on the impacts on lives and livelihoods of natural hazards, to improve the safety of transport, including at sea, and to contribute to human and environmental health outcomes. Improving operational climate services through the GFCS will enhance national capabilities to support climate-related decision-making, in particular through (a) early warning systems and preparedness; (b) medium- and long-term sectoral planning (e.g., land zoning, infrastructure development and agricultural management); and (c) utilization of weather-indexed insurance and financing mechanisms to reduce the impacts of disasters at various levels
- **Economic benefits:** accurate, timely and impact-oriented weather, climate, water and related environmental services from WMO and its Members' NMHSs make a significant contribution to economic stability, efficiency and growth in many sectors. Examples include in water resource management, food production, marine transportation and energy, especially hydro-, solar- and wind-power. Early warning services and forecasts inform economically-driven decisions that mitigate the effects of meteorological and hydrological hazards, including coastal and marine. Improved climate products and services offer significant economic benefits.
- **Environmental benefits:** WMO and its Members' NMHSs monitor the environment over time, providing insight into possible impacts on our climate, food and water security, natural ecosystems and human health. Changes are occurring in rainfall and temperature, the chemical composition of our atmosphere, surface and groundwater availability, land cover

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<sup>22</sup> To be adopted by the World Meteorological Congress at its seventeenth session (Geneva, 25 May – 12 June 2015) (see: <https://sites.google.com/a/wmo.int/cg-17/documents-english>).

<sup>23</sup> Studies on the socioeconomic benefits of weather and climate services, including on the maritime sector, are being undertaken under the auspices of WMO. For a first orientation, see <https://www.wmo.int/pages/prog/dra/eguides/index.php/en/3-national-relationships/3-4-socio-economic-benefit-analysis>;

and soil condition, the temperature and chemical balance of our oceans, and pollutants in our air, water, soil and oceans. Subtle changes in these parameters can have profound consequences for ecosystems, biodiversity and our food production systems.

6. Among other activities, **services for the reduction of risks of disasters from coastal and marine hazards** represent important examples for the integration of the different pillars of sustainable development. Natural disasters are recognized as a critical impediment to social and economic development and poverty eradication.<sup>24</sup> Coastal flooding, including from storm surges, wind-driven waves and tsunamis, is among the most significant natural hazards, affecting several million people globally each year, especially in Small Island Developing States and many coastal regions of developing countries. For the concentration of people and economic activities, port cities exposed to coastal flooding are particularly vulnerable, while the presence of a significant part of global population in river deltas exposes it to a combination of river and coastal flooding. It is expected that the risk from coastal flooding will increase in the future due to a combination of factors: rise in sea levels coupled with the likely increase in frequency and intensity of tropical storms due to climate change; increase of population and value of material assets in vulnerable coastal zones. Overall, it is estimated that economic losses due to weather, climate, and geophysical-related disasters, including coastal flooding, are higher in developed countries, while fatality rates and economic losses as a proportion of gross domestic product are higher in developing countries, thus clearly marking the inter-linkage between natural disasters, climate change and the development agenda.

7. As a practical example of this approach, through the **Coastal Inundation Forecasting Demonstration Project (CIFDP)**<sup>25</sup> WMO aims to improve the safety of coastal communities and support their sustainable development by enhancing coastal inundation forecasting and warning systems that are embedded in national disaster management. The project focuses on strengthening capabilities for operational monitoring and forecasts/warnings on coastal inundation from combined extreme events, such as extreme sea level rise (e.g. large waves, storm surges, high tide), fluvial flooding and tropical cyclones, and furthermore, for decision support system for emergency management. Benefits of CIFDP implementation to countries are not only to enhance capacity of NMHSs for coastal risk warning, but also to improve interaction with users of the NMHSs' information services – primarily national disaster managers and decision makers. The CIFDP is implemented at national level by operational forecasting agencies, under the WMO framework and with technical guidance provided by WMO Groups of Experts. Currently, five national sub-projects of CIFDP are under way in Bangladesh, Dominican Republic, Fiji, Indonesia and Shanghai/China.

### III. Challenges and opportunities for enhanced coordination and coordination at the intergovernmental and inter-agency levels

8. The vulnerability of coastal regions to marine hazards from meteorological, geophysical and climatic origin (tropical storm and associated storm surges, tsunamis, sea level rise and coastal erosion) and the exposure of growing population and valuable assets to such hazards call for increased cooperation and coordination of specialized agencies to strengthen the resilience of coastal populations to such hazards. Yet the current proposal for an ocean goal as part of Sustainable Development Goals<sup>26</sup> does not include reference to marine hazards and related natural hazards and further collaborative work at the UN level may be needed. As a contribution to the preparation of UNISDR Global Assessment Report 2015, WMO, with inputs from IOC/UNESCO, has prepared a *Synthesis of the Status and Trends with the Development of Early Warning System for all Major Hazards and Outreach to Communities*, which encompasses marine hazards. WMO and IOC/UNESCO are collaborating also in the context of the preparations for the

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<sup>24</sup> A/RES/66/288 (2012): *The future we want*, paragraph 186; UNISDR/WMO (2012): *Disaster risk and resilience: Thematic think piece*, Geneva, UNISDR/WMO.

<sup>25</sup> [http://www.jcomm.info/index.php?option=com\\_content&view=article&id=167](http://www.jcomm.info/index.php?option=com_content&view=article&id=167)

<sup>26</sup> <https://sustainabledevelopment.un.org/focussdgs.html>

Third World Conference on Disaster Risk Reduction (Sendai, 14–18 March 2015), with the organization of a working session on early warning, contribution to the definition of targets and indicators for the post-2015 framework for disaster risk reduction, and the preparation of a report on the state of standardization of early warning and risk information, co-led with the United Nations Development Programme (UNDP). Moreover, the experience developed by IOC/UNESCO and WMO through the preparation of guidelines for coastal hazards (sea level rise, coastal erosion, coastal inundation) and climate adaptation for policymakers and local managers could be further expanded. Coastal megacities, in particular, could represent a strong potential test case for climate services. Additional work in cooperation between WMO, IOC/UNESCO, IHO and IMO could advance approaches to better adapt to the impacts of climate change, including sea level rise, in coastal regions, including through better incorporation of risk management in integrated coastal area management, and the development of early warning systems and climate services.