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UN OCEAN CONFERENCE – IHO INPUT TO CONCEPT PAPERS

Reference:

A. DESA letter DESA-17/00373 dated 27 February

Dear Ms Wang and Ms Hicuburundi,

1. In response to the Reference, the Secretariat of the International Hydrographic Organization (IHO) provides the following information in Annex A to this letter, in support of the Concept Papers being developed to support the partnership dialogues at the UN Ocean Conference in June 2017.

2. In particular, the IHO is submitting information in relation to Theme 6 - *Increasing scientific knowledge, and developing research capacity and transfer of marine technology*.

3. In addition to the information provided in Annex A, I would like to draw your attention to the recent submission from the IHO to the Secretary-General's report on the Ocean and Law of the Sea, a copy of which is included in Annex B.

Yours sincerely,

Robert WARD
Secretary-General

Annexes:

A. IHO Input: Theme 6 - *Increasing scientific knowledge, and developing research capacity and transfer of marine technology*

B. IHO Input to Part I of the Report of the UN Secretary General on Oceans and Law of the Sea - 2017

IHO Input

Theme 6 - *Increasing scientific knowledge, and developing research capacity and transfer of marine technology*

1. The IHO, comprising 87 Member States, is the recognized competent authority with regard to the setting of the international standards for hydrography that are used to measure and define the depth and shape of the ocean floor which, in turn, has an important underpinning role in all marine science activities.

2. The following notes are intended to provide an IHO perspective on Theme 6.

a. **Status and trends**

Scientific knowledge of the oceans is patchy and in almost all cases is insufficient to meet the requirements of society in the 21st century. This is particularly true in relation to mankind's understanding of the mechanisms that impact the health of the ocean and the sustainable use of its resources.

In the case of hydrography, which is the scientific task of measuring the depth and defining the shape of the ocean floor, the depth of about 50% of the world's coastal waters and over 85% of the deeper ocean has never been directly measured. In many areas, there is not even a reliable estimate of the depth. This lack of such fundamental data has a significant impact on understanding or optimizing most ocean process or uses of the ocean.

b. **Challenges and opportunities**

As has been the case in the IHO since its inception in 1921, the basic mapping of the seas and oceans requires multi-disciplinary, multi-stakeholder involvement in the collection of oceanic data and then making that data available to the widest possible audience for government, commercial and public benefit.

The IHO is encouraging and assisting all its Member States representatives to establish or contribute to national and regional marine spatial data infrastructures, which can then provide access to baseline hydrographic data for all those that require the information, including marine spatial planning, environmental monitoring, coastal zone management, commercial exploitation of marine resources, and so on.

The IHO is keen to ensure that the measurement of the depth of the seas and oceans is included as part of all ocean environmental observing programmes. In this context, the IHO is encouraging both crowd-sourcing and the release and discoverability of data that has already been collected. This includes data collected by both the scientific and the commercial sectors for initially narrower and more specific purposes.

c. **Existing partnerships**

The IHO, through its 16 Regional Hydrographic Commissions that cover the world, coordinates national hydrographic activity in and between the regions and actively promotes multi-disciplinary, multi-stakeholder involvement in the collection of data.

The IHO has a policy of encouraging international organizations to participate as Observers. In doing so, it has adopted a flexible and open approach to obtaining feedback and suggestions and now has a successful programme of collaborative assistance, particularly in relation to capacity building and the establishment of pragmatic technical standards that are supported by the industry and academic sectors.

The IHO, now in collaboration with the Intergovernmental Oceanographic Commission (IOC) of UNESCO, continues to provide the principal support to the GEBCO (General Bathymetric Chart of the Ocean) project initiated by Prince Albert I of Monaco in 1903. The GEBCO project, which provides the world's best reference dataset for the depth of the seas and oceans, has always relied on the voluntary data collection efforts of marine scientists, mariners and others. It serves as a

long-standing and very successful example of the power and the benefits that can be achieved from inter-disciplinary cooperation, the sharing of data and accessibility to that data.

d. **Possible areas for new partnerships**

The IHO is very keen to ensure that cooperative arrangements are strengthened between relevant intergovernmental and international organizations in order to ensure that all seagoing platforms and other observational technologies are maximised in the collection of relevant environmental scientific data – including the measurement of depth. Work is ongoing with the IOC and the World Meteorological Organization (WMO), as well as with the commercial shipping industry and other relevant bodies.

The IHO-IOC GEBCO Project has set a target to provide at least a 100m resolution grid of the world's seas and oceans by 2030. This is still less than the resolution for existing maps of the Moon and Mars. Achieving the target of a 100m map resolution will rely very heavily on ensuring that both institutional and volunteer observing programmes in support of SDG14 include depth as one of the underlying parameters to be measured.

e. **Guiding questions for the dialogue**

How can we raise the collective awareness of our limited knowledge of the oceans and the impact on the sustainable use of the oceans?

How can we ensure that every seagoing platform and any other observational technologies are engaged in the cost-effective collection of relevant environmental scientific data – including the measurement of depth, in the public interest?

How can we ensure that all environmental data that is non-sensitive for commercial, scientific research or security reasons, is discoverable and easily accessible in the public interest?

IHO Input to Part I of the Report of the UN Secretary General on Oceans and Law of the Sea - 2017

This contribution is provided in response to letter *LOS/SGR/2017* dated 16 December 2016 as the input from the International Hydrographic Organization to Part I of the report of the UN Secretary General on Oceans and Law of the Sea. It addresses the topic of the eighteenth meeting of the Informal Consultative Process: "*The effects of climate change on oceans*".

Executive Summary

The International Hydrographic Organization (IHO) is the inter-governmental organization whose principal aim is to ensure that all the world's seas, oceans and navigable waters are properly surveyed and charted. At present, this is not the case: less than 15% of the depths of ocean waters (> 200 metres) have been measured directly and about 50% of the coastal waters (< 200 metres) remain unsurveyed.

The current membership of the IHO stands at 85[1] Member States.

Hydrography (bathymetry) is a major controlling parameter in ocean dynamics and underpins the models for predicting the natural phenomena such as tides, ocean currents and tsunami inundation as well as for meteo-oceanographic forecasts. Many climate processes are influenced by the depth and shape of the seafloor.

The IHO is committed to the collection and management of reference bathymetry data sets required for modelling the different mechanisms which are sensitive to the effect of climate change on the oceans, in particular through the IHO-IOC project of the General Bathymetric Chart of the Oceans (GEBCO). The IHO contributes also to the collection of long series tidal observations which are essential to understanding and monitoring sea level rise.

The IHO has developed a framework to ensure that appropriate procedures and guidelines are in place so as to enable an immediate and appropriate response in terms of hydrographic and charting support when a disaster, such as a tsunami or a coastal storm, affects any coastal area of the world.

Although bathymetric knowledge underpins the safe, sustainable, cost effective execution of almost every human activity, most of the seafloor remains virtually unmapped, unobserved, and unexplored. This unsatisfactory situation, of which the public is generally unaware, is either not acknowledged or else given a very low priority by many governments.

Noting that the current lack of knowledge about the depth and shape of the seafloor, and the seas and oceans more generally, can only be improved through international coordination and cooperation, it is important that the United Nations continue to call upon States that do not have any arrangements in place to consider fulfilling their obligations to provide hydrographic services and to become members of the IHO, in order to coordinate their efforts and to benefit from the IHO Capacity Building Programme.

The innovative supplementary data gathering and data maximizing initiatives developed by the IHO, including the GEBCO project, crowd-sourced bathymetry (volunteered geographic data) and satellite-derived bathymetry, should be encouraged and promoted by all stakeholders.

General

1. The International Hydrographic Organization (IHO) is the inter-governmental organization whose principal aim is to ensure that all the world's seas, oceans and navigable waters are properly surveyed and charted, through the coordinated endeavours of national Hydrographic Offices. The IHO has been hosted by the Government of Monaco since its creation in 1921 and its current membership stands at 85 [now 87] Member States.

2. Hydrography involves measuring the depth of the water (bathymetry) and fixing the position of all the navigational hazards that lie on the seafloor, such as wrecks and rocks. This is done mainly with specialized ships and boats operating echo sounders and sonars, but also using survey aircraft fitted with lasers. Useful information can also be derived sometimes from satellite observations. Hydrography

[1] At the time of the report. The current membership (March 2017) stands at 87.

also involves measuring the tide and the currents. Hydrographic information is essential for the safe, efficient and sustainable conduct of every human activity that takes place in, on or under the sea.

3. This report focuses on two aspects relevant to the role of the IHO in relation with the effects of climate change on oceans:

- actions and activities in relation with climate change; and
- suggestions for further action.

Actions and activities of the IHO in relation with climate change

4. Hydrography is a major controlling parameter in ocean dynamics and underpins the models for predicting the natural phenomena such as tides, ocean currents and tsunami inundation as well as for meteo-oceanographic forecasts. Many climate processes are influenced by the topography of the seafloor. For example, warm subsurface waters are suspected to accelerate the melting of marine terminating glaciers that, in turn, affect global sea-level rise. The pathways of these warm sub-surface waters across polar continental shelves towards marine terminating glaciers are controlled by the depth and shape of the seabed and can therefore not be modelled without bathymetric data. A more dramatic example relates to the impact of tsunamis, storm surges, or wind waves on the coastline and coastal settlements and infrastructures. The direction and size of these long waves are affected by the depth and shape of the seafloor through wave refraction. The depth and shape of the seafloor adjacent to coastal locations, strongly influences the way that the energy of these long waves is focussed, thereby making them susceptible to catastrophe.

5. The IHO is committed to the collection and management of reference bathymetry data sets required for modelling the different mechanisms which are sensitive to the effect of climate change on the oceans. It encourages national Hydrographic Offices to participate in and contribute to the marine element of national Spatial Data Infrastructures (MSDI) so that all relevant hydrographic and particularly bathymetric data is made as widely available as possible to support coastal zone management and marine spatial planning (see IHO Publication C-17 - *Spatial Data Infrastructures: "The Marine Dimension" - Guidance for Hydrographic Offices*, available from the IHO website at *www.iho.int*). The IHO has also established the IHO Data Centre for Digital Bathymetry (DCDB) and operates, together with the Intergovernmental Oceanographic Commission of UNESCO, the GEBCO project - the *General Bathymetric Chart of the Oceans*. GEBCO's aim is to provide the most authoritative publicly-available bathymetry of the world's oceans. The GEBCO products include global gridded bathymetric data sets, a global set of digital bathymetric contours and a reference manual on how to build bathymetric grids. The continuing improvement of these products relies on close collaboration with regional ocean mapping programmes. Further information on GEBCO products is available at *www.gebco.net*.

6. Understanding trends in sea level, as well as the relationship between global and local sea level, provides critical information about the impacts of the Earth's climate on the oceans and the atmosphere. The longest instrumental time series of sea-level observations come from tide gauges. The data have been used to study a wide range of processes, such as storm surges and tsunamis. The long time series of mean sea-level data collected at permanent tide gauges provided the primary evidence of globally averaged sea-level rise during the twentieth century. Altimetry data from satellite missions have provided a near-global coverage of sea surface trends since the early 1990s. However, satellite observations need to be corrected for a variety of factors, including sea-state bias and wet tropospheric delay. An important final check that errors in the corrections do not introduce biases into the long-term trends is to compare the altimeter time series with those from tide gauges distributed throughout the world. Therefore, it is essential to maintain such a network of tide gauges. The IHO contributes to this objective by encouraging its Member States to collect and make available long series quality-controlled tidal observations. In liaison with the Global Sea Level Observing System, (GLOSS) operated under the auspices of the IOC, the IHO Tides, Water Level and Currents Working Group maintains an inventory of tide gauges and current meters operated by IHO Member States. This inventory is available at:

www.iho.int/mtg_docs/com_wg/IHOTC/IHOTC_Misc/TideGaugeInventory.pdf.

7. Coastal storms, tsunamis, flooding, coastal erosion and land subsidence, exacerbated by climate change, may severely affect coastal communities through the widespread loss of life and the extensive destruction of most facilities. Huge numbers of displaced persons may immediately suffer from shortages of food, water and fuel while the destruction of port facilities and the creation of new navigational obstacles may impede adequate emergency response. In such circumstances support by sea transport is vital and depends upon the immediate restoration of appropriate hydrographic and charting services. Based on the experience of the 2004 tsunami in the Indian Ocean, the IHO identified the need to ensure that appropriate procedures and guidelines are in place so as to enable an immediate and appropriate response when a disaster affects any coastal area of the world. Such a framework has been established through an IHO Resolution adopted in 2005 on *IHO Response to Disasters*. The framework defines the respective roles of the IHO Secretariat, the fifteen Regional Hydrographic Commissions covering the different ocean and sea basins and the IHO Member States in order to:

- ensure the immediate assessment of damage and its effect on the safety of navigation of national and international shipping,
- immediately inform mariners and other interested parties of relevant damage and any dangers, particularly with respect to navigational hazards,
- re-establish the basic key maritime transportation routes, and
- ensure that charts and other hydrographic information of affected areas are updated as soon as possible.

The framework has been progressively improved based on the feedback from more recent disasters such as the 2011 tsunami in Japan, the 2016 tropical cyclone "*Winston*" in the South West Pacific and the 2016 hurricane "*Matthew*" in the Caribbean.

8. The IHO Capacity Building Programme assists IHO Member States and other coastal States in developing capacities to address the effect of climate change on the oceans. Related activities include in particular workshops and training courses on establishing Maritime Spatial Data Infrastructures (MSDI), tidal observations and tsunami inundation mapping.

Suggestions for further action

9. The oceans, covering seventy per cent of the Earth's surface, are fundamental not only to controlling the climate but also to sustaining life and accessing a vast source of resources and economic wealth. Yet our understanding of ocean and seafloor processes is quite limited due to the difficulties in operating in this environment. Foremost amongst the challenges of understanding and depicting the oceans and the seafloor is the fact that electromagnetic waves such as light and radar are highly attenuated in ocean water and thus the suite of optical and electromagnetic sensors that have been developed to map, observe, and better understand the Earth cannot penetrate more than a few meters in typical ocean waters. This has left most of the seafloor virtually unmapped, unobserved, and unexplored. No more than 15% of ocean depths greater than 200 metres have been directly measured: the ship tracks along which depth measurements are available may be hundreds of miles apart and this means that in many instances the shape of the seafloor is inferred, relying on educated guess and indirect measurement such as satellite altimetry, which do not provide the detail required to understand critical ocean processes and to manage ocean resources. The situation in coastal waters is less dramatic but nothing to be proud of, with about half of the world's coastal waters, from the 200 metre contour line to the shore, remaining unsurveyed.

10. This unsatisfactory situation, of which the public is generally unaware, is either not acknowledged or else given a very low priority by many governments. Although the provision of adequate hydrographic surveying and nautical chart services are national obligations under the international Convention for the Safety of Life at Sea (SOLAS) and other international instruments, only about half of the world's coastal States have arrangements in place to provide such services and are Members of the IHO. Additionally, many of the national hydrographic authorities represented in the IHO are reporting that government-sponsored surveying activity is now decreasing because of financial pressures.

11. Noting that the situation can only be improved through international coordination and cooperation, it is important that the United Nations continue to call upon States that do not have any arrangements in place to consider fulfilling their obligations to provide hydrographic services and to become members of the IHO in order to coordinate their efforts and to benefit from the IHO Capacity Building Programme.

12. In addition, the United Nations should encourage the collection of bathymetric data as part of all data gathering activities that take place at sea. The UN 2030 Agenda for Sustainable Development and its Goal 14 on the Oceans, and in particular Target 14a to increase scientific knowledge of the oceans, are most relevant in this context.

13. The innovative supplementary data gathering and data maximizing initiatives developed by the IHO should be encouraged and promoted by all stakeholders, including crowd-sourced bathymetry (volunteered geographic data) and satellite-derived bathymetry.