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IHO Input to the Report of the UN Secretary General on Oceans and Law of the Sea

This contribution is provided in response to your letter dated 15 April 2020 as the input from the International Hydrographic Organization to the report of the UN Secretary General on Oceans and Law of the Sea. It addresses developments and issues relating to ocean affairs and the law of the sea, including the implementation of resolution A/RES/73/124.

Executive Summary

The International Hydrographic Organization (IHO) is the inter-governmental international organization whose principal aim is to ensure that all the world's oceans, seas and navigable waters are properly surveyed and charted. The work is done by bringing together the national hydrographic agencies responsible for the conduct of hydrographic surveys, the production of nautical charts and related publications, and the distribution of Maritime Safety Information (MSI) in accordance with the requirement set out in the International Convention for the Safety of Life at Sea (SOLAS) and other international regulations. The current membership of the IHO stands at 93 Member States.

Although safety of navigation remains a major driver for the IHO, hydrographic products and services are meant to support all activities associated with the oceans, seas and navigable waters. As every human activity conducted in, on or under the sea depends on knowing the depth and the nature of the seafloor and an understanding of the tides and the currents, hydrography is an essential foundation to the development of the Blue Economy. Yet, mankind has higher resolution maps of the Moon, Venus and Mars than for most of the seas and oceans. This has a significant impact on what mankind can do at sea today in a safe, economical and sustainable way. It is impeding progress and economic development in many, if not most, coastal States and has a major impact on the effective management, sustainable exploitation, and well-informed governance of the seas and oceans. This situation results notably from the fact that only about half of the States Parties to the SOLAS Convention have arrangements in place to provide adequate hydrographic surveying and nautical charting services. In this context, it is important to continue to call upon States that have not yet done so to consider becoming Member States and actively contributing to the work of the IHO, and urge all States to work with the IHO to increase the coverage of hydrographic information on a global basis.

All coastal States should be encouraged to ensure that their seas and coastal areas are properly surveyed and charted. This will directly support safety of navigation and protection of the marine environment. There are currently 165 States Party to SOLAS, 168 States Party to the UN Convention on the Law of the Sea and more than 150 States that have a recognisable coastline. Perversely, there are only 93 States that are Members of the IHO.

Through its active technical and capacity building programmes conducted in close liaison with other international organizations, notably the International Maritime Organization and the Intergovernmental Oceanographic Commission of UNESCO, the IHO supports the development and improvement of hydrographic and nautical charting standards, products and services, especially in digital formats. These capabilities contribute directly to safe navigation, informed marine spatial planning and coastal management and the prevention of natural disasters. They provide also a technical basis for the implementation of the UN Convention on the Law of the Sea.

General

1. The International Hydrographic Organization (IHO) is the inter-governmental international organization whose principal aim is to ensure that all the world's oceans, seas and navigable waters are properly surveyed and charted, through the coordinated endeavours of national Hydrographic Offices that also contribute to the promulgation of Maritime Safety Information (MSI). The requirement to provide these services is set out in Regulation 9 of Chapter V of the International Convention for the Safety of Life at Sea (SOLAS) and is therefore an obligation placed on all contracting governments. Regulation 9 requires, among other things, that States: "*… ensure that hydrographic surveying is carried out, as far as possible, adequate to the requirements of safe navigation*". Regulation 4 of Chapter V places an obligation on Contracting Governments to ensure that appropriate navigational warnings are issued as part of the MSI services. The IHO has been hosted by the Government of Monaco since its creation in 1921 and its current membership stands at 93 Member States.

2. The reference to "navigable waters" does not mean that the IHO is concerned only with safety of navigation. Although supporting safety of navigation is a major priority for all national Hydrographic Offices, their products and services, in some way or another, support all activities that take place on, in or under the sea. This has been highlighted in the five most recent themes for World Hydrography Day: "Our seas and waterways - yet to be fully charted and explored" in 2015, "Hydrography - the Key to well managed seas and waterways" in 2016, "Mapping our seas, oceans and waterways - more important than ever" in 2017, "Bathymetry - the Foundation for Sustainable Seas, Oceans and Waterways" in 2018 and "Hydrographic Information driving Marine Knowledge" in 2019. The IHO is one of the important actors underpinning the sustainable development of the oceans.

3. Hydrography involves measuring the depth of the water (bathymetry), describing the physical features of the seafloor 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 is increasingly being derived from satellite observations. Hydrography also involves measuring the tide and the currents.

4. Hydrographic information is essential for the safe, efficient and sustainable conduct of every human activity that takes place in, on or under the sea. Without hydrography, no ship sails; without hydrography, no port is built; without hydrography; no offshore infrastructure is developed; without hydrography, no environmental plan is implemented; without hydrography, no shore is defended, no island protected; without hydrography, no search and rescue operation is attempted, without hydrography, no maritime boundary is delimited. Therefore, hydrography is inherent to the three dimensions of the sustainable development of the oceans, ensuring that the marine environment is respected and that no adverse economic or social impact is incurred.

5. The activities of the IHO in 2018-2019 which addressed specifically the implementation of resolution A/RES/73/124 concerned four areas: developing standards, guidance, products and services; building capacities; raising awareness on the role of hydrography; and contributing to the promotion of the marine dimension in global agendas.

Developing standards, guidance, products and services

6. The IHO develops and sets standards, and issues guidance which ensure that hydrographic information is available and can be delivered to users through appropriate harmonized and interoperable products and services. The current maintenance of existing standards and the development of new ones are driven by the need to continue to satisfy the SOLAS requirements of enhancing safety of navigational, and more recently, supporting the implementation of "e-navigation", which is being led by the UN's International Maritime Organization (IMO). Both elements require easy access to standardized high quality digital geospatial information that can support marine spatial management. Accordingly, the IHO continued to work on its S-100 framework to support the creation and maintenance of interoperable maritime data product specifications compliant with the ISO-19100 series of geographic information standards. Product specifications for electronic navigation chart (S-101), bathymetric surface (S-102), surface currents (S-111), marine protected areas (S-122), marine radio services (S-123), marine traffic management

(S-127) and underkeel clearance management (S-129) for vessels navigating in waters of restricted depths have received approval already. The series also includes a product specification for maritime limits and boundaries (S-121). The purpose of S-121 is to provide UN DOALOS with a suitable format for the exchange of digital vector data pertaining to the maritime boundaries, limits and zones of States to meet their respective UNCLOS deposit obligations.

7. Numerous IHO Member States currently engage in significant efforts to establish regular and frequent services utilizing such datasets with national and regional coverage. Since the S-100 framework and the associated web based infrastructure is not limited to host data product specifications native to the hydrographic domain, the IHO is proactively supporting the expansion of the S-100 concept to related domains such as maintenance of fixed and floating aids to navigation (IALA), weather and sea ice coverage (WMO), rout plan exchange format (IEC), inland electronic charting (IEHG) and oceanography (IOC). A notable progress was made with the WMO weather wave hazards overlay (S-412) designed for digital nautical chart systems (ECDIS).

8. The IHO is also developing and maintaining guidelines to assist stakeholders in implementing the requirement of international instruments such as UNCLOS and SOLAS. An example is the Manual on Technical Aspects of the UN Convention on the Law of the Sea (TALOS Manual - IHO Publication C-51). The TALOS Manual is maintained jointly by the IHO and the International Association of Geodesy (IAG). Its purpose is to provide guidance in order to ensure maximum international standardization of the technical aspects of UNCLOS. The Manual can be downloaded free of charge from the IHO website at www.iho.int.

9. IHO standards and guidelines, intended to assist coastal States meet their obligations and requirements, fall under three main themes:

- nautical charts, issued on paper or in digital format (Electronic Navigational Charts), which are produced by national Hydrographic Offices to support safe navigation in accordance with the requirements of SOLAS;
- the maritime component of spatial data infrastructures being developed at the national and regional levels, which includes in particular high resolution bathymetry (depth data) compiled by national Hydrographic Offices;
- the global reference bathymetric data sets developed and made available through the GEBCO project (General Bathymetric Chart of the Oceans) operated jointly by the IHO and the Intergovernmental Oceanographic Commission (IOC) of UNESCO.

10. The current worldwide coverage of Electronic Navigational Charts is now effectively corresponding with paper chart coverage. However numerous areas remote from the highly frequented shipping routes are still not sufficiently covered by modern up to date nautical chart information. Further progress is hindered by the lack of reliable survey data and the allocation of appropriate resources and priority by the governments of many coastal States. While most of the world's established shipping routes are relatively safe navigationally because of widespread use by many ships over many years, the advent of larger vessels and the need for vessels to travel to new destinations, in particular with regard to the expansion of the cruise industry, are not being supported by adequate surveys and charts.

Building capacities

11. Capacity building continues to be an important component of the IHO Work Programme. The IHO defines capacity building as the process by which the Organization assesses the status of current arrangements and assists States to achieve sustainable development and improvement in their ability to meet hydrographic, cartographic and maritime safety obligations with particular reference to recommendations in UNCLOS, SOLAS, and other international instruments. The scope encompasses all hydrographic needs as it underpins every other activity associated with the sea, including safety of navigation, protection of the marine environment, national infrastructure development, coastal zone management, marine exploration, marine resource exploitation (minerals, fishing, etc.), maritime boundary delimitation, maritime defence and security, and coastal disaster management. The IHO Capacity Building Strategy stipulates that the focus should be on achieving enduring output which will benefit safe navigation, safety of life at sea, protection of the

marine environment and economic development, rather than on creating enabling infrastructure per se.

12. The IHO Capacity Building programme is funded from the IHO budget and is supplemented by additional support from Member States.. The level of activity of the IHO Capacity Building (CB) Programme in 2019 remained at the same intensity as in 2018. Expenditure in the IHO 2019 CB Work Programme was 872 832 Euros, 1% lower than the budget for the previous year. Ongoing financial support is provided by the Nippon Foundation of Japan, the Republic of Korea and by a contribution from the IHO budget with in-kind support from Member States and from industry. The Secretariat is continuing its campaign to find additional donor States and funding organizations. Taking into account the growing demands for IHO CB activities, more funds and contributions are required. For this reason, the IHO representatives continuously engage with external stakeholders such as the United Nations, IMO, IALA, the European Commission, funding agencies, academia and industry in general, with priority for the Caribbean, West Africa and South West Pacific regions.

13. The full range of IHO Capacity Building activities is accessible only to IHO Member States.

Raising awareness on the role of hydrography

14. The theme for the celebration of World Hydrography Day 2019 (WHD-2019) - “Hydrographic Information driving marine knowledge” - was intended to signal the eminent role of hydrographic data in combination with information provided by adjacent maritime domains and advertises the benefits of making hydrographic data accessible to the widest possible audience for use that goes well beyond safety of navigation. It was also intended to acknowledge the increasing interest being shown by the UN-Committee of Experts on Global Geospatial Information Management (UN-GGIM) in marine geospatial data. A number of WHD events were held by Member States of the IHO including Bangladesh, Italy, New Zealand, Pakistan, Poland, Sri Lanka and the United Kingdom.

15. The theme of World Hydrography Day (WHD) 2020 is “Hydrography – enabling autonomous technologies”. This theme is intended to highlight the role of hydrography in various dimensions: Firstly for the conduct of hydrographic survey itself by means of autonomously acting sensor carriers such as autonomous surface vehicles (ASV), autonomous underwater vehicles (AUV) and flying drones with Lidar equipment. Secondly to pave the way for the expected development of safe, secure and environmentally sound Maritime Autonomous Surface Ships (MASS) operations under the auspices of the IMO, which will definitely rely on certified hydrographic information.

16. Raising awareness on the role of hydrography was also the objective of technical assessment and advisory visits made or planned by the IHO in 2019 to Cameroon, Gambia, Lebanon, Marshall Islands and Palau.

Promoting the marine dimension in global agendas

17. The IHO Secretariat has continued to contribute directly to the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM). At its 9th session in August 2019 the report on the *Implementation and adoption of standards for the global geospatial information community* (Agenda Item 10), was brought to the attention of the Committee by the Secretary-General IHO. He assured the Committee that many diverse and collaborative standards development and implementation activities carried out by the three standards development organizations ISO, OGC and IHO in the global geospatial information management community. The Group of the three Standard Developing Organizations agreed to continue the strong liaison on all levels to support the UN-GGIM process further.

18. The Working Group on Marine Geospatial Information under the leadership of John Nyberg (USA), established by UN-GGIM 7 in 2017, reported to the Committee of Experts for the second time. The Committee welcomed the report of the Working Group on Marine Geospatial Information, and noted its progress, including the initiation of a use-case exercise on data availability and interoperability. The Chair highlighted that the group has utilized the Integrated Geospatial Information Framework as mechanism for articulating and demonstrating national leadership in marine geospatial information and that its nine strategic pathways are the appropriate means towards implementing integrated marine geospatial information systems in a way that will deliver a

vision for sustainable social, economic and environmental development. He insisted that marine geospatial information must be made available, accessible and discoverable for a multiplicity of purposes. The Committee invited the Working Group to consider the variety of marine data sources that may be available, and in this regard, consider capacity development activities to strengthen marine geospatial information capabilities in developing countries and Small island developing states.

Ocean bathymetry

19. The General Bathymetric Chart of the Ocean (GEBCO) project is a joint programme that is executed under the governance of the IHO and the Intergovernmental Oceanographic Commission (IOC) of UNESCO. GEBCO is directed by a Guiding Committee made up of representatives from both IHO and IOC and is supported by a Technical Sub-Committee on Ocean Mapping (TSCOM), a Sub-Committee on Undersea Feature Names (SCUFN), a Sub-Committee on Regional Undersea Mapping (SCRUM), a Sub-Committee on Communications, Outreach and Public Engagement (SCOPE) and a Nippon Foundation/GEBCO Training Project Management Committee. SCUFN maintains close liaison with the UN Group of Experts on Geographical Names (UN-GEGN), and with international or national authorities concerned with the naming of undersea features.

20. Through the work of its organs, GEBCO produces and makes available a range of bathymetric data sets and products, including the GEBCO Gazetteer of Undersea Feature Names; the GEBCO world map; GEBCO Cook Book; Web Map Services and its lead bathymetric product: a global gridded bathymetric data set.

21. A significant source of data for these products is the IHO Data Centre for Digital Bathymetry (DCDB). One of the primary objectives of the IHO DCDB is to provide an authoritative source of bathymetry for ocean mapping requirements. In order to achieve this, GEBCO proactively collects, stores and disseminates bathymetric data for the world's oceans. GEBCO has worked towards improving its participation in regional mapping activities and has appointed representatives to participate in selected meetings of Regional Hydrographic Commissions that operate under the umbrella of the IHO. Traditionally GEBCO has focused on waters deeper than about 200 m; however, it is now actively collecting data in shallow water areas to support activities such as coastal zone management and development, and the mitigation of marine disasters such as storm and tsunami inundation. IHO Member States are encouraged to contribute bathymetric data in shallower coastal areas to support the production of higher resolution gridded data products.

22. A new GEBCO 15 arc-second global grid, GEBCO_2019, was published in March 2019. This is the first GEBCO grid produced in cooperation with the Nippon Foundation-GEBCO Seabed 2030 Project. The grid uses as a 'base' Version 1 of the SRTM15+ data set (Olson et al, 2014) - a fusion of land topography with measured and estimated seafloor topography. This base grid is augmented with the gridded bathymetric data sets developed by the four Seabed 2030 Regional Centers and compiled into a global bathymetric grid at the Seabed 2030 Global Center. Information on how to access the grid and the data sets included can be found on the GEBCO web site: www.gebco.net/data_and_products/gridded_bathymetry_data/.

23. Initiated at the Forum for Future Ocean Floor Mapping by Mr Sasakawa, chairman of the Nippon Foundation, in Monaco in June 2016, the Nippon Foundation-GEBCO Seabed 2030 project commenced its operational phase at the beginning of February 2018. Under the initial Directorship of Mr Bindra Sindra, the project stood up the four regional centres (North Pacific-Arctic Oceans, South and West Pacific Ocean, Atlantic-Indian Oceans, and Southern Ocean) and the Global Center based at the British Oceanographic Data Centre (BODC) of the National Oceanographic Centre (NOC) in the United Kingdom (UK). A number of regional meetings have been held with a focus on data discovery, making data publically available and gap assessment. A reappraisal analysis of the data coverage of the GEBCO 30 arc-second grid, based on current technology variable resolution bands, indicated that about 6% of the current GEBCO grid has been completed. The Seabed 2030 project has a goal of completing the GEBCO grid by 2030, such that each grid cell at the defined target resolutions that varies by depth, will contain at least one depth sounding. The new GEBCO grid released in March 2019, contains significantly more data, particularly in the Arctic and Antarctic regions, where the coverage has increased to approximately 15%. Work continues on making additional datasets available and encouraging the IHO Crowdsourced

Bathymetry (CSB) initiative to help increase the publicly available bathymetric data. The Seabed 2030 regional and global centers continue to work closely with the CSBWG.

24. The IHO established a Crowdsourced Bathymetry Working Group (CSBWG) in 2015 to examine how best to incorporate, manage and use bathymetric data acquired by other than conventional means and develop principles and guidelines to enable the appropriate collection and use of crowdsourced bathymetry for the benefit of all stakeholders interested in knowing the shape and nature of the seafloor and its depths. In 2019, the CSBWG, comprising representatives from national Hydrographic Offices, academia, and industry finalised the first Edition of a guidance document that sets out the key issues regarding crowdsourcing - both from a collector's and a user's perspective. The guidance document provides general advice and information for those considering collecting or using crowdsourced bathymetry. It is not intended to be either prescriptive or authoritative, but rather to alert those with an interest in crowdsourcing of the relevant considerations to take into account. The guidance document named IHO B-12 "Crowdsourced Bathymetry Guidance Document" was approved by the IHO Member States in April 2019 and is now publicly available for application.

Awareness of hydrography and the future

25. Increased IHO involvement in the United Nations initiative on Global Geospatial Information Management (UN-GGIM) and the preparatory phase of UN´s Decade of Ocean Science for sustainable development indicates that there is a growing acknowledgement and awareness of the relevance and the underpinning contribution that hydrographic information can make in the context of the 2030 Agenda for Sustainable Development and in particular in support of its Sustainable Development Goal 14 - Conserve and sustainably use the oceans, seas and marine resources for sustainable development. The IHO will not stop to underpin the vital importance of the digital mapping of the oceans presenting seabed topography as the basic information and to advertise for IHO´s S-100 approach to be potentially applicable to all sorts of marine information including chemistry and biology of the oceans resulting in interoperable datasets to form "the digital aquarium".