INTERNATIONAL HYDROGRAPHIC ORGANIZATION

ANNUAL REPORT 2019

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FOREWORD

The year 2019 saw the centenary of the First Hydrographic Conference which took place in London, United Kingdom in the summer of 1919. Only one year after the end of “the” War, representatives from 26 countries met at Trinity House to discuss and agree on future technical cooperation in hydrography. The report of the proceedings starts with the following statement:

> *“The experiences of the War in special relation to hydrographic matters showed most clearly the enormous importance of the possession of accurate charts and hydrographic information generally, and the very grave disadvantage attendant on their no-possession; and also brought clearly into prominence the great divergence in methods of production, etc. obtaining in the various countries of the world. It was also evident that the cessation of the War must inevitably lead to increased activities in shipping trade, and that this must automatically increase the amount of hydrographic surveys which will be required by all maritime countries of the world.”*

This notable modern phrasing confirms that hydrography was already considered a prerequisite of what was highlighted in the 2019 theme for World Hydrography Day “Hydrographic information driving marine knowledge”. Yet clearly, the major focus 100 years ago had been the aspiration for uniformity of items such as units of measurement, descriptions of currents and tidal streams, and the design of nautical charts and sailing directions. The international community of hydrographic offices agreed at this Conference that resolutions would constitute the primary mechanism to establish regulations which would be valid and respected internationally. This approach still prevails and constitutes the foundation of the International Hydrographic Organization which was established two years later as a result of the considerations of the London Conference. One of the fundamental documents of the IHO, the Publication M-3 *“Resolutions of the IHO”,* still holds 23 Resolutions which originate from this Conference in 1919. Though amended from time to time, numerous basic assumptions related to the objects of the Organization are laid down here.

The collection of resolutions remains our indispensable regulatory framework. However, in turbulent times like ours, it was necessary to find a way to be able to adopt resolutions and reach decisions which was prompt yet also based on collective discussions. This was the purpose in amending the IHO Convention and establishing the Council, which originally focused on three main goals: First, to develop an identity and culture for the Council and institute processes which promote effectiveness. Second, to position this new organ within the existing structures of the IHO, the Secretariat, the Inter-regional Coordination Committee (IRCC), and the Hydrographic Services and Standards Committee (HSSC). Third, to develop proposals for the strategic direction of the IHO for consideration by the Assembly. With the completion of the first Council triennium this year, we are proud of the accomplishments achieved in these areas, and of the development of a robust operating mechanism for the Council that will enable the IHO to progress on important issues more rapidly.

The smooth interaction between the Council, the Secretariat and the relevant Committees produced the first results. Numerous brand new digital product specifications based on the S-100 framework were approved and a first roadmap for the introduction of the S-101 format for the next technical generation of Electronic Navigational Charts covering all navigable waters was presented.

The IHO sees standardization not only for its technical aspects. In collaboration with the International Federation of Surveyors (FIG) and the International Cartographic Association (ICA) we oversee two compilations of curricula content that institutions and professional bodies use as part of their educational/training programmes and competency schemes, Standards of Competence for Hydrographic Surveyors and for Nautical Cartographers. Those two standards are the accepted basis for education in hydrography and nautical cartography worldwide and also serve as a tool to assess the providers of such education. This approach is efficient and successful as there are currently 62

recognized programmes spread across 32 countries. It is encouraging that there is a good number of entities – either universities, colleges or commercially-acting industry stakeholders spread over all continents which offer professional education and training in hydrography and nautical cartography in a harmonized way. This provides Hydrographic Offices, industry and academia with a comparable level of competence from appointed personnel.

The relevant chapters of this report reflect these developments and the related prospects in more detail. It highlights how, thanks to the enduring commitment and support of its Member States through human, technical and financial resources, the IHO was again able to largely meet its goals articulated under all three Work Programmes of Corporate Affairs, Hydrographic Services and Standards, and Inter-Regional Coordination and Support.

This year saw the start of another triennium: 2019 to 2021 which will remind the public of the first Hydrographic Conference in London in 1919 and the foundation of the International Hydrographic Bureau in 1921 in the Principality of Monaco. These constituted the starting point for a centenary of fruitful international cooperation in hydrography. As part of the celebrations, the IHO's legacy was highlighted in an exhibition and a symposium focusing on the history of survey and cartography in the Mediterranean and beyond.

History provides an important perspective to assess achievements and adjust decisions to tackle current challenges. One of these challenges is to be heard and be recognised in the context of a multitude of players competing for attention and resources. To address this, the IHO has increased its use of modern media and digital communication channels and created a contemporary branding. Living in a visual age, the revised corporate design with the careful modernization of the logo and the launch of the new IHO website are visible steps in the updating of our corporate identity.

This foreword started with the explanation of how IHO Resolutions were important instruments for international cooperation in Hydrography. One of the prominent resolutions is Resolution 7/1919 *"Hydrographic Office arrangements for the exchange and reproduction of nautical products"*. This resolution was recently amended during the first IHO Assembly in 2017 to reflect the digital aspect of nautical products nowadays. It can be expected that this will not be the last amendment since uniformity in presentation and ease of use are permanent concerns for both chart and text orientated nautical information. The national Hydrographic Offices of the now 93 IHO Member States dedicated "to improve global coverage, availability and quality of hydrographic data, information, products and services …" through the IHO Convention, have taken stock of such remarks and will implement appropriate measures in their respective work programmes. The compelling need to get the oceans mapped for a multitude of societal, scientific and commercial reasons as well as rapidly emerging new survey technology requires a truly international approach to bring together all capacities, whether from the public and commercial sectors, ocean research or citizen science. The spirit of the very first Conference, now a hundred years ago, which was to embark on a cooperative intergovernmental approach, still remains our guiding path.

Monaco, 1st March 2020



Abri Kampfer	Dr Mathias Jonas	Mustafa Iptes
Director	Secretary-General	Director

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INTRODUCTION

Introduction

The Secretariat is pleased to present the Annual Report of the activities of the Organization for 2019. This report provides an account of the principal activities and achievements of the IHO, the subordinate bodies of the Organization and the Secretariat during the year. The report also describes the cooperation and participation of other international organizations and stakeholders in the execution of the IHO Work Programme. This Report consists of two Parts:

Part 1 – General

Part 1 provides short summary reports and observations on the execution of the IHO Work Programme. Part 1 is structured based on the three parts of the Work Programme: Corporate Affairs, Hydrographic Services and Standards and Inter-Regional Coordination and Support. In this way, the Report is also directly related to the technical structure of the Organization which is based on the Secretariat (Corporate Affairs) function and the two principal Committees - the Hydrographic Services and Standards Committee (HSSC) and the Inter-Regional Coordination Committee (IRCC). As far as possible, Part 1 of the Report follows the same structure and uses the same headings as in the approved Work Programme.

Part 2 – Finance

Part 2 provides the financial statement and accounts for 2019 together with the report of the external auditor.

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The numbering of the pages will be updated at the final version

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PART 2 - FINANCE

PART 1 – GENERAL

Summary reports and observations on the execution of the IHO Work Programme

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MEMBER STATES OF THE INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO) – 31 December 2019

Algeria	Monaco
Argentina	Montenegro
Australia	Morocco
Bahrain	Mozambique
Bangladesh	Myanmar
Belgium	Netherlands
Brazil	New Zealand
Brunei Darussalam	Nigeria
Bulgaria	Norway
Cameroon	Oman
Canada	Pakistan
Chile	Papua New Guinea
China	Peru
Colombia	Philippines
Croatia	Poland
Cuba	Portugal
Cyprus	Qatar
Democratic People's Republic of Korea	Republic of Korea
Democratic Republic of the Congo*	Romania
Denmark	Russian Federation
Dominican Republic	Samoa
Ecuador	Saudi Arabia
Egypt	Serbia*
Estonia	Seychelles
Fiji	Singapore
Finland	Slovenia
France	South Africa
Georgia	Spain
Germany	Sri Lanka
Ghana	Suriname
Greece	Sweden
Guatemala	Syrian Arab Republic*
Iceland	Thailand
India	Tonga
Indonesia	Trinidad and Tobago
Iran (Islamic Republic of)	Tunisia
Ireland	Turkey
Italy	Ukraine
Jamaica	United Arab Emirates
Japan	United Kingdom of Great Britain and Northern Ireland
Kuwait	United States of America
Latvia	Uruguay
Malaysia	Vanuatu
Malta	Venezuela (Bolivarian Republic of)
Mauritius	Viet Nam
Mexico	

***** *Rights of membership suspended*

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IHO SECRETARIAT

Secretary-General	Directors
Dr Mathias JONAS, Germany	**Abri KAMPFER,** South Africa
	
	Mustafa IPTES, Turkey
	

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Managerial Staff

Alberto PEDRASSANI COSTA NEVES	(Brazil)	Cooperation and Capacity Building	
Yves GUILLAM	(France)	Charting and Services	
Anthony PHARAOH	(South Africa)	Digital Technology	
David WYATT	(United Kingdom)	Surveying and Operations	
Ghislaine FAUCHOIS	(France)	Manager, Finance and Administration	

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Translators

Mary Paz MURO	Spanish Translator	
Isabelle ROSSI	Head French Translator	
Perrine BRIEDA SAUVEUR	French Translator	

Technical, Administrative and Service Staff

Isabelle BELMONTE	Website and Publications Editor	
Sandrine BRUNEL	Capacity Building Assistant	
Lorène CHAVAGNAS	Office Assistant	

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Dan COSTIN	Information Technology Officer	
Caroline FONTANILI	Personal Assistant	
Sarah JONES-COUTURE	Public Relations and Communication Officer	
Arezki MAACHE	Bureau Support Assistant	
Daniel MENINI	Cartography and Graphics Assistant	
Mireille MOLLET	Registrar, Librarian	

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Jeff WOOTTON

Technical Standards Support Officer

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Associate Professional Officers

Dr Hee Yoon PARK (from September 2018)	(Republic of Korea)	Standards Support	
Naohiko NAGASAKA (from April 2018)	(Japan)	GIS and IT Projects	
Cesar Rodriguez (from February 2019)	(Peru)	Council Managing Assistant	
Kristen Crossett (since May 2018)	(USA)	Social Media Content and Provision Management	

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WORK PROGRAMME 1
Corporate Affairs

Introduction

IHO Work Programme 1 “Corporate Affairs” covers the provision of the principal organs as well as the other services of the Secretariat of the IHO including the management and fostering of relations with other international organizations. Work Programme 1 is executed primarily by the Secretariat, under the leadership of the Secretary-General assisted by the two Directors.

IHO Council

- **The 3rd Session of the Council (15-17 October 2019)**

The Secretary-General of the IHO, Dr Mathias Jonas welcomed members of the Council and noted that 29 Member States were registered, with apologies having been received from South Africa. The absence of India was then noted. He acknowledged the participation of the following 8 Member States who do not have a seat at the Council: Bangladesh, Croatia, Malta, Myanmar, Nigeria, Poland, Portugal and Qatar. In his welcoming remarks he pointed out that the Council is a new instrument in the one hundred-year history of the IHO and was still in a work in progress mode. The Secretary-General reminded the participants that the Secretariat is the Secretariat of the Organization, not the IHO itself, and has a rather small capacity of 20 staff who also supported three committees, six sub-committees, 13 working groups as well as other projects. He requested the members to be agile, flexible and pragmatic in their discussions. Members should aim to minimize bureaucracy and be self-confident in their ability to take action and get work done, in particular on the eve of the deadline for the submission of proposals to be considered at the 2nd session of the Assembly.

3rd Council Meeting - Monaco

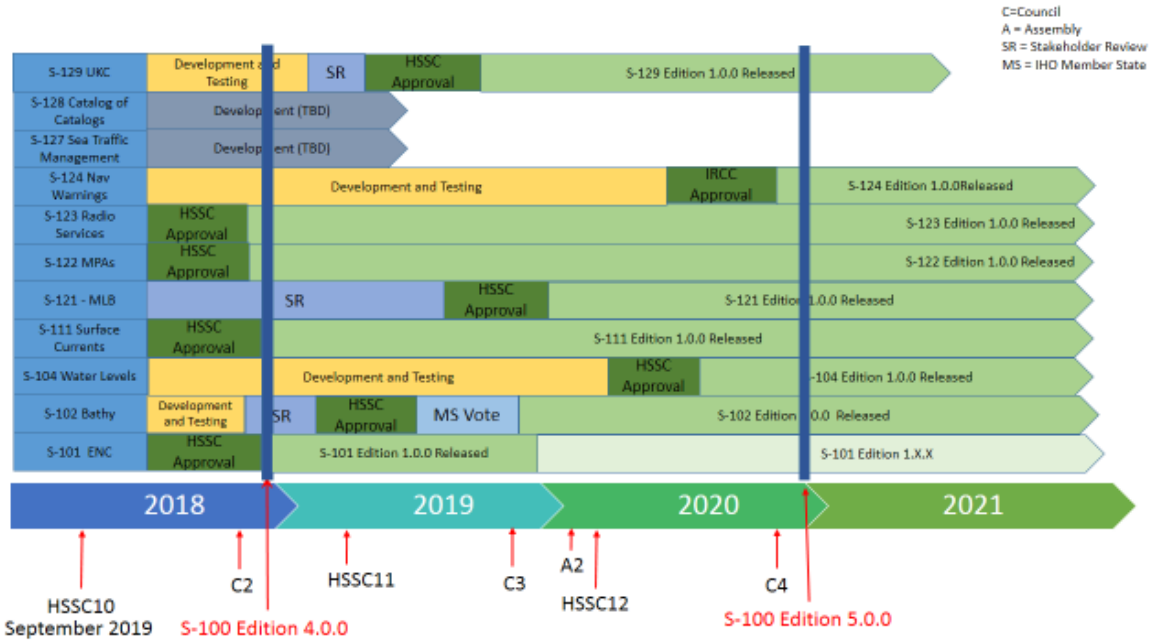
The Chair of the Council, Rear Admiral Shepard Smith (USA), noted that a new era was coming to the hydrographic world, with new technological capacities, internal and global governance and the overarching question of sustainability. The 36 Member States present represented nearly 40% of the membership of the IHO and almost 50% of global tonnage. He called on members to be mutually supportive in embracing a world that would be better, faster and cheaper than could have

been imagined. The Council would be called upon to examine the Strategic Plan; the S-100 Roadmap and the promise of a new generation of navigation support services; as well as Governance matters. The Assembly would expect the Council to produce informative reports and recommendations.

- **Report and proposals from HSSC**

The Chair of HSSC Rear Admiral Luigi Sinapi reported on the work of the Committee for the current cycle of the Council and highlighted the prioritized activities both at the strategic and technical level. These included: the development of S-98 (the S-100 interoperability specification); completion of the S-121 product specification; continued S-101 development; consolidated efforts to improve data quality and data quality visualization; and further work on the future of the paper chart. Other areas of advancement include the preparation of a new edition of S-44, the publishing of the Chinese version of the IHO Dictionary and the preparation of an Arabic version, cyber security, and again the harmonization of data quality across S-100 products, a theme of particular significance for autonomous shipping.

A new S-100 timeline was presented which indicated the processes and steps for the development and approval of the suite of S-100 specifications. “Making the IHO S-100 framework a reality” has been adopted as the unofficial mantra of the HSSC.



There was an active and wide-ranging discussion regarding the future of the paper chart. It is evident that Member States have varying plans concerning paper chart production and provision. Participants called for more work from the NCWG to determine the future role of paper charts, since they were increasingly used only as a backup and to determine the impacts on the INT chart program that this diminished role might provoke. These tasks need to be reflected in the work plans of the working group.

- **Showcase of S-100 based products and test beds**

The Chair of HSSC introduced five presentations by four Member States illustrating the potential of the new S-100-based products and services. He explained that the goal of the showcase was to demonstrate the work that is being carried out towards the implementation of the S-100 framework.

Canada provided an overview of pilot projects that are underway for developing dynamic S-100 based products and services. Focus is now on S-102, S-104, and S-111 data. Test beds are being run in key maritime traffic areas such as the Port of Vancouver and the St Lawrence River. Projects include the provision of high-density S-102 data via a cloud-based service. Portable pilot unit (PPU) manufacturers and pilots are also being included in the evaluation of the data and services. The services are tested by river pilots using portable pilot units. Canada is hoping to cooperate further with regional neighbours and the other members of ARHC to develop complementary, non-duplicating products and services.

Norway has developed an S-102 demonstrator and distribution service, a cloud-based S-102 bathymetry data service and a “dual-fuel” service distributor covering both S-57 and S-101. Operational testing included a demonstration of the liner Queen Mary II entering Oslo harbour, which provided more accurate seabed mapping information than even experienced pilots can provide.

The Republic of Korea has developed an S-100 web testing procedure which is interoperable, viewable, user-friendly and open to all users. A sea trial was conducted in August 2019, involving mariners, pilots, data producers and systems developers, with two S-100 test systems installed on the bridge of the vessel and a third in the data analysis room.

The National Oceanic and Atmospheric Administration (NOAA), United States, is developing an open-source process to convert native surface current data to the S-111 format. It provides surface current predictions in one-hour time-slots, 72 hours in advance, which can be used to predict voyage times more accurately, enabling captains to maintain more consistent speeds and thus save fuel. The methodology could potentially be expanded beyond coastal zones to the global ocean level.

The Naval Information Warfare Center (former SPAWAR), United States, has worked on the S-100 Working Group Test Framework to improve the standardization of services. It has developed a viewer, using an open-standard scripting language (Lua) commonly used in videogaming, and an encoded dataset browser compatible with the ISO-8211 standard, which will ensure machine readability for OEMs. The viewer is capable of feature and portrayal catalogue validation.

- **Report and proposals from IRCC**

The IRCC Chair Dr Parry Oei presented a report of the Committee’s activities with particular emphasis on the continued need for Capacity Building; the ongoing work of an amended assignment for the WENDWG to also encompass the future S-100 products; Maritime Safety Information (MSI); Crowdsourced bathymetry; Project Seabed 2030; and Marine Spatial Data Infrastructure (MSDI). It was encouraging to note the improvements in developing countries, introduced slowly but surely in recent years, as a result of capacity building. Considerations on the status of the Seabed 2030 Project in terms of the coverage of the current GEBCO grid meeting Seabed 2030 requirements (6%) were given in order to raise the awareness of the challenge to reach 100% in 2030. IRCC Chair acknowledged the work of the IHO Project Team on implementation of UN-GGIM Shared Guiding Principles.

- **S-100 Implementation Strategy**

The Secretary-General introduced the discussion of the S-100 Implementation Strategy, indicating the topic was among the most important to be discussed by the Council and carried a mix of emotions by Member States due to the goodness of technology versus the anxiety of implementation timelines. The main drivers to develop S-100 are further digitization in the shipping industry - for classic and autonomous navigation – and the benefits of "smart hydrography". The new S-100 will not only improve safety of navigation and shipping in ports, but provide a cyber-secure, easily maintained software foundation that will support creative industry policy. S-101 ENC will become the premium product of hydrographic offices. In order to start with reasonable coverage, S-101 ENC could be produced by converting S-57 datasets before native production of ENCs in the cartographically enriched S-101 format. The IHO will coordinate with IMO and industry stakeholders concerning the transition to the S-101 ENC production, coverage and use in end user applications. The "dual fuel" model of parallel provision of S-57 ENCs and S-101 ENCs after this date for a significant duration would be instrumental for the transition period.

The Council agreed that substantial data coverage is necessary for successful adaptation among customers, especially within the shipping industry. It was also noted that there should be a technical and standardized compatibility between S-101 and S-57 during the transition phase for the implementation period to allow for S-57-only ECDIS to meet carriage requirements and remain operational. There should also be a defined sunset for S-57 ENC complaint production. The meeting underlined the importance of effective implementation since the safety of the mariner was at stake as well as the reputation of the IHO. The Council confirmed the importance of starting engagement with stakeholders and industry in this implementation phase as its success relies on good coordination, cooperation and synchronization established and maintained among different parties.

- **Review of IHO Corporate Affairs**

The Secretary-General briefly reviewed the highlights of IHO's work in 2019. He introduced the proposed work programme for 2020, based on the third year of the 3-year programme approved by the First Session of the IHO Assembly and covering the three programme elements of corporate affairs, hydrographic services and standards and interregional coordination and support.

The key priorities of the IHO Work Programme 2019-2020 were summarized as follows:

Corporate Affairs	Hydrographic Services and Standards	Inter-Regional Cooperation and Support
• Facilitate the technical and operational arrangements of the S-100 implementation based on C-3 discussions. • Promote the joint approach of DCDB, GEBCO and Seabed 2030 in collaboration with IOC. • Intensify engagement within the framework of the UN Nations to foster the use of marine geoinformation on the basis of the IHO Standardization framework and regional/national contributions of the IHO Member states. • Enhance the visibility of the IHO trough digital centricity of communication including	• Develop an S-100 Interoperability Specification • Develop all the components needed to make S-101 a reality • Develop S-121 Product Spec for Maritime Limits and Boundaries • Consolidation and clarification of standards in relation to ECDIS/ENC • Future of Nautical Paper Chart • Consider data quality aspects in an appropriate and harmonized way for all S-100 based product spec. • Prepare Ed. 6.0.0 of S-44	• Increase in the provision of capacity building requests and follow up activities by existing and new IHO member states • Implementation of Crowd Sourced Bathymetry Activities • Implementation of Seabed 2030 Project • Development of Marine Spatial Data Infrastructures activities • Transition from WEND to WENS Concept

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incorporation of the Secretariat´s GIS-services. • Continue preparations of the upcoming Centenary celebrations of IHO.		

- **IHO Strategic plan review - Report and Proposals from SPRWG**

As an introduction to the discussions about the Revised Strategic Plan, the Chair of the Strategic Plan Review Working Group (SPRWG), Bruno Frachon (France), introduced the draft reviewed Strategic Plan. The Plan is designed as a portable tool without reference and contains an overview of IHO and Member States' hydrographic activities and three Strategic Goals (SG) encompassing eight Targets for 2021-2026.

SG 1 encompasses evolving hydrographic support for safety of navigation;

SG 2 involves increasing the use of hydrographic data for the benefit of society;

SG 3 covers participation in international initiatives related to sustainable use of the ocean.

The meeting agreed on the way forward to ensure the continuation of the work of the SPRWG, pending amendments to its TORs and ROPs, from A-2 to the first meeting of the Council after A-2 (C-4). The Council endorsed the proposed Revised Strategic Plan and tasked the IHO Secretariat to submit the proposal to A-2 for Member States approval.

- **Acknowledgements**

Norway recognized Bruno Frachon (France), chair of SPRWG, for his lengthy contribution of work to the IHO and for leadership of SHOM. The Chair recognized Luigi Sinapi (Italy) for his work over the Council cycle and his leadership of HSSC and IIM. The United Kingdom recognized Parry Oei (Singapore) for his work as Chair of IRCC and the First Session of the IHO Assembly, and his leadership of hydrography in Singapore and the East Asian region.

The Secretary-General asked for the Secretariat to be associated with the comments about Bruno Frachon, Luigi Sinapi and Parry Oei. The Secretary-General also congratulated all the delegates on bringing the Council into being and making it a valuable body of the IHO. He highlighted the efforts made by the whole Secretariat´s staff to make the conduct of the Council so smooth and efficient.

USA recognized Luis Palmer, Vice-Chair of the Council, for his work in Brazil and the MACHC. Germany thanked the Chair for his work in establishing the Council, bringing it into being, and building it into a significant and effective body within the IHO structure. The Chair thanked the delegates for all their efforts and work in addressing the tasks undertaken by the Council.

Cooperation with International Organizations

This element covers liaison and cooperation between the IHO and other international organizations. Notable activities during the year are described. The IHO was represented in most cases by the Secretary-General, a Director or an Assistant Director.

International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)

- **IALA – IHO Coordination Meeting**

Under the framework of the Cooperation Agreement between the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and the IHO, a coordination meeting was held at the IALA Headquarters in Saint-Germain-en-Laye, France on 16 October in conjunction with the 10th IALA Aids to Navigation Requirements and Management (ARM) meeting (14 to 18 October).

The IHO/IALA coordination meeting was attended by five IALA members and Assistant Director Anthony Pharaoh represented the IHO Secretariat. Update reports were provided on the standards development activities of both organizations. Since the last meeting, the IHO has published a new edition of the S-100 framework standard and five new product specifications. IALA has completed a product specification for Aids to Navigation Information (AtoN) (S-201) which will be released as Edition 1.0.0 for testing and evaluation. IALA has also made significant progress with their Maritime Resource Name (MRN) specification. This provides a naming scheme that can be used to uniquely identify any maritime resource on a global scale.

Other items discussed during the meeting included; charting requirements for new combinations of fixed and flashing lights, the status of inclusion of Aids to Navigation concepts (terms and definitions) in the IHO Registry and recent extensions to the Maritime Resource Name specification.

Participant of the 10th IALA ARM Meeting

During the main IALA ARM plenary meeting, reports were provided on relevant items from recent IMO Council, Maritime Safety Committee (MSC) and Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) meetings. Presentations were provided on the status of the *Integrated Maritime Autonomous Transport,* and the *Smart Navigation* projects. A presentation was also provided on the impact of AtoN distribution during North China Sea freeze-up. Progress was made on the development of various work items under the Navigational Requirements, Information Services and Portrayal and Risk Management Working Groups, during the course of the week.

International Maritime Organization (IMO)

The Secretariat of the IHO represented the Organization at all IMO sessions where the agenda contained items of relevance to the Member States, submitting papers for consideration as appropriate. The following paragraphs provide summaries of IHO involvement in various bodies of the IMO that met during the year.

- **Sub-Committee on Navigation, Communications and Search and Rescue (NCSR)**

The Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) is a subordinate body of the Maritime Safety Committee (MSC) of the International Maritime Organization (IMO).

The 6th session of the Sub-Committee (NCSR 6) was held at the IMO Headquarters in London, United Kingdom from 16 to 25 January. The IHO was represented by Director Abri Kampfer, Assistant Director David Wyatt, Mr Peter Doherty, the Chair of the World-Wide Navigational Warning Service Sub-Committee (WWNWS-SC), and Mr Christopher Janus, Branch Chief, NGA Maritime Watch - NAVAREA IV/XII. Several representatives of Hydrographic Offices also attended the meeting as a member of their national delegation.

IMO NCSR 6 Plenary in session

The Sub-Committee received reports from the Chair of the IMO NAVTEX Panel and the Chair of the IHO WWNWS-SC reported on the activities of the sub-committee.

With respect to navigation matters, the NCSR 6 approved the draft MSC resolution on amendments to MSC.191(79) on Performance standards for the presentation of navigation-related information on shipborne navigational displays, which included an expanded appendix of S-mode Guidelines. The Sub-Committee approved the draft SN.1/Cir.243/Rev.2 on Guidelines for the presentation of navigation-related symbols, terms and abbreviations. The NSCR 6 approved the draft MSC circular on Initial descriptions of Maritime Services in the context of e-navigation, which included an annex containing all the draft descriptions submitted by coordinating bodies to date. The Sub-Committee approved the draft MSC circular on Guidance for navigation and communication equipment intended for use on ships operating in polar waters.

IHO and WMO delegations at IMO NCSR 6

In regard to Communications and Global Maritime Distress and Safety System (GMDSS) matters, the Sub-Committee approved the re-establishment of a Correspondence Group on the modernization of the GMDSS, taking into account the progress on the revision of SOLAS chapters III and IV and on the related and consequential amendments to existing instruments other than SOLAS. The Sub-Committee invited Member States and international organizations to submit proposals to a subsequent session to address the issues related to monitoring of Enhanced Group

Call (EGC) messages in a multi-provider environment. The NCSR 6 approved revisions to the SafetyNET Manual related to the recognition of the Fleet Safety service and for these revisions to be issued as interim guidance in a MSC circular. The Sub-Committee approved the proposed amendments to resolutions A.705(17), as amended, – *Recommendation on promulgation of Maritime Safety Information*, A.706(17), as amended, – *World-Wide Navigation Warning Service*, and A.1051(27) – *IMO/WMO worldwide met-ocean information and warning service guidance document* – subject to final consideration of some text at MSC 101 before final approval and adoption. The Sub-Committee approved the revised Terms of Reference for the International SafetyNET Coordinating Panel and agreed to the re-naming of the Panel to become the IMO Enhanced Group Call (EGC) Coordinating Panel, in line with the current IMO NAVTEX Coordinating Panel.

- **Maritime Safety Committee**

IMO MSC 101 in plenary session

The Maritime Safety Committee (MSC) is the highest technical body of the International Maritime Organization (IMO). The functions of the MSC are to consider matters related to aids to navigation, construction and equipment of vessels, rules for the prevention of collisions, handling of dangerous cargoes, maritime safety procedures, hydrographic information, salvage and rescue and any other issues directly affecting maritime safety.

The 101st session of the MSC (MSC 101) was held at the IMO Headquarters in London, UK, from 5 to 14 June. Director Abri Kampfer and Assistant Director David Wyatt represented the IHO. In addressing the agenda of the session in his opening statement, the Secretary-General of IMO, Mr Kitack Lim, highlighted completing the high-level review of IMO instruments and performing an overarching analysis to ensure that MASS operations are addressed in the most efficient manner in future, keeping in mind the need to maintain or, if possible, enhance safe navigation and operations. He highlighted that Sub-Committee on Navigation, Communications and Search and Rescue (NCSR) had produced many draft circulars and resolutions for approval and adoption; of special importance were the instruments related to the provision of maritime safety information through Inmarsat Fleet Safety and Iridium Safety Cast. He noted it was imperative that the guidance material needed to implement those new services was made available as soon as possible.

Acting Director Seabed 2030 Project, Dr Graham Allen, addressing a post plenary session at MSC 101

Dr Graham Allen, acting Director of the Nippon Foundation (NF)-GEBCO Seabed 2030 project, gave a presentation during one of the post plenary events, which was supported by an information

document submitted to the MSC 101. He provided background to GEBCO and the Seabed 2030 project as well as highlighting the progress achieved by the Seabed 2030 to date and the next steps to increase the current global bathymetric coverage. He highlighted the recent success of the NF-GEBCO Alumni team in winning the Shell Ocean Discovery XPrize competition. He concluded with the actions that maritime administrations could take to support the project and thus contribute to achieving the goals of UN Sustainable Development Goal (SDG) 14 and the UN Decade of Ocean Science for Sustainable Development.

Maritime Autonomous Surface Ships (MASS)

The Committee noted the progress of the regulatory scoping exercise. The MSC encouraged IMO Member States to contribute to the first step of the regulatory scoping exercise and invited Member States to submit the results of the first step to the intersessional Working Group. The Committee approved the terms of reference for the intersessional Working Group and approved the draft interim guidelines for MASS trials and the associated MSC circular (MSC.1/Circ.1604). A number of IMO Member States highlighted the need to have prior permission from coastal state for vessels in level 3 and 4 of autonomy to operate in their waters.

Hydrography, Navigation and Charting

The traffic separation schemes and routeing measures approved at NSCR 6 were adopted. The MSC approved the MSC Circular (MSC.1/Circ.1609) on *Guidelines for the standardization of user interface design for navigation equipment, S-Mode*. The Committee also adopted the resolution MSC.466(101) on *Amendments to the Performance standards for the presentation of navigation-related information on shipborne navigational displays* and approved SN.1/Circ.243/Rev.2 on *Guidelines for the presentation of navigation related symbols, terms and abbreviations*. Directions given by all three documents will affect the design of ECDIS user interface from 2024 onwards. The Committee adopted resolution MSC.467(101) on *Guidance on the definition and harmonization of the format and structure of Maritime Services in the context of e-navigation* and approved MSC.1/Circ.1610 on *Initial descriptions of Maritime Services in the context of e-navigation*.

Maritime Safety Information

The Committee approved MSC.1/Circ.1364/Rev.1/Corr.1 on *Amendments to the Revised International SafetyNET Manual* and MSC.1/Circ.1611 on *Interim guidance on technical requirements for Fleet Safety*. The MSC adopted, with modifications submitted by IMSO, resolution MSC.468(101) on *Amendments to Promulgation of Maritime Safety Information* (resolution A.705(17), as amended); the Committee also adopted resolutions MSC.469(101) on *Amendments to World-Wide Navigational Warning Service* (resolution A.706(17), as amended) and MSC.470(101) on *Amendments to IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document* (resolution 1051(27)). The MSC agreed to circulate the interim Iridium SafetyCast service manual by means of an MSC circular until such time as the full and mature document is finalized, consequently the Committee approved MSC.1/Circ.1613 on *Interim Iridium SafetyCast service manual*.

Ship Voluntary Observing Scheme

During the discussions on the ship voluntary observing scheme (VOS), the World Meteorological Organization made a strong intervention supporting the current mode of operation. The IHO made an intervention in support of the position of the WMO, highlighting the negative impact on IHO initiatives, such as Crowdsourced Bathymetry and GEBCO, if the proposed amendments were adopted and approved. There was considerable support from Member States and other organizations for the position of the WMO and the future of the VOS in its current form. Some Member States questioned the assertion that VOS activities did not come under the UNCLOS restrictions with respect to scientific research.

- **Technical Cooperation Committee**

The Technical Cooperation Committee (TCC) is the IMO body that considers matters within the scope of the implementation of technical cooperation projects for which the IMO acts as the executing or cooperating agency and any other matters related to the IMO's activities in the field of technical cooperation.

The 69th session of the TC (TC 69) was held at the IMO Headquarters in London, UK, from 25 to 27 June. Mr. Zulkurnain Ayub (Malaysia) chaired the meeting. Assistant Director Alberto Costa Neves represented the IHO.

In his opening remarks, the Secretary-General of IMO, Mr Kitack Lim, highlighted this year's World Maritime theme, "Empowering women in the maritime community", in line with SDG 5 (*Achieve gender equality and empower all women and girls*), to highlight the important contribution of women all over the world to the maritime sector. He stressed the role of the IMO's Integrated Technical Cooperation Programme (ITCP) to help all Member States to develop and formulate innovative policies and strategies to respond to the needs of countries to achieve the SDGs.

Chair of the TCC, Mr. Zulkurnain Ayub (Malaysia), addressing the meeting.

The meeting considered the ITCP delivery during 2018 and approved the ITCP for the biennium 2020-2021 and the TC Fund allocation of circa 14.6 million US dollars to support the programme's core activities. The TC Fund receives contributions from Member States and donor agencies. The Committee endorsed the long-term resource mobilization strategy to support Capacity Building and maritime development projects. The 2020-2021 ITCP envisions regional workshops and training courses for safety of navigation in West Central Africa, Asia, Pacific Islands, Eastern Europe, Latin America and Caribbean and Arab States/Mediterranean region, which will involve the IHO and IALA.

The Committee considered the implementation of the 2030 Agenda for Sustainable Development, especially SDGs 5 and 14, and the strengthening partnerships with the World Maritime University (WMU), International Maritime Law Institute (IMLI) and other global maritime training institutions. It also approved the new and improved Country Maritime Profile module, which has the potential to provide knowledge in support of the IMO-IHO-IALA joint needs assessment visits to coastal States.

The meeting took note of the first joint needs assessment mission in Sudan by the IMO, IHO and IALA, conducted on matters related to hydrography, hydrographic surveys, nautical charts, ships' routing and aids to navigation. The collaboration between the three organizations, which is expected

to be sustained, was aimed at enhancing and supporting safety of navigation. Also noted was the participation of the IMO regional presence in IHO and IALA related activities under the UN "Delivering as One" and the contribution from the IHO to the capacity building activities in the Asia-Pacific region.

The Committee noted the status of implementation of the global technical cooperation programme of the IMO Member State Audit Scheme (IMSAS). The IHO representative made an intervention to indicate that, with respect to the implementation of relevant aspects of SOLAS Chapter V, the IHO stands ready to contribute to the Corrective Action Plans (CAP) following IMSAS visits and to the preparation of auditors and audit visits.

Countries in the Caribbean Sea reported on the Regional Senior Maritime Administrators (SMA)' Workshop held on 28 February and 1 March 2019 in Jamaica. Among other matters, the Jamaica SMA Resolution 2019 invited Caribbean States to consider inviting the IHO to assist in the establishment of a national framework for hydrographic services in order to meet the mandatory obligations of SOLAS Chapter V - Regulation 9, researching the feasibility of the establishment of a regional hydrographic office, and becoming members of the IHO and of the Meso America - Caribbean Sea Hydrographic Commission (MACHC). The SMA Workshop became an annual event which includes Hydrography as a permanent agenda item.

Prime Minister of Malta, the Honorable Dr Joseph Muscat and IMO Secretary-General, Mr Kitack Lim with IMLI's Faculty and Alumni during the 30th anniversary celebration session.

Side activities included a session to celebrate IMLI's 30th anniversary, with the participation of the Prime Minister of Malta, the Honorable Dr Joseph Muscat, a ceremony where Malaysia handed financial contributions to WMU and IMLI, with the participation of the Minister of Transport of Malaysia and the launching of the Secretary-General Emeritus Koji Sekimizu's PhD Fellowship on Maritime Governance at WMU. During the meeting other Members announced donations to the TC Fund. The meeting held a small session of appreciation to Mr Juvenal Shiundu, Acting Director of the Technical Cooperation Division, who will retire after more than 22 years of sterling service to the IMO.

During the meeting the IHO representative had numerous fruitful informal discussions with the IMO Secretariat Staff and with delegates. The cooperation between the IMO and the IHO for developing and eventually sharing their respective country maritime profiles was discussed and will be further considered. Coordination was progressed with the Executive Director of the *Comisión Centroamericana de Transporte Marítimo* (COCATRAM) on the implementation of joint capacity building activities in the Meso America and Caribbean Sea region. A joint needs assessment visit to Iraq was discussed and is under consideration by IMO, IHO and IALA.

- **IMO International Maritime Law Institute (IMLI)**

The IMO International Maritime Law Institute situated in Malta was established under the auspices of the International Maritime Organization, a specialised agency of the United Nations. The Institute is an international centre for the training of specialists in maritime law. It also contributes to the development and dissemination of knowledge and expertise in international maritime law, with special reference to the international regulations and procedures for safety and efficiency of shipping and the prevention of marine pollution. Special emphasis is given to international regulations adopted by the International Maritime Organization.

Institute`s entrance

On 12 April it was for the first time ever, that hydrography was subject of a lecture at IMLI. Under the title “Hydrographic Aids – interrelation to IMO Instruments”, the Secretary-General of the IHO, Dr Mathias Jonas discussed liability and copyright aspects of hydrodraphic products as well as legal basics of crowd sourced bathymetry with IMLI students in a one-day course.

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- **IMO/ ITU EG15**

The International Telecommunication Union (ITU) is a specialized agency of the United Nations (UN) which is responsible for issues that concern information and communication technologies, including aeronautical and maritime navigation. The Experts Group (EG) established jointly by the International Maritime Organization (IMO) and the ITU consists of representatives active in the IMO and the ITU in relation to maritime communications. The function of the IMO/ITU EG is to advise on the development of future requirements for maritime radiocommunications taking into account the operational needs as defined by the IMO and the regulatory needs as defined by the ITU. The 15th session of the IMO/ITU EG (IMO/ITU EG15) was held at the IMO Headquarters in London, United Kingdom, from 8 to 12 July under the chairmanship of Mr Christian Rissone (France). Assistant Director David Wyatt represented the IHO.

The Group addressed a number of topics of direct interest to IHO Member States resulting from discussions at the 101st session of the IMO Maritime Safety Committee (MSC 101), 6th session of the IMO Sub-committee on Navigation, Communications, and Search and Rescue (NCSR 6) and in preparation for the ITU World Radiocommunication Conference 2019 (WRC-19).

15th session of the IMO-ITU EG

After considering the outcomes of NCSR 6 and MSC 101, the participants focused on further developing the IMO position on the WRC-19 agenda items relating to maritime services.

The majority of the meeting was then spent on developing the related draft revisions of SOLAS Chapters III and IV and the related and consequential amendments to other existing instruments. A comprehensive review was conducted with numerous amendments and revisions proposed, including the revision and development of a number of definitions for terms.

The Group considered the proposed amendments to regulation IV/5.2 and agreed with the recommendation of the EG that Contracting Governments should provide the Organization with notice prior to the withdrawal of any radiocommunication service. However, the Group could not agree if the requirement should include a period for prior notification or not, and, if so, what period. The Group noted that if a prior notification would be required, then an appropriate mechanism should be implemented in the GISIS module on "Master Plan of shore-based facilities for the GMDSS" to accommodate this requirement.

The Group briefly discussed a preliminary revision of resolution A.707(17) on *Charges for distress, urgency and safety messages through the Inmarsat system*. The IHO was in agreement with the USA, UK and Inmarsat that a cost sharing model was the most appropriate vehicle so as to spread the increased costs of additional recognized mobile satellite service providers amongst all IMO member states. It was felt that making MSI messages free would have negative consequences on message content and brevity, which would eventually degrade the service provided to the maritime community. The International Mobile Satellite Organization (IMSO) supported the free provision of MSI messages.

Intergovernmental Oceanographic Commission (IOC)

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- **IOC Assembly**

United Nations Educational, Scientific and Cultural Organization

Intergovernmental Oceanographic Commission

The Assembly is the highest governing body of the Intergovernmental Oceanographic Commission (IOC) of UNESCO. The functions of the Assembly are to consider matters related to managing the regional subsidiary bodies and their programmes, overseeing the ocean research programmes, the ocean observing systems and data management, the regional tsunami warning systems, the coordination of warning and mitigation systems for ocean hazards, the capacity building programme and strategy, sustainable development and governance, administration and management of the IOC and governance of the IHO-IOC GEBCO Project in cooperation with the IHO.

The 30th session of the IOC Assembly was held at the UNESCO Headquarters in Paris, France from 26 June to 4 July, preceded by the **52nd Session of the IOC Executive Council held on 25 June**. Ocean Science Day was also celebrated by special panel sessions on 27 June. The delegations included representatives of the Hydrographic Offices of the following IHO Member States: Argentina, Brazil, Chile, Colombia, France, Germany, Peru, Portugal, Republic of Korea, Russian Federation, Singapore, Sweden, Thailand, Turkey, USA and Viet Nam. Director Mustafa Iptes and Assistant Director David Wyatt represented the IHO. The Assembly was opened by the Deputy Director-General of UNESCO, Mr Qu Xing, on behalf of the Director-General, Ms Audrey Azoulay, and Dr Vladimir Ryabinin, the Executive Secretary of the IOC.

30th IOC Assembly in plenary session

General

The Assembly received reports from the Executive Secretary, on the activities of the IOC regional subsidiary bodies – *the sub-commissions for the Western Pacific, the Caribbean and adjacent regions, and Africa and adjacent island States* - the status of the IOC global ocean science report, the world climate research programme and the 2nd International Indian Ocean expedition. Introducing the discussions on the UN Decade of Ocean Science for Sustainable Development (the Decade), the Executive Secretary highlighted that there were less than two years to work with

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Members States, the UN, all partners and stakeholders to develop an implementation plan. He noted that this was a once-in-a-life-time opportunity for all to achieve a breakthrough in the capacity of oceanography to serve people and the planet. The Executive Secretary identified as the main challenge for the Commission's small Secretariat the dual tasks of raising, not only extra budgetary resources necessary to maintain its core operational programmes, but also significant additional resources to lead and coordinate the Decade preparation phase. He noted a new approach to fund-raising and outreach, based on highlighting the societal benefits of the IOC's work and demonstrating the return on investment in ocean science and observation were being developed. The Executive Secretary highlighted that the Global Planning Meeting in Copenhagen last May represented a first step in bringing together experts and stakeholders to discuss and identify the science questions to be addressed during the Decade. He introduced the six societal outcomes of the Decade, the expected science breakthroughs, the research and development priority areas as well as the four potential pillars of the Decade (a georeferenced Atlas, observations and data system, the science-policy interface and societal applications). He stressed the need for technological innovations as well as an economic valuation of the ocean to drive the development of transformative partnerships under the Decade.

The Assembly identified that the IOC has a critical role to play in the development of UN Sustainable Development Goal (SDG) 14 indicators. In the context of biodiversity beyond national jurisdiction (BBNJ), the Commission's contribution on capacity development and transfer of marine technology was noted as particularly important. The Assembly stressed the need for more operational services and exchange of data, with a particular focus on real-time data exchange. The Assembly welcomed the continuation of the 2nd International Indian Ocean Expedition (IIOE-2) until 2025 as an important contribution to the first half of the Decade. The potential role of Maritime Spatial Planning in addressing many issues related to economic development of coastal nations was highlighted. The Assembly discussed the UN world ocean assessment and the progress with the Global Ocean Observing System (GOOS), the Global Climate Observing System and the restructuring of the World Meteorological Organization (WMO), which will result in the establishment of a Joint WMO-IOC Collaborative Board to which the new WMO-IOC Joint technical committee for oceanography and meteorology (JCOM) will report. Two GOOS-related projects - the European Commission (EC) Horizon 2020 funded AtlantOS project and the Tropical Pacific Observing System in 2020 (TPOS 2020) project – were highlighted. It was noted that the AtlantOS has contributed to the development of a vision for an All-Atlantic Ocean Observing System as a contribution to GOOS, and is seeking to develop mechanisms to engage with Member State agencies and organizations around the Atlantic Basin.

The Assembly also discussed the regional tsunami warning and mitigation systems – *the Pacific (PTWS), the Indian Ocean (IOTWMS) and the North-Eastern Atlantic, the Mediterranean and connected seas (NEAMTWS)* – the tsunami and other coastal hazards warning system for the *Caribbean and adjacent regions (CARIBEEWS)* as well as the global coordination of warning and mitigation systems for ocean hazards and harmful algal blooms. During the presentation of the reports and subsequent discussions covering the Tsunami and Other Hazards Warning System Working Group (TOWS-WG), the IHO was highlighted as one of the significant partner organizations, particularly with respect to the transmission of warning information. The adoption of the TOWS-WG report and recommendations, means that the World-Wide Navigational Warning Service Sub-Committee (WWNWS-SC) and the TOWS-WG can move forward on the implementation of the operational processes for the dissemination of tsunami warnings and structured messages via the International Maritime Organization/IHO WWNWS. The Chair of the IHO-IOC GEBCO Guiding Committee (GGC) highlighted the importance of comprehensive bathymetric datasets to model tsunami impacts and the speed of propagation of the energy wave.

The Assembly received a briefing on the proposed development of the IOC Ocean Data and Information System (ODIS), that will be a framework in which existing ocean data and information systems, products and services will be promoted and where connections between these systems will be promoted and possibly developed by relevant stakeholders. It was noted that the International Oceanographic Data and Information Exchange (IODE) will work with existing stakeholders, linked and not linked to the IOC, to improve the accessibility and interoperability of existing data and

information, and to contribute to the development of a global ocean data and information system, leveraging established solutions where possible. The IOC ODIS will target scientists, government agencies/policy-makers, IOC global and regional programmes, IODE National Oceanographic Data Centres, Associate Data Units, Associate Information Units, UN agencies, IGOSs, and Industrial and commercial enterprises. The Assembly stressed the need to develop ODIS with involvement from the widest possible range of stakeholders, ensuring active participation from IOC Member States but also from other UN agencies, NGOs, national and regional programmes and projects, as well as the private sector.

Ocean Bathymetry and Capacity Building

The Assembly considered the biennial report of the Chair of the GGC and expressed its support for the increased IOC engagement in the work of GEBCO activities. The Chair of the GGC highlighted the various activities undertaken in the recent biennium, in particular highlighting the commencement, in February 2018, of the operational phase of the Nippon Foundation-GEBCO Seabed 2030 project and the progress achieved to increase the global bathymetric coverage. The proposed revisions, as amended by IRCC11, to the Guiding Committee terms of reference and rules of procedure were endorsed. During the GEBCO discussions the IHO representative noted that the wide spread verbal support needs to be supported by real actions to gather bathymetry and make data available. He also urged all IOC Member States, that owned or operated research vessels, to ensure that their vessels were collecting and storing bathymetric data whenever they were at sea and that the data was provided to the IHO Data Center for Digital Bathymetry so as to be freely and openly available to all who may wish to make use of it, sentiments reiterated by the Executive Secretary of the IOC.

The Assembly discussed the IOC Capacity Development Strategy, including its regional programmes and proposals for the IOC Capacity Development Fund. The IOC Ocean Literacy activities, including contributions to the Ocean Literacy in 2018-2021 Action Plan, which had been undertaken in the last intersessional period, were highlighted including progress on global and regional cooperation.

Side Event and Discussion Panel on the Nippon Foundation - GEBCO Seabed 2030 Project

A side event and discussion panel on the Nippon Foundation – GEBCO Seabed 2030 project was held during the lunch time break of the Assembly on 2 July, moderated by Mr Shin Tani, GEBCO Guiding Committee Chair. Assistant Director David Wyatt, representing the IHO, was invited as a panelist. During the introductions to the discussions he stressed the long association of the IHO with the GEBCO Project and its governance. He highlighted the importance of completing the picture of the ocean floor to support the numerous UN initiatives, which needed a comprehensive bathymetric dataset to achieve their goals.

The panel participants at the Seabed 2030 side event

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UN Decade of Ocean Science for Sustainable Development (2021-2030)

The 1st Global Planning Meeting ended after three days of lively discussions with over 200 participants from science, academia, policy, communication and private sector organisations brainstorming on how to achieve the six key Decade outcomes by 2030: a clean ocean, a healthy and resilient ocean, a safe ocean, a sustainable and productive ocean, a predicted ocean and a transparent and accessible ocean. Dr Mathias Jonas, Secretary-General of the IHO, represented the IHO Secretariat.

Human and society questions were at the fore and core of debates: What kind of science and infrastructures are needed to understand and inform decision makers and citizens alike about the present and future changes in the ocean? How can we align on-going research investments in order to produce major breakthroughs such as a global map of the seafloor or a deep-sea observing system? How can science define pathways for ocean sustainability, providing solutions to feed a growing world population without harm to marine biodiversity?

“The Decade takes on a critical role in critical times, as we are facing challenges our species has never faced before. As we know so little, we need this Decade to fill the gaps in scientific knowledge to enhance ocean health. But it must do so within a precautionary approach applied with vigor” said Peter Thomson, UN Secretary-General’s Special Envoy for the Ocean, opening the meeting at the Assembly Hall of Denmark’s National Museum.

By video message, H.S.H. Prince Albert II of Monaco urged all to go further in the transformation of society. He insisted that we must act urgently to provide solutions to society’s major current challenges, responding to the climate change and biodiversity crisis and plastic pollution.

Peter Haugan, Chair of the Intergovernmental Oceanographic Commission (IOC) of UNESCO expressed the Decade is a once-in-a-lifetime opportunity, that it needs to be about the people, leaving no one behind, and enabling individuals to make a difference. He highlighted the need for an ambitious top-down and bottom-up movement to meet the Sustainable Development Goals.

Vladimir Ryabinin, Executive Secretary of IOC called on young professionals and social scientists to work together in an interdisciplinary effort. It should be an ambitious, team-work undertaking across all sectors.

Dr Mathias Jonas, Secretary-General of IHO, underpinned the vital importance of the digital mapping of the oceans presenting seabed topography as the basic information. He explained the GEBCO concept and the interrelation to the Seabed 2030 project. For data contributions gathered by commercial surveys he coined the term “digital philanthropy”. He went on 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”.

Official group picture of the 1st Global Planning Meeting of the UN Decade of Ocean Science for Sustainable Development © Leif Bolding – Copenhagen - Denmark

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In order to succeed, participants concluded that the Decade needs to promote ocean literacy across the world to anchor mind-sets around the fundamental relationship humanity has with the ocean. The Decade needs to be inclusive, participative, and interdisciplinary. It will require a powerful marketing and communication strategy, advancing stakeholder partnerships across different disciplines.

Capacity development and technology transfer are required to smaller economies who are in need of ocean science, such as the Small Island Developing States. The importance of traditional knowledge should be emphasized, because the current way of life is destructive. Ultimately, the Decade needs to start a global movement and should change the current 'domination' narrative over the ocean and turn it into something positive. In the end, as summed up by Margaret Leinen, Director of the SCRIPPS Institution of Oceanography, "it is about what can we do together that we cannot do separately" as no single nation can deliver on its own the science we need for the ocean we want.

Dr Mathias Jonas, Secretary-General IHO explains the role of hydrography in relation to the Ocean Decade.

Live stream: #OceanDecade First Global Planning Meeting (Monday, 13th May 2019)

International Organization for Standardization (ISO)

- **48th meeting of the ISO/TC 211**

The 48th meeting of the International Organization for Standardization (ISO) - Technical Committee 211 (ISO/TC211) meeting was hosted by the Slovenian Institute for Standardization (SIST) from 03 to 07 June. The University of Maribor - Faculty of Electrical Engineering and Computer Science provided venue and organizational and logistics support for the meeting.

Twenty three Permanent and 5 Liaison member organizations attended the meetings. Assistant Director Anthony Pharaoh and Technical Standards Support Officer Jeff Wootton represented the IHO Secretariat at the Working Group and Plenary meetings.

Participants of the 48th ISO/TC211 Plenary Meeting

Ms Agneta Engberg from the Swedish Swedish Mapping, Cadastral and Land Registration Authority, took over as Chair of the Technical Committee from Ms Christina Wasström.

ISO requires in principle that all standards undergo regular revisions to ensure that they remain fit for purpose. The plenary meeting agreed that the following Standards should undergo systematic review; 19150-1:2012 Ontology (Part 1: Framework); 19158:2012 Quality assurance of data supply and 19159-2:2016 Calibration and validation of remote sensing imagery sensors and data (Part 2: Lidar). The meeting also agreed that the Technical Report on "Imagery and gridded data" should undergo a formal review.

The Committee announced the public release of the ISO Geodetic Registry which includes a structured database of coordinate reference systems and transformations. The online Registry application can be accessed from (https://geodetic.isotc211.org/). Other online include resources include; ontology representations of the 19100 standards; harmonized UML conceptual and implementation models, and a repository of XML schemas.

During a half-day "Standards in Action" seminar, presentations were provided on the implementation of TC211 standards and specifications. These included titles such as; "Outdoor Augmented Reality with Geographical Object Identification by Deep Learning", "The development of a standard for data and metadata preservation" and "Archiving Geospatial data – Bridging the gap between Archival and Geospatial standards."

- **49th meeting of the ISO/TC 211**

The 49th meeting of the International Organization for Standardization (ISO) - Technical Committee 211 (ISO/TC211) was hosted by the Japanese Industrial Standards Committee (JISC). The meeting took place at the Omiya Sonic City building in Tokyo, Japan, from 3 to 7 December 2019.

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Participants of the 49th ISO/TC211 Plenary Meeting

In addition to the working group meetings, this meeting was held on the activities being undertaken by the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). The meeting included discussions on the contribution that "Standards Development Organization's" (SDO's), such as the IHO, the ISO/TC211 and the Open Geospatial Consortium (OGC), are making to the development of an Integrated Geospatial Information Framework (IGIF).

A report on the current state of the IHO's standards development activities was presented, highlighting the publication of the first edition of the S-121 Maritime Limits and Boundaries Product Specification, which has been produced on behalf of the United Nations Division for Ocean Affairs and the Law of the Sea (UN-DOALOS). Reports were also provided by the representatives from the OGC and the Defense Geospatial Information Working Group (DGIWG), which resulted in discussions on required updates to the 19100 standards under the remit of WG6.

During a half-day "Standards in Action" seminar, presentations were provided on the implementation of the TC211 standards and specifications. These included the following topics; "The introduction of geographic information and statistical standards for surveying data quality", "The Korean address assignment scheme of AOT (Address of things)", "Data standardization activity for urban revitalization in Japan", "Calibration and Validation of Air-borne Multispectral Imaging Sensors" and "The entire Global Space 3D Grids and Application for Low Altitude Airspace Management".

International Seabed Authority (ISA)

The 25th Assembly of the International Seabed Authority (ISA) was held at ISA Headquarters from 22 to 26 July in Kingston, Jamaica. The IHO was represented by the IHO Secretary-General, Dr Mathias Jonas.

The ISA Secretary-General, Mr Michael Lodge gave his annual report on the activities of the Authority and the financial situation. Based on the Strategic Plan as approved by the previous Assembly in 2018, the Secretary-General presented a high level action plan which links precise activities to the overall nine strategic directions of the Authority and associates key performance indicators to each activity. Strategic direction number 4 "Promote and encourage marine scientific research in the Area" addresses the need to establish strategic alliances and partnership with relevant organizations, inter alia the IHO, to share data and information in an open and transparent manner, avoid the duplication of efforts and benefit from synergies, for example, by aligning with the United Nations Decade of Ocean Science for Sustainable Development.

In this context the IHO Secretary-General discussed intensively how ISA´s new repository of data related to the deep seabed and associated water column named *DeepData* and IHO´s DCDB / GEBCO infrastructure can take mutual benefit from each other. Numerous conversations were held with ISA contractors with the same intention to inform them about Seabed 2030 and the options to contribute bathymetric information to the GEBCO digital Ocean Map.

Among numerous considerations, the Assembly authorized the ISA Secretary-General to sign a Memorandum of Understanding between the ISA and the State Oceanic Administration of China concerning the establishment of a joint training and research centre situated in Qingdao, China. The governance will be conducted by a steering committee equally manned by the ISA Secretariat and the Chinese partners.

The Assembly devoted a full day´s agenda to celebrate the 25th Anniversary of the Authority to highlight the progress made within this period. So far 29 contractors belonging to 22 countries have been endorsed to explore their claims consisting of about 1% of the global sea floor to be prepared for regular exploitations as soon as the universal mining code and the associated arrangements are adopted by the ISA Member States within the years to come. Regular exploitation is expected to start around the middle of the next decade.

Cadets of the Jamaican Navy presenting the flags of the ISA Member States –among them the flag of Monaco.

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United Nations

- **United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM)**

The principal purpose of the UN-GGIM is to play a leading role in setting the agenda for the development of global geospatial information management and to promote the use of geospatial information in addressing key global challenges, particularly taking into account the role of geospatial data in monitoring and achieving the Sustainable Development goals agreed under the UN 2030 Agenda for Sustainable Development. The UN-GGIM reports to the UN Assembly via the UN Economic and Social Council (ECOSOC).

The 9th Session of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) took place at the UN Headquarters in New York, USA from 7 to 9 August.

Overall 424 participants attended the UN-GGIM, 301 of them representing 94 UN Member States and 123 representing 70 observing organisations – amongst them IHO, represented by the Secretary-General of the IHO, Dr Mathias Jonas.

Of special relevance for the IHO work programme was the report given under Agenda Item 10 *Marine geospatial information* by the Working Group on Marine Geospatial Information and Agenda Item 15.

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.

The Delegates noted the updated work plan for the biennium 2019 -2020 and requested that the Group consider engaging with the United Nations Decade of Ocean Science for Sustainable Development and related international initiatives, including the Seabed 2030 project. In the course of the discussion it became a specific item of note that the participation of IHO and OGC representatives has strengthened the WGs commitment to promoting geospatial standards, including the IHO S-100 suite of standards, and looks forward to the preparation of a practical guide for the use of geospatial standards in marine data. The Committee requested the Working Group to consider extending the use-case exercise to a broader audience beyond the group members as to enable better understanding of the challenges and issues to address, including to provide real world examples of the benefits of and need for readily available and accessible marine geospatial

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information. Finally, encouragement was given for a broader geographic participation from Member States in the WG, including from Africa and Small Islands Developing States.

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 in the global geospatial information management community. The Delegates expressed their appreciation to the three collaborating standards development organizations, the Open Geospatial Consortium (OGC), the Technical Committee 211 of the International Organization of Standardization (ISO) and the International Hydrographic Organization (IHO) for the continuing support and valuable work. The ongoing contribution in the development of guidance and recommended actions for the standards pathway for the implementation Guide of the Integrated Geospatial Information Framework was welcomed as well. The Committee requested the standards development organizations to continue to liaise and work with Member States with technical standards development and adoption, and keep the Committee informed of their ongoing work regarding the use of geospatial standards in supporting the implementation of national geospatial data and systems, the Integrated Geospatial Information Framework and the measurement and monitoring of the SDGs, and encouraged the regional committees, thematic networks and working groups of UN-GGIM to continue to improve knowledge, raise awareness about and engage in the development and promotion of internationally agreed and open geospatial standards.

The Group of the three Standard Developing Organizations agreed to continue the strong liaison on all levels to support the UN-GGIM process further.

IHO Secretary-General Dr Mathias Jonas,
Agneta Engberg Chair ISO/TC211, Mark Reichardt, OGC, C

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- **1st Meeting of the UN-GGIM WGMGI**

MSDIWG10 and OGC Marine DWG were followed by the 1st Meeting of the UN-GGIM WGMGI. The meeting was chaired by Mr John Nyberg (USA), one of the co-chairs of the WG. All Member States participating in the meeting were represented by Hydrographic Offices or by their representatives in an IHO body.

The Chair reported on the progress made with the online meetings and highlighted the importance of the support received from the IHO, in particular of its Secretary-General. Main points emphasized by the Chair included the strong relationship with the UN SDG 14 (Conserve and sustainably use the oceans, seas and marine resources for sustainable development) and the need to improve Communications, the importance to include inland waters and countries with no coastline and the very importance of funding and capacity building.

Participants of the 1st meeting of the UN-GGIM Working Group on Marine Geospatial Information

The WG aimed to address marine geospatial information, including inland water bodies and waterways, focusing on the 2030 Agenda for Sustainable Development, in particular, SDG 14 and to an extent, SDG 6 (Ensure availability and sustainable management of water and sanitation for all). The meeting was attended by 42 expert representatives from Australia, Brazil, Denmark, Germany, Italy, Jamaica, Netherlands, Norway, Republic of Korea, Singapore, United Kingdom, United States of America, IHO, OGC and UN-GGIM Private Sector Network.

The meeting agreed that marine geospatial information must be made available, accessible and discoverable for a multiplicity of purposes within collaborative information systems nationally to deliver reliable, timely and quality information necessary for citizens, organizations and governments to build accountable actions and make informed and evidenced-based policies and decisions.

Other Organizations with relevant agendas to the programme of the IHO

- **Our Ocean Conference**

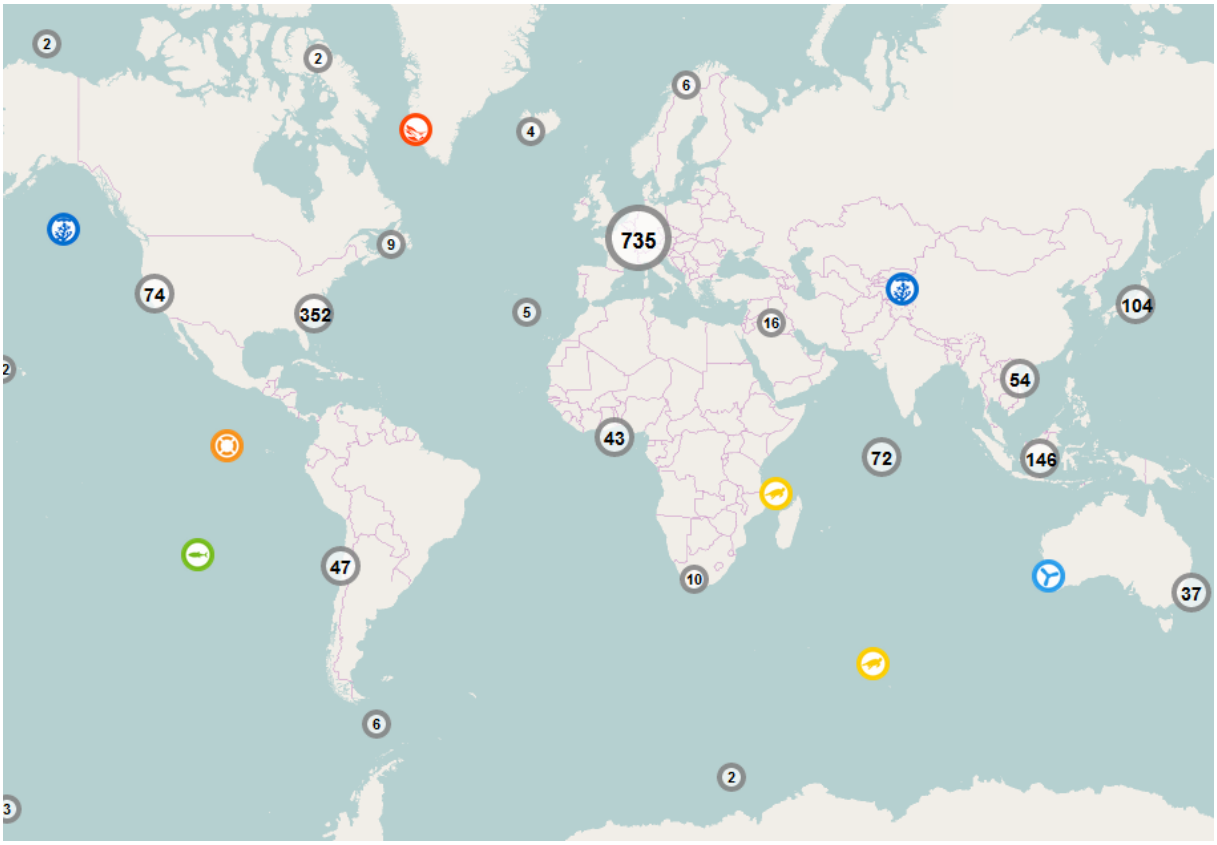
The Our Ocean conference series started in 2014 in New York, USA aiming to build partnerships between government, industry, science and civil society, putting knowledge, technology and finance into action to meet the challenges facing the ocean and enable production and sustainable use to go hand in hand so that the ocean can continue to provide for the needs of future generations.

The Our Ocean 2019 was held in Oslo from 23 to 24 October and hosted by the Government of Norway. The IHO Secretariat was represented by Secretary-General Dr Mathias Jonas.

The agenda was specifically highlighting the importance of knowledge as the basis of our actions and policies to ensure protection of our ocean, responsible management of marine resources and sustainable future economic growth. The conference brought together leaders from governments, businesses, civil society and research institutions to share their experience, identify solutions and commit to action for a clean, healthy and productive ocean.

Lise Kingo, CEO and Executive Director of the United Nations Global Compact, which is the world's largest corporate sustainability initiative with more than 13,500 signatories from 170 countries, presented the five tipping points for a healthy and productive ocean – each one with direct or indirect relation to hydrography.

At the core of the Our Ocean conferences are voluntary commitments for significant and meaningful actions towards a clean, healthy and productive ocean. Previous conferences have resulted in nearly one thousand commitments. Governments, organisations and businesses are encouraged to announce new and far-reaching actions for the best of our ocean at this year's conference. Commitments should have significant impact, be measurable and have a clear timeframe. As one of the 1600 commitments made, the IHO Secretary-General gave a commitment for the provision of a global bathymetric grid (GEBCO Grid) and a mechanism for standardized data products for the broadest range of maritime knowledge (S-100).



Global map of commitments made during the 6th Our Ocean Conference.

Information Management

- **IT-Infrastructure of the Secretariat**

The IT-infrastructure continues to rely on a combination of one dedicated member of staff and approximately a third of the time of an Assistant Director, together with assistance and services provided by several service providers under contract terms. In the face of evolving new requirements, particularly in relation to adopting an increasingly complex digital data and information environment, resources remain stretched to meet all the requirements. The complex IHO IT-infrastructure serves a significant archive of reference documents, an extensive and dynamic website that includes the following online applications: a meeting registration system, the ENC catalogue, the INT chart catalogue, an online hydrographic dictionary, a stakeholder's database, an S-62 producer code database and an index of downloadable GEBCO charts. Several on-line web services support the mobile computing environment for the senior members of staff who are required to travel frequently. These include mail services and secure access to the Secretariat internal network services. A new fully searchable and remote accessible digital archive for all IHO documents was tested exhaustively to be put into regular operation in combination with the expected launch of the new IHO web site in the beginning of 2020.

The work of three Project Officers seconded by Japan, Peru and the Republic of Korea enabled several important capabilities to be implemented that might otherwise not have been possible within existing resources; the reporting period saw important progress in enhancements of the GIS environment, combining country and regional information systems, chart information systems and capacity building and bathymetry information under the service name: INToGIS.

- **Maintenance of publications that are not allocated to a specific IHO body**

The Secretariat maintained and issued various publications during the year including P-5 - IHO Yearbook, P-7 - IHO Annual Report, S-11 Part B – Catalogue of INT Charts, and M-3 - IHO Resolutions. Technical measures were taken to transform the content of P-5 and S-11 Part B into retrievable content of the online INToGIS system operated by the Secretariat.

- **Communication between the IHO Secretariat and Member States through Circular Letters**

During the year, the Secretariat published 64 Circular Letters (CLs) in English, French and Spanish and three Finance Circular Letters were published in English and French. In addition, four Council Circular Letters were published in preparation of the 3rd Session of the IHO Council.

- **Technical Library of the IHO Secretariat**

The Secretariat's technical library comprises of bound manuscript copies of all significant IHO records, such as Conference Proceedings and Circular Letters, together with an extensive ad hoc collection of reference books and periodicals on various topics related to hydrography and nautical charting.

Public Relations and outreach

- **Relationships with the Government of Monaco and the diplomatic corps accredited in Monaco**

The relationship with the Government of Monaco remained excellent throughout the year. The Department of External Relations and Cooperation continued to assist the IHO Secretariat. The Secretary-General and Directors were also able to further promote good relations when they met various diplomatic and government officers at functions and events hosted in Monaco by the Government or diplomatic missions in the Principality.

- **Promote the IHO through publicity and public relations initiatives**

The years 2019 and 2021 are important in the history of the International Hydrographic Organization (IHO). The year 2019 will mark the centenary of the 1st International Hydrographic Conference, which was held in London in 1919 and the year 2021 will be the centenary of the establishment of the International Hydrographic Bureau (IHB) in Monaco as precursor of the modern IHO. The IHO Secretariat has undertaken the centenary celebrations of the International Hydrographic Organization as important milestones of the IHO. In this regard, it has been planned to organize exhibitions, symposiums, outreach events and similar activities over the next three years.

As the first event under the IHO Centenary Celebrations, the Secretariat of the IHO organized an Exhibition on "Historical Nautical Charts and Mediterranean" from 1 to 14 April 2019 which was held at the Monaco Yacht Club. The Curator of the exhibition was Mr Ali Riza Isipek (Turkey).

Opening Ceremony of Monaco Exhibition honoured by HSH Prince Albert II of Monaco.

The exhibition, presenting a stunning collection of historic sea charts, ship models and other artefacts, was opened by HSH Prince Albert II of Monaco on 1 April 2019 and appreciated by numerous distinguished guests. The exhibition also attracted numerous local and international visitors, exposing them to the historic art of nautical charting during the two weeks.

Visitors had thus the opportunity to learn about famous cartographers, the maritime world of the Mediterranean, types of old ships, historic navigation methods, old nautical charts from different countries and tools used for navigation. This immense heritage was displayed by means of oil paintings, wooden ship models, tiles (maps and miniatures on ceramic), portolans (world´s first nautical charts), flags, navigational tools and informative roll-up banners. A section dedicated to Prince Albert I of Monaco was also displayed at the exhibition.

HSH Prince Albert II of Monaco and the IHO Secretary-General Dr Mathias Jonas during the Inauguration Tour of the Exhibition.

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- **International Monaco Symposium at the Oceanographic Museum**

An International Symposium on *"Historical Approach for Measuring and Protecting of World Oceans and Waters*" was held at the Oceanographic Museum of Monaco on 20 and 21 June 2019. The Symposium was jointly organized by the IHO Secretariat, Pîrî Reis University, Turkey and the Oceanographic Institute, Prince Albert I of Monaco Foundation.

The Opening Ceremony of the Symposium was held in the morning of 20 June 2019 and attended by numerous distinguished guests from local dignitaries, government and diplomatic representatives. Secrétaire d'État H.E. Jacques BOISSON represented the HSH Prince Albert II of Monaco at the Opening Ceremony.

Participants of the Monaco International Symposium together with Secrétaire d'État H.E. Jacques BOISSON.

32 speakers from twelve countries presented their papers and speeches in seven sessions during the two-day symposium. The IHO Secretary-General Dr Mathias Jonas chaired the Technology Panel session and Director Mustafa Iptes chaired the Hydrographic History session at the symposium.

The objective of the International Symposium was to exchange knowledge and experience on what has been done in the history of measuring and protecting world oceans and waters and what remains to be done through international cooperation in hydrography. The Symposium was successfully conducted as a forum where government agencies, industry and academia from all around the world contributed to an understanding of all aspects of the world oceans and waters and their place in human history, reviewed the steps of the advances in measuring and mapping the world oceans and waters and examined the precautions to be taken to protect the marine environment.

Joint organizers of the Symposium, the IHO Secretary-General, Dr Mathias Jonas, the Rector of the Pîrî Reis University, Prof Dr Oral Erdogan and the Representative of the Oceanographic Institute, Prince Albert I of Monaco Foundation, Dr Nadia Ounais with Secrétaire d'État H.E. Jacques BOISSON (right), during the presentation of mementos.

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- **Monacology 2019**

Monacology is an annual event traditionally held in June for school children from Monaco. The 2019 edition of Monacology took place from 11 to 14 June 2019 below the International Hydrographic Organization's Headquarters. Monacology aims to raise children's awareness about the environment and sustainable development.

The underlying theme of *Monacology 2019* was *"Monaco, my substainable town".* In accordance with the theme the IHO presented a chart of the "Marine protected area from Toulon to Orbetello", courtesy of the French Hydrographic Office (SHOM), showing the protected area for marine mammals, subject to an agreement between Italy, Monaco and France.

IHO stand at the Monacology 2019

With inquisitive eyes, the children were curious to learn the name of "their" sea and with great attentiveness and precision (like a true cartographer, editor's note) they reproduced the chart with the coastline and protected areas.

Learning to read and grasp the geography of our Blue Planet is allowing our youngsters to address the question of hydrography and marine science and to create awareness of their importance.

In this instance all the participating youngsters from local schools, were able to produce their own chart which they could take home or back to school.

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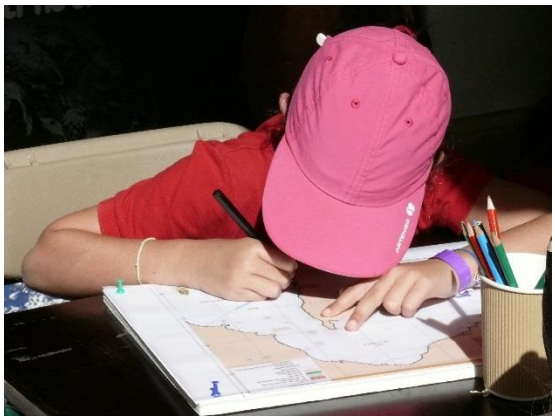

A young hydrographer and the struggle for a chart puzzle

Each budding hydrographer was given an IHO badge “Junior Hydrographer” in recognition of their efforts.

The IHO stand was honoured by the visit of HSH Prince Albert II of Monaco, on Wednesday 13 June. He was welcomed by Secretary-General Dr Mathias Jonas who presented the IHO Stand which focused on creating awareness for the new generation on the importance of hydrography for sustainable development of seas and oceans, especially the Mediterranean which is their playground.

HSH Prince Albert II of Monaco on the IHO stand with IHO Secretary-General Dr Mathias Jonas

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- **World Hydrography Day 2018**

The World Hydrography Day (WHD) 2019 marked the 98th anniversary of the establishment of the organization known today as the IHO. Under the motto *"Hydrographic information driving marine knowledge"*, the IHO and its 93 Member States reaffirmed their commitment to raising awareness of the importance of hydrography; and continue to coordinate their activities, in particular through maintaining and publishing relevant international standards, providing capacity building and assistance to those countries who aim to increase their activities in sea survey and cartography.

The Secretariat provided briefing material for World Hydrography Day 2019 and published reports on the IHO website that described the celebrations that were conducted by Member States around the world. In conjunction with the International Monaco Symposium conducted at the Oceanographic Museum of Monaco, a reception was held on the roof terrace of the Museum on 21 June. Secretary-General Dr Mathias Jonas presented the new IHO image video produced by the media company *BlueOrange*.

The WHD reception was attended by the symposium participants, invited guests from Monaco and the staff and retirees of the Secretariat of the IHO. The Hydrographers of Italy, Mozambique, Turkey and Ukraine attended the celebration. The theme "*Hydrographic information driving marine knowledge*" - highlighting the important role of hydrographic data in combination with information provided by adjacent maritime domains and advertising the benefits of making hydrographic data accessible to the widest possible audience for use that goes well beyond safety of navigation.

- **International Hydrographic Review**

The IHR is a pdf publication, with peer-reviewed articles, with two editions a year and an annual printed copy consisting of a compilation of the articles. Access to this publication is free via the IHO website and without restriction. Member States are strongly urged to contribute to the Review as an important means of sharing information on their activities and developments within the hydrographic community. Other organizations or individuals working in related hydrographic fields, are also invited to contribute to this publication.

The IHO Secretariat has been working with the University of New Brunswick (UNB), Canada, in a project to develop a digital repository of the complete library of the IHR. As a result, the project now provides access to all volumes from 1923 to 2019, which can be found at: https://journals.lib.unb.ca/index.php/ihr.

Number 21 of the International Hydrographic Review was compiled and published in collaboration with the appointed editor, Mr Ian Halls in May. Mr Halls regrettably passed away in May. For the interim period, Assistant Director Alberto Costa Neves assumed the role of IHR Editor by the end of the year for preparation of the November edition. Due to transition period of IHR Editorship role, second edition of IHR could not be delivered in November 2019 and scheduled to be delivered in the beginning of 2020. Mr Brian Connon (USA) was appointed as new IHR Editor in effect from January 2020

- **Digital presence and media outreach**

The Secretariat maintained a record of the principle IHO activities in the monthly publication of the IHO Bulletin, as well as providing a biannual article in the journal Hydro International.

One of the priorities continued under the Work Programme 2019 had been an overhaul of the IHO website, including GIS-services and IHO´s presence on social media. Ms Sarah Jones-Coutoure became the first Public Relations / Communications Officer in the history of the IHO in November. She maintains dedicated IHO social media accounts under LinkedIn, facebook, twitter and youtube.

- **Preparations for the IHO Centenary**

The plans for the celebration of the centenary of the foundation of the IHO are taking shape. Activities will extend over three years, from the 100th anniversary of the 1st International Hydrographic Conference in London, in 2019, to the 2nd session of the IHO Assembly, in 2020, to the anniversary of the foundation of the International Hydrographic Bureau in Monaco, in 2021. The "peak-of-the-peak" will be World Hydrography Day (WHD) on 21 June 2021. There will also be an

opportunity to present IHO's achievements at the United Nations General Assembly in September 2021 and at the IMO Assembly in November 2021.

The editorial board for the planned prestige book publication, entitled "Measuring and Charting the Ocean - One hundred Years of International Cooperation in Hydrography" continued its work on the script.

Work Programme & Budget, Strategic Plan and Performance Monitoring

This element of the work programme concerns the execution of the IHO work programme, the new structure and organization of the IHO and its capacity to meet future requirements.

- **Drafting Group of the Strategic Plan Review Working Group (SPRWG)**

The 1st Meeting of the Drafting Group of the Strategic Plan Review Working Group (SPRWG) was held in Monaco, from 30 to 31 January with 12 participants from eight Member States. Secretary-General Mathias Jonas and Assistant Director Alberto Costa Neves represented the IHO Secretariat.

Participants at the 1st Meeting of the Drafting Group of the Strategic Plan Review Working Group (SPRWG)

The IHO Council was directed by the 1st Session of the IHO Assembly to conduct a comprehensive review of the IHO Strategic Plan and to provide a draft revised Plan in time for the 2nd Session of the Assembly in 2020. In the current scoping phase the Drafting Group reviewed the current and future strategic context in which the IHO operates, advancing the work done by correspondence.

Participants considered the definition of success for the IHO in 2026, identified deficiencies in the existing Plan, and envisioned the appropriate goals, ways and means that could address those deficiencies. The meeting identified criteria for measuring success and for proposing priorities for the IHO, considered the interrelation to other management elements such as budget, work plan and performance indicators.

The meeting considered the international arena and the relationship with the United Nations Sustainable Development Goals and the Shared Guiding Principles for Geospatial Information Management. Cooperation with other international organizations and the existing joint work were also discussed. A modern communication framework was considered as a critical element for the success of the IHO Strategic Plan.

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Among other factors considered were the need to develop nautical publications under the S-100 framework, cyber security and data assurance, increase of the bathymetric coverage and knowledge of seafloor shape and enhance capacity building.

- **Programme management, performance monitoring and risk assessment**

The processes for programme management, performance monitoring and risk assessment described in the edition of the Strategic Plan in place ranges from 2018 to 2020. In order to improve preparedness for the years to follow, the 1st Session of the Assembly tasked the Council to conduct a comprehensive review of the Strategic Plan and to provide a draft revised Plan, as appropriate, in time for the consideration of the 2nd session of the Assembly in 2020 and empowered the Council to establish a working group for this discrete purpose. The group finalized the work on a draft revised Strategic Plan and submitted it to the 3rd Council in October.

Annex B reports on the status of performance indicators allocated for the purpose of performance monitoring within 2019.

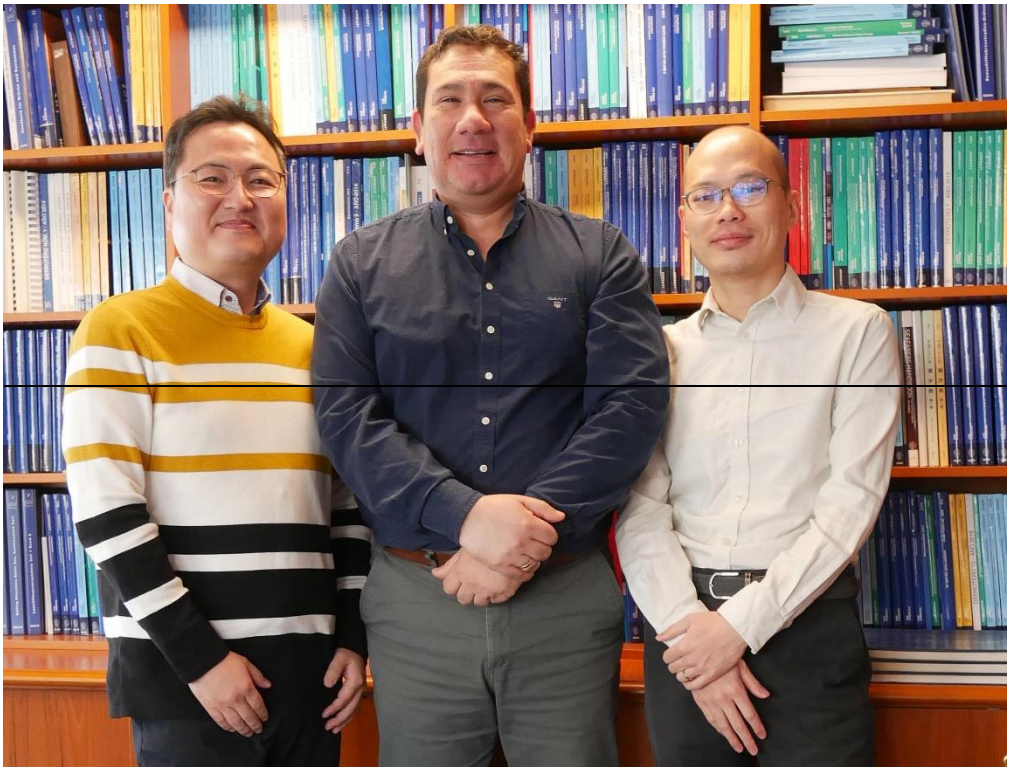
A significant part of the operational budget is allocated to travel. This supports the travel expenses of the Secretariat Staff engaged on IHO activities. A list of Secretariat travel in 2019 is shown in **Annex C**.

Management of the IHO Secretariat

- **Investment in infrastructure**

Continued investment was made in conference infrastructure such as advanced audio systems including build-in loudspeakers, power supply and wifi connecting points.

- **Secondment of Personnel to the IHO Secretariat**



Seconding Officers, Dr Hee Yoon PARK (ROK), Captain Cesar Rodrigrez (Peru), Mr Naohiko Nagasaka (Japan)

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Three officers were seconded to the Secretariat during 2019 under the terms of IHO Resolution 3/1987 as amended. Dr Hee Yoon PARK from the Korea Hydrographic and Oceanographic Agency, Captain Cesar Rodrigrez from the Hydrographic Office of Peru and Mr Naohiko Nagasaka from the Hydrographic and Oceanographic Department of the Japan Coast Guard were of great help in assisting the Secretariat on various issues.

Dr Park was employed as the Associated Professional Officer (APO) to support the capacity building activities of the IHO, and worked on the development of the capacity building management system and online registration system. He also made valuable contribution to S-100 for renewing the website as well as testing its converter.

Mr Nagasaka continued to work on the IHO Country Information System as well as the launch of IHO Online Form System. He also coordinated the implementation of the IHO-Nippon Foundation CHART project which was successfully finished in 2019 and is being discussed for further evolution.

Captain Rodriguez continued with the transfer of all documentation as editor (with the new mode of presentation of the archives) from the old website (meetings of the last 10 years, IHO publications and circular letters of the last 20 years) to the new website, which has been placed in the new IHO Digital Archive. He also assisted with the Spanish translation of the M-10 History of the IHB.

- **Translation Service**

The Secretariat continued to translate key documents from English into French and Spanish through the use of its translation staff, who were employed primarily on the translation of Circular Letters and Secretariat's correspondence. Translations from French into English, when required, were provided by the Personal Assistant. All incoming Spanish correspondence was translated into English, for internal use, by the Spanish Translator.

Since the volume of this work was significantly higher compared to previous years due the work on the script for the IHO-100 Prestige book and the maternity leave of one of the translators, external translation service was used.

- **Secretariat Operations & Performance Improvement Campaign**

The Directing Committee continued with the process of systematic review of the current internal arrangements of the Secretariat in order to identify needs and options to adapt to changed conditions, to optimize the internal work flow, aiming to improve efficiency and make the best use of the skills and talents of all the Members of Staff by acting more collectively. Based on the assessment of the implementation of the previous year´s outcome, a workshop with the focus on internal and external communication issues as well as the streamlining of administrative processes was conducted with all the Secretariat Staff.

The results were categorized and will be used for change management in the years to follow.

WORK PROGRAMME 2
Hydrographic Services and Standards

Introduction

The IHO Work Programme 2 “Hydrographic Services and Standards” seeks to develop, maintain and extend technical standards, specifications and guidelines to enable the provision of standardised products and services that meet the requirements of mariners and other users of hydrographic information. This Work Programme is under the principal responsibility of the Hydrographic Services and Standards Committee (HSSC).

Technical Programme Coordination

This element monitors technical developments and oversees the development of the IHO technical standards, specifications and publications through the coordination and interaction of the relevant IHO working groups reporting to the HSSC.

Conduct Annual meeting of HSSC

The 11th meeting of the Hydrographic Services and Standards Committee (HSSC) took place in Cape Town, South Africa from 6 to 9 May 2019. The meeting was hosted by the South African Navy Hydrographic Office (SANHO). The HSSC Chair, RAdm Luigi Sinapi (Italy) opened the meeting and invited Captain Theo Stokes, National Hydrographer of South Africa to provide the opening address. After welcoming delegates to the Mother City in all eleven official languages spoken in South Africa, Captain Stokes emphasized South Africa’s commitment to providing standards based on hydrographic products and services. He reported on the new rejuvenation programme being undertaken by the SANHO which will include the acquisition of a new hydrographic survey vessel, 3 organic survey motor boats and major upgrades to the production and training facilities within SANHO.

Sixty-three participants representing twenty-four IHO Member States and eleven stakeholder organizations participated in the meeting. The IHO Secretariat was represented by Director Abri Kampfer, Assistant Directors Yves Guillam and Anthony Pharaoh.

Following the resignation of the HSSC Vice-Chair, Mr Michael Prince (Australia), the Committee elected Mr Magnus Wallhagen (Sweden) as his replacement. The HSSC Chair congratulated Mr Wallhagen and expressed his appreciation to Mr Prince for the significant contribution he had made during his term in office.

The Chair of the Strategic Plan Review Working Group (SPRWG) of the IHO Council, Ingénieur général Bruno Frachon (France), reported on the draft Revised IHO Strategic Plan currently under development and the links to be established with the IHO Work Programme of the HSSC through Performance Indicators. Subsequent suggestions were made by the HSSC Chair. The meeting also discussed the format and content of a showcase presentation on S-100 based products and test bed systems to be presented at the 3rd session of the IHO Council.

The participants of the 11th Hydrographic Services and Standards Meeting.

Reports were provided by the Chairs of the HSSC Working Groups and Project Teams. The S-100WG Chair reported on new documents under development which include a guidebook for product specification developers (S-97), the "Interoperability Specification" for S-100 based navigation systems (S-98) and a proposal to implement an "S-100 Technical Readiness Levels" concept for controlling and monitoring the development of S-100 based products. Reports were also provided on the status of the S-101, S-102, S-121 and S-129 Product Specifications. PRIMAR reported on their implementation of the S-100 based security system for the distribution of S-102 and other product data.

The Chair of the ENCWG reported on the S-58 test datasets, progress with developing guidance on producing high density bathymetric ENC's and extensions to the S-63 (IHO Data Protection Scheme) required to address cyber security concerns.

The NIPWG Chair reported on the product specifications that have recently been completed, and those still under development. He reported on the outcomes of the joint IMO/IHO Harmonization Group on Data Modelling (HGDM) meeting (IMO, London – October 2018) and the discussions on the IMO e-Navigation Maritime Service descriptions that fall under the IHO responsibility.

The NCWG Chair reported on the status of IHO publications under its remit, and highlighted issues and options reported in a paper entitled "Future of the Paper Chart". A survey is proposed to Member States and its outcome will be incorporated into the final version of the report on the future of the paper chart.

The Chair of the DQWG reported on the new data quality indicators under development and highlighted a data quality "decision tree" that is intended to provide guidance on achieving a harmonized implementation of quality parameters for hydrographic data under the S-100 framework. The DQWG was also commended for the development of a new conditional visualization methodology of quality of bathymetric data which now needs to be experimented.

Canada reported on an "S-100 cloud distribution pilot project" which has demonstrated the ability to store S-102 data on a cloud repository, combine it with S-57 data and make it available for use as a web services.

Following a proposal made by the USA, the meeting had fruitful discussions on the possible implementation of MARPOL regulations into a new S-100 based product, still to be developed. A two-step process was agreed to speed up the service to mariners, firstly a revision of the S-57 catalogue of objects and then to consider at a later stage, whether it is appropriate to move forward with a new S-100 based products covering IMO-type regulations.

Reports were also provided on the activities of the Hydrographic Survey Project Team (HSPT), the Tides - Water Level and Current Working Group (TWCWG), the Hydrographic Dictionary Working Group (HDWG) and Advisory Board on Law of the Sea (ABLOS) activities. The HDWG provided a demonstration of the prototype online hydrographic dictionary applications which includes English, French, Spanish and Chinese terms and definitions.

Towards a multilingual IHO Hydrographic Dictionary using unique reference number for definitions

All reports and presentations given by the Working Groups are planned to be used in preparation of a strategic paper covering the S-100 Implementation Strategy aiming to provide some guidance to Member States on their transition plans to prepare the future production of S-100 based products.

Presentation on the activities of the following relevant external liaison organizations were provided by the International Maritime Organization (IMO), Comité International Radio-Maritime (CIRM), International Organization for Standardization (ISO/TC211), International Association of Light house Authorities (IALA), Open Geospatial Consortium (OGC), International Cable Protection Committee (ICPC) and Defense Geospatial Information Working Group (DGIWG). There were information papers presented on the phase II of the INToGIS project, the NOAA surface currents reporting facility and increases in the shifting of the magnetic north pole.

Hydrographic Data Transfer Standards

This element addresses the developments related to transfer standards for digital hydrographic data, the maintenance of the relevant IHO standards, specifications and publications and the provision of technical advice as appropriate.

Conduct meetings of S-100 and ENC Standards Maintenance Working Groups

The S-100 Working Group meeting, which was chaired by Ms Julia Powell (USA - NOAA), considered reports on the status of the following product specifications currently under development by IHO subordinate bodies; the S-102 (Bathymetric Surface), the S-121 (Maritime Limits and Boundaries), the S-101 (Electronic Nautical Chart), the S-129 (Under Keel Clearance Management) and the S-124 (Navigational Warnings) Product Specifications.

The meeting discussed several proposals for changes and extensions for inclusion in the next edition of the S-100 Universal Hydrographic data Model. These included proposals to change the naming convention used for exchange set catalogues; to implement changes to the catalogue style sheet file structure; and to provide colour pallet support for the display of symbols. There were also proposals to extend the HDF5 data encoding format and to modify the way feature associations are used in the ISO 8211 encoding format.

Denmark provided a presentation on the work that it has been carried out to produce generic S-100 based validation checks. The meeting also reviewed the following two important support documents currently under development; S-97 - Product Specification Development Guidebook; and S-98 - Interoperability Specification for S-100.

Presentations were provided on the status of the new GI Registry web application; the S-57 to S-101 conversion software application; the Feature Catalogue and Portrayal Catalogue builder applications; the Data Classification and Encoding Guide (DCEG) document generation application; and the S-100 data viewer applications.

The Korea Hydrographic and Oceanographic Agency (KHOA) and the USA Space and Naval Warfare Systems Command (SPAWAR) organization provided comprehensive presentations on projects to test the use of S-100 data within prototype navigations systems. These test systems load and portray datasets based on the S-101 ENC, S-102 Bathymetric Surface, S-111 Surface Currents, S-122 Marine Protected Areas, S-123 Radio Signals and S-127 Marine Traffic Management Product Specifications.

Participants of the 4th S-100 Working Group Meeting.

- **1st IHO Geospatial Information Registry Workshop**

The 4th S-100WG meeting was preceded by the 1st IHO Geospatial Information (GI) Registry workshop, which was chaired by the IHO GI Registry Manager, Mr Jeff Wootton (IHO Secretariat). Thirty two delegates from 11 Member States (Canada, China, Denmark, Finland, France, Italy, Norway, Republic of Korea, Romania, Sweden and United States) and eight expert contributors (ESRI, IALA, IC-ENC, IEHG, KRISO, Portolan Sciences, University of New Hampshire and WMO) attended the workshop. Stakeholder participation in the workshop was also provided by representatives of six IHO Working Groups and Project Teams (ENC Working Group, Nautical Information Provision Working Group, S-100 Working Group, S-101 Project Team, S-124 Project Team and S-129 Project Team).

The Chair outlined the main aims of the workshop, which were to provide participants with a common understanding of the IHO GI Registry; and to leverage on the wide range of subject matter expertise of the participants in discussing and improving all aspects of the Registry. An introduction to the structure, roles, interface and content of the IHO GI Registry and its component Registers was provided. This was followed by a briefing on the issues raised and the “lessons learned” in the operation of the IHO GI Registry since it became operational in October 2016, which provided the starting point for discussions for the remainder of the workshop. The structure of a new “Beta” version of the GI Registry, which is under development but partially operational, was demonstrated and discussed.

The standardization of the content of the Registry was discussed in detail, which provided input to an editing session on draft publication S-99 Annex A – Conventions and Guidelines for the Content of the IHO GI Registry. Outcomes from the workshop will also contribute to a review of S-100 Part 2 – Management of Registers and S-99 – Operational Procedures for the Organization and Management of the S-100 Geospatial Information Registry. The workshop concluded with demonstrations of the Feature Catalogue Builder and Portrayal Catalogue Builder tools.

Participants in the 1st IHO Geospatial Information Registry Workshop

- **S-102PT**

Twenty two participants representing Member States, industry organizations and academia participated in the 5th S-102 Bathymetric Surface Project Team meeting which was held at the same venue and time as the Registry Workshop. The meeting was chaired by Mr David BRAZIER (USA – CNMOC).

The primary focus of the meeting was to complete Edition 2.0.0 of the S-102 Bathymetric Surface Product Specification, in time for consideration at the 11th Hydrographic Services and Standards Committee (HSSC11) meeting (May 2019). Some of the main items that were considered by the meeting included issues relating to horizontal accuracy metadata, revisions to the S-102 grid structure, the suitability of S-102 for navigation and extensions to the HDF5 encoding format. The meeting considered several proposals for corrections, clarifications and extensions to the Product Specification. There were also some informative discussions on data quality constructs (developed by the Data Quality Working Group) and how these could be used to portray uncertainty in navigation systems.

The Chair provided a report on the software application that has been developed to convert grid data from the "Bathymetric Attributed Grid" (BAG) format to the S-102 format. This conversion software will be made available for downloaded from the S-100WG page on the IHO website.

Participants in the 5th S-102 (Bathymetric Surface) Project Team Meeting.

- **S-100 Test Strategy Meeting (TSM)**

The S-100 Working Group's 7th Test Strategy meeting took place at the IHO Secretariat in Monaco from 23 to 26 September 2019. Fifteen Member State representatives from Australia, Canada, Finland, France, Germany, Netherlands, Norway, Korea (Rep of) and the USA attended the meeting. Nine representatives from the following industry and academic organizations attended; Esri, Electronic Chart Centre (ECC), Korea Research Institute of Ships and Ocean (KRISO), Korea Maritime and Ocean University (KMOU), IIC-Technologies, International Centre for ENCs (IC-ENC), Portolan Sciences, SevenCs, Teledyne Caris and WR Systems.

The meeting was chaired by Julia Powell (USA). IHO Director Abri Kampfer, Assistant Directors Anthony Pharaoh and Alberto Costa Neves and Technical Standards Support Officer (TSSO), Jeff Wootton, represented the IHO Secretariat and provided logistical support.

The IHO Secretary-General, Dr Mathias Jonas, opened the meeting and reminded delegates of the importance of the work being undertaken by the S-100WG. He highlighted the challenge of bringing all the elements of S-100 data products together for use by data providers, service providers and end users.

The participants of the 7th S-100 Test Strategy Meeting.

The primary goal of the meeting was to carry out a review of draft S-98 publication and to discuss issues relating to the extensions to the S-100 Framework Standard and the implementation of data products in Electronic Chart Display and Information System (ECDIS). The meeting considered issues relating to the architectural display of S-100 related products in ECDIS and how best to achieve harmonized portrayal. There were discussions on the development of an exchange catalogue for multiple products and KHOA provided a report on their sea trial project to test the use of S-100 datasets in a prototype S-100 ECDIS. Other important issues discussed included the need for a code-list register, the implementation of a bathymetric data quality model, carriage requirements for S-100 based ECDIS and data security and authentication for the distribution of S-100 products. A number of proposals for extensions to the S-100 framework standard were also considered.

- **S-101PT**

The S-101 Electronic Navigational Chart Project Team (S-101 ENC PT) held its 4th meeting at the IHO Secretariat, in Monaco from 13 to 14 June 2019. Twenty eight Member State representatives from Australia, Brazil, China, Denmark, Estonia, Finland, France, Germany, Italy, Norway, Korea (Rep of), the United Kingdom (UK) and the USA attended the meeting. Ten members from seven industry and academic organizations also attended the meeting. The meeting was chaired by Mr Albert Armstrong (USA). Director Abri Kampfer, Assistant Director Anthony Pharaoh and Technical Standards Support Officer Jeff Wootton represented the IHO Secretariat.

The participants of the 4th S-101 Project Team Meeting.

Following the publication of Edition 1.0.0 of the S-101 ENC Product Specification in December 2018 for evaluation and testing, a few inconsistencies in the S-101 feature catalogue were reported and discussed during the meeting. These will be resolved in the next minor edition of the feature catalogue. A report was provided on the development of the S-101 portrayal catalogue and its associated conditional procedure framework. This work includes the development of conditional rules for triggering both portrayal and alert / indicator events within an ECDIS.

Demark reported on their activities to develop a framework for documenting validation rules for S-100 based products. Denmark have also developed a preliminary list of validation checks for S-101 ENC data.

The IHO Registry Manager reported on the current status of the GI Registry, and the outcomes of the Registry workshop which took place during the 4th S-100WG meeting in Aalborg, Denmark from 27 Feb to 1 March 2019. KHOA provided update reports of the Feature Catalogue and Portrayal Catalogue builder applications that are currently being tested. These applications work in tandem with the GI Registry.

IIC-Technologies presented the results of an S-57 ENC to S-101 ENC data conversion study. One of the main objectives of the study was to look at how S-57 data can be "optimised" in order to facilitate data conversion. The free S-57 to S-101 ENC converter produced by Esri was used for the data conversion.

The Chair of the DQWG reported on a proposed mechanism to automatically compute the equivalent of CATZOC for use in S-101. The process requires that the underlying survey data is adequately attributed.

A report on the new data security scheme that will be used for the distribution of S-100 products was provided by Primar. Other items discussed included; quality of horizontal measurement, additional portrayal issues and reports on test bed projects.

- **S-121PT**

The Maritime Limits and Boundaries Project Team (S-121PT) held their 9th meeting at the IHO Secretariat, (Monaco) from 19 to 23 August 2019. Fourteen Member State representatives from Australia, Canada, China, Korea (Rep of) and the United Kingdom (UK) attended the meeting. Industry members from IIC Technologies and Cooley also attended the meeting. Members from Canada, France, USA and the United Nations - Division of the Oceans and Law of the Sea (UN-DOALOS) also participated in the meeting via online teleconference link. The meeting was opened by Director Mustafa Iptes, and Assistant Director Anthony Pharaoh represented the IHO Secretariat during the meeting.

The primary objective of the meeting was to review feedback provided on the draft Edition 1.0.0 S-121 Product Specification documents. The meeting considered 435 comments received from Member States, the S-100 Working Group, industry and the IHO Secretariat. More than three hundred and sixty of the comments were, either accepted for inclusion in the current edition, or for inclusion in a future edition.

The participants of the 9th S-121 Project Team Meeting.

A presentation was provided on a pilot project to test the S-121 Product Specification. The project will be undertaken by the Open Geospatial Consortium (OGC). Its main objectives will be to test the implementation of the S-121 data model and to highlight any geospatial interoperability issues. It is the intention to publish S-121 Edition 1.0.0 for evaluation and testing. It was decided that the date and venue of the next meeting will be determined after the specification has been tested and sufficient feedback has been received.

- **ENCWG**

The ENC Standards Maintenance Working Group (ENCWG) held their 4th meeting at IHO Secretariat, (Monaco) from 10 to 12 June 2019. Twenty participants representing the following Member States attended the meeting; Australia, Brazil, Canada, Chile, China, Denmark, Estonia, Finland, France, India, Italy, Japan, Netherlands, New Zealand, Norway, Korea (Rep of), Spain, Sweden, United Kingdom (UK) and the USA attended the meeting. Ten representatives from industry organizations and academia also attended the meeting.

The meeting was opened by Director Abri Kampfer who welcomed members to the Secretariat of the IHO and thanked them for their contribution to the standards development and maintenance activities of the Organization. Assistant Director Anthony Pharaoh and Technical Standards Support Officer Jeff Wootton represented IHO Secretariat.

Participants of the 4th ENC Standards Maintenance Working Group Meeting.

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The meeting discussed Edition 6.1.0 of S-58 "*ENC Validation Checks"* which was published in September 2018. This edition introduces a new 'Critical Error' category of check which specifies a minimum standard to which all ENC datasets must comply. As of September 2019 S-58 Edition 5.0.0 will be retired, and all new ENCs will be required to comply with Edition 6.1.0.

As a result of the publication of the S-52 Presentation Library Edition 4.0.2, some minor inconsistencies with the S-57 *Use of the Object Catalogue (UOC)* document were highlighted. The meeting concluded that a new edition of the UOC should be produced to address the inconsistencies.

The meeting reviewed a guidance document on *High Density (HD) ENC Production and Maintenance* which had been produced in response to an HSSC action for inclusion of text into the next edition of the S-65 *ENCs: Production, Maintenance and Distribution Guidance* document.

The meeting also discussed papers dealing with several encoding and portrayal issues. These included; editorial amendments to S-52, encoding of active submarine volcanos, encoding of omnidirectional lights with a nominal range of 10NM or greater, performance issues with "over scale" area pattern in ECDIS, the display of non HO data boundary in ECDIS and issues with the encoding of OBSTRN (obstruction) objects.

Nautical Cartography

This element addresses the developments related to nautical cartography for paper nautical charts and the colours, symbols and display rules used to show System ENC (SENC) information on ECDIS, the maintenance of the relevant IHO standards, specifications and publications, and the provision of technical advice as appropriate.

Conduct meetings of Nautical Cartography Working Group (NCWG)

Hosted by the Hydrographic Office of the Swedish Maritime Administration, the 5th meeting of the Nautical Cartography Working Group (NCWG-5) took place in Stockholm, Sweden, from 5 to 8 November. The meeting was chaired by Mr Mikko Hovi (Finland), supported by Mr James Timmins, Secretary (United Kingdom). Thirty-four delegates from 21 Member States (Australia, Brazil, Canada, Denmark, Estonia, Finland, France, Germany, India, Indonesia, Italy, Japan, Latvia, Netherlands, Norway, Republic of Korea, Romania, Spain, Sweden, United Kingdom and USA), two Expert Contributors (Esri, Teledyne-Caris) and Dr Lysandros Tsoulos, representing the FIG/IHO/ICA International Board of Competence for Nautical Cartographers and the ICA Commission on Marine Cartography participated in the meeting. The IHO Secretariat was represented by Assistant Director Yves Guillam, who also facilitated a workshop for Regional INT Chart/ENC Coordinators on 4 November, preceding the NCWG-5 meeting.

Mr Magnus Wallhagen (Sweden) welcomed the participants on behalf of Mr Patrik Wiberg, Director of the Swedish Hydrographic Office. In his opening address, he highlighted the challenges the Swedish Hydrographic Office's cartographers face every day due to Sweden's archipelago environment. In his position as Vice-Chair of the HSSC, he also stressed the most important issues raised by the HSSC and the Council, which included the requirement for the NCWG to develop at this meeting, as a matter of priority, the recommendations on the Future of the Paper Chart. He emphasized in particular the issues faced by Hydrographic Offices for the allocation of resources in the sustainable maintenance and production of traditional charts (paper and ENCs) and the investments needed for preparing the future with S-100 based products.

NCWG-5 participants

Following a proposal from India in support of the IHO Resolution 1/2005 as amended – *IHO response to disasters* – the working group noted that amendments to this Resolution were currently submitted for approval at the next Session of the Assembly and was of the opinion that the provision of emergency contact details was likely to be more appropriate in Nautical Publications than printed on or included in nautical charts. In a proposal from Australia justifying the need for a new type of chart designed with the main purpose of serving as back-up to electronic navigation that can be easily produced from officially (and richer) published ENC data, the working group noted that "two" standards would certainly create some confusion to the mariners. It was also agreed that the associated proposed Australian amendment to the IMO definition of what constitutes a back-up paper chart was not helpful on the matter. The US representative presented the outcome of their experimentation on the automated production of paper charts from an ENC chart database, supported by Esri who stressed the current limitation factors in the IHO standards for automation.

The Chair (US) of the Sub-Working Group on the Future of the Paper Chart (FNPC) provided a summary report on the outcome of the survey on the Future of Nautical Paper Charts to which 52 Member States responded.

Discussions on the outcome of this survey led to the preparation of three draft recommendations that will be finalized, together with the report on the FNPC, for submission to HSSC. It was noted that due to the deadline for submission to HSSC (mid-March 2020), the report will be available prior to the 2nd Session of the Assembly. As a consequence and by anticipation, the NCWG also drafted some amendments to its Terms of Reference in order to propose a better alignment of its activities with the IHO Work Programme and priorities, such as the S-100 Implementation Decade.

The working group noted the concept for the visualization of the quality of bathymetric data for safe navigation presented on behalf of the Chair of the DQWG, which was questioned mainly due to portrayal issues illustrated by some "counter-examples" provided by Finland. In response to an action from HSSC-11, the meeting welcomed the offer made by the UK to assume the role of custodian for the maintenance of INT-1 – *Symbols, Abbreviations and Terms used on Charts*. This topic was complemented by several suggestions from industry and representatives of the ROK in favour of the development of a *.svg IHO library of symbols to be made available in the IHO Geospatial Registry.

Following the workshop for Regional INT Chart/ENC Coordinators, that included some brainstorming about the future role of Regional Chart Coordinators, it was generally agreed that the INT Charts schemes are not a priority anymore. The IHO Secretariat provided an update on the preparation of the commissioning and timelines of the KHOA supported project, INToGIS II web services, consisting of S-11 Part B, web catalogue of ENCs and INT charts, new layers in the Manager mode such as AIS data, CATZOC, Ports database, enhanced user interface, layers with different patterns and transparency cursors.

Digital Data Protection and Authentication

The IHO Secretariat continued to carry out the role of administrator of the S-63 scheme. This function involves processing applications and providing technical support and the individual and unique digital certificates and codes that are required to allow ENC data servers, OEMs and software developers to encrypt and de-encrypt ENCs as part of the services or equipment that they provide. The S-63 Security Scheme currently includes fifty seven Data Servers and three hundred and fifty three Original Equipment Manufacturers (OEM's). Three new Data Servers and eighteen new OEMs were added to the scheme during 2019.

Data Quality

This element addresses the developments related to methods of classifying and depicting the quality of hydrographic information, the maintenance of the relevant IHO standards, specifications and publications, and the provision of technical advice as appropriate.

Conduct meetings of Data Quality Working Group (DQWG)

The 14th meeting of the Data Quality Working Group (DQWG) took place at the IHO Secretariat, Monaco, from 5 to 8 February.

Director Abri Kampfer welcomed the participants and gave a short opening address stressing the transversal role of the DQWG in the IHO and the large expectations from Member States to get data quality guidance for harmonizing purposes. The meeting was chaired by Mr Rogier Broekman (Netherlands). Thirteen delegates from 11 Member States (Brazil, Canada, Denmark, Finland, France, Italy, Japan, Netherlands, Norway, United Kingdom and United States) attended the meeting. The Secretary-General of the IHO made an intervention during the meeting, highlighting the increasing interest in data quality in support of marine knowledge, decision making by mariners and the development of autonomous shipping. The IHO Secretariat was represented by Technical Standards Support Officer Jeff Wootton and Assistant Director Yves Guillam. Assistant Director Alberto Costa Neves attended the meeting as well, mainly as liaison for MSDI, C-55 and Capacity Building/Educational matters, in relation to data quality and data integrity.

Following the review of the Terms of Reference of the DQWG, the meeting agreed to submit an amendment for the approval of the HSSC, aiming to offer the possibility for the DQWG to provide advice related to data quality in all areas and not only limited to Product Specifications managed by the S-100WG.

The Chair provided a status report on the harmonization of data quality indicators, describing how IHO Members allocate S-44 values for different types of survey techniques (including crowd sourced bathymetry, satellite derived bathymetry and LIDAR) and translate these to CATZOC values. Examples of generalization (aggregation) issues of current CATZOC values across ENC compilation scales were also discussed, while steadily keeping in mind the key objective that the DQWG is tasked to develop guidance on quality aspects that will help the Member States to allocate meaningful quality values of bathymetric data in future S-101 ENC. To this end, a document will be created describing the conversion of S-57 (M_QUAL/CATZOC) to S-101 (Quality of Bathymetric Data).

The DQWG reviewed all the comments received on its first draft of the Data Quality Checklist for Product Specifications that is planned to become a component of Part C of IHO Publication S-97 – *IHO Guidelines for Creating S-100 Product Specifications*. Graphical examples still need to be included in this Part C.

The Chair reported that the DQWG had received requests to review the data quality components of the S-101, S-102 and S-127 Product Specifications. These were checked against the draft Part C, with feedback to be provided to the responsible Working Groups.

During an interactive workshop, the meeting considered methodologies for the display of quality information. A benchmarking of proposals and current standards was made, for two user modes: route planning and route monitoring. While noting the obstacles of an evolution of the regulations and ECDIS standards in the short term, several findings were identified during the workshop that will help to define a new portrayal concept. When finalized, it will be submitted to the other HSSC Working Groups for testing, and possible implementation in the design of future S-101 ECDIS.

The DQWG reviewed the significant number of comments and concerns received on the draft Publication S-67 - *Mariners' Guide to Accuracy of Depth Information in ENCs* - and agreed to propose a new way forward at the next HSSC meeting.

Participants in the DQWG-14 meeting, IHO Secretariat, Monaco

Nautical Publications

This element addresses the developments related to the preparation of nautical publications, the maintenance of the relevant IHO standards, specifications and publications, and the provision of technical advice as appropriate.

Conduct meetings of Nautical Information Provision Working Group (NIPWG)

The 7th meeting of the Nautical Information Provision Working Group (NIPWG) took place in Tallinn, Estonia, hosted by the Estonian Maritime Administration (EMA) from 25 to 29 November.

Ms Kaidi Katus, Head of Aids to Navigation and Hydrography Division and Deputy Director General of EMA, welcomed the participants and gave an opening address emphasizing the importance of NIPWG activities in the development of some of the key components of the S-100 Implementation Strategy. The meeting was chaired by Mr Jens Schröder-Fürstenberg (Germany), supported by Mr

Thomas Loeper, Secretary (USA). Twenty-five delegates from 14 Member States (Canada, Denmark, Estonia, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Republic of Korea, Spain, United Kingdom and United States) and seven expert contributors (Anthropocene Institute, Furuno/IEC, ICS[1], IHMA[2], KRISO[3], National Taiwan Ocean Centre and University of New Hampshire) attended the meeting. The IHO Secretariat was represented by Assistant Director Yves Guillam.

The meeting was opened with an important clarification on the functional terminology - *route monitoring* or *route planning* – the only one to be used when addressing the use of future digital nautical publication products in an ECDIS environment and issues related to the architecture of navigation systems. These terms match with the IMO definitions in use.

The Secretariat reported on the outcome of the 3rd meeting of the Council in relation to NIPWG activities. The participants were in particular informed that following the Council's endorsement of a draft S-100 Implementation Strategy, engagement with the IMO will be starting soon with a submission paper to NCSR7[4] which presents a roadmap of the introduction of the next generation of S-101 Electronic Navigational Charts (ENC) and introduces the resulting implications for existing and new ECDIS installations. Attention was drawn on the fact that the timeline is set to achieve synchronization of the implementation of S-101 ENC compatibility with the application of MSC.1/Circ.1593 - *Interim Guidelines for the Harmonized Display of Navigation Information Received via Communications Equipment* - coming into force on 1 January 2024 for new ECDIS equipment by OEMs.

As part of the national projects presented during the meeting, the working group noted the good progress made on the development of the Norwegian Pilot Guide, which has led to a certain level of harmonization of harbour infrastructure data in cooperation with port authorities. The potential reuse of this concept for the provision of nautical information in non-SOLAS environment was noted as well as the possible benefit for the S-100 Implementation Strategy, if data models could be derived from S-12x Product Specifications. In the presence of the representative of IHMA, the meeting agreed that the assessment of needed information to produce a potential product specification on Marine Harbour Infrastructure, including *services* to be established by the HOs to collect data from harbour authorities, was now required. A convincing presentation by the representative of UNH also confirmed the need to move forward in the development of the S-126 - *Marine Physical Environment* data modelling. The intention to initiate or resume the relevant Product Specification development will be submitted for approval to HSSC.

In the context of the S-100 Implementation Roadmap, the meeting acknowledged the increasing importance of the development of the S-128 Product Specification - *Catalogue of Nautical Publication* as a possible driver to provide end-users with the up-to-datedness of the products to be used and to be recognized during Port State control inspections in the future. This development was reported by the representative of KRISO for KHOA. The KHOA's project for portrayal harmonization, which is critical for S-12x based products used in ECDIS environment, led to the decision to have a one-day workshop at the next meeting to assess use-cases and lessons learned provided by Member States. Portrayal issues were also discussed for S-124 - *Navigational Warnings*, and on S-122 – *Marine Protected Areas*. It was noted that some nations have started to produce test datasets in support of some provision and portrayal experimentations.

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[1] International Chamber of Shipping.

[2] International Harbour Masters Association.

[3] Korea Research Institute of Ships and Ocean Engineering.

[4] IMO Sub-Committee on Navigation, Communications and Search and Rescue (NCSR 7) – Reference: IHO CL 54/2019.

In session: discussion on the portrayal of nautical information in ECDIS environment

USA reported on the final steps of the revision of S-49 - *Standardization of Mariners' Routeing Guides* that will be submitted as Edition 2.1.0 to HSSC for endorsement in application of the recently amended IHO Resolution 2/2007. In this context, the meeting also considered briefly the possible implications of the discontinuity, within a five years' time frame, of the production of paper charts by the US.

Mr David Lewald (US Coast Guard) informed the participants on the outcome of the recent IALA technical meetings. The working group noted with appreciation the IALA's initiative aiming to develop S-125 – *Marine Navigational Services* for the IHO, as well as the existence and ongoing development of the Marine Resource Name Management Guideline by IALA.

At the end of the meeting, Mr Stefan Engström (Finland) was elected as Vice-Chair of NIPWG.

NIPWG-7 participants in Tallinn, Estonia

Tides and Water Levels

This element addresses developments related to tidal and water level observation, analysis and prediction and other related information including vertical and horizontal datums, the maintenance of the relevant IHO standards, specifications and publications, and the provision of technical advice as appropriate.

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Conduct meetings of the Tides, Water Level and Currents Working Group (TWCWG)

Hosted by the Korean Hydrographic and Oceanographic Agency (KHOA), the TWCWG held its 4th meeting at the Shilla Stay Haeundae Hotel, Busan, Republic of Korea, from 8 to 11 April under the chairmanship of Dr Gwenaële Jan of France. The meeting was attended by 47 delegates from 21 IHO Member States (Australia, Brazil, Canada, Chile, China, Colombia, Finland, France, Germany, India, Indonesia, Japan, Netherlands, Norway, Peru, Republic of Korea, South Africa, Spain, Sweden, UK and USA) and observers from the Centre for Coastal and Ocean Mapping/University of New Hampshire (CCOM-JHC/UNH), Joint Institute for Marine and Atmospheric Research (JIMAR) University of Hawaii Sea Level Center (UHSLC), Université de la Rochelle, laboratoire LIttoral ENvironnement et Sociétés (LIENSs), LIttoral ENvironnement et Sociétés/ Laboratoire d'Études en Géophysique et Océanographie Spatiales (LIENSs/LEGOS) and the Secretariat of the Intergovernmental Oceanographic Commission of UNESCO (IOC). Assistant Director David Wyatt represented the IHO Secretariat. The meeting included a day of joint sessions with the participants at the 16th meeting of the IOC Global Sea Level Observing System Group of Experts (GLOSS-GE XVI), which followed TWCWG4 and for which a number of the TWCWG members remained to participate.

The meeting received an update on the interaction and discussions which had taken place with other IHO subordinate bodies, in particular NIPWG, DQWG, HDWG and S-100WG. Significant time was set aside to progress the S-100 based Product Specifications (PS), for which the TWCWG is responsible. It was noted that S-111 - Surface Currents - Edition 1.0.0 had been published in December 2018. Significant progress was made developing the draft S-104 - Water Level Information for Surface Navigation - specification, identifying areas which needed to be addressed to allow an Edition 1.0.0 to be published. Guidance and advice to address a number of issues to progress the development of the S-104 PS was provided by the Vice-Chair of the S-100WG.

A number of presentations were given, highlighting national projects covering various aspects of both S-104 and S-111. All participants were encouraged to provided compatible datasets to allow further testing and development.

The final draft of the proposed IHO resolution covering standards for digital tide tables was presented and approved for submission to HSSC11 for endorsement. A breakout group, which included a number of GLOSS-GE members, agreed on a number of actions and tasks to be addressed before TWCWG5 to reinvigorate the task of comparing tidal predictions generated as a result of analysis of common datasets by different analysis software. It was agreed that a document was needed to provide guidance on the minimum number of years for a large time series dataset, data uncertainty, harmonic analysis and minimum metadata to be provided with a dataset. The inventory of tide gauges and current meters, and the list of Actual Tides On-line Links were highlighted. The IOC recommended that their Manuals and Guides No 14 - *IOC Manual on Sea Level Measurement and Interpretation* – and the IOC report on Sea Level Measurements in Hostile Conditions could be highlighted and linked at the head of the inventory list as an additional resource. Participants were requested to check both lists periodically to ensure currency and that they should be highlighted through Regional Hydrographic Commissions with the purpose of raising awareness and encouraging additional inputs.

Participants at the TWCWG4 meeting

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It was agreed that the IHO resolutions, for which the TWCWG is responsible, needed comprehensive review and a group led by South Africa agreed to undertake the task and provide initial draft revisions for consideration at TWCWG5. The wider use of tide, water level and current data beyond safety of navigation was proposed for consideration as part of the review, as well as the exchange of high frequency Real Time Data and historic data recovery, both of whom are relevant for sea level monitoring.

Participants at the Joint meeting of the IHO TWCWG4 and the IOC GLOSS-GE XVI

A number of national projects were presented during the joint sessions as well as comprehensive briefs on the IHO Capacity Building course, which has been translated into French, Spanish and Portuguese, as well as the efforts being undertaken to address historic data recovery and data archaeology. The IOC agreed to provide details of their Capacity Development resources and the IOC Sea Level Monitoring Facility, which are available on the IOC website, for inclusion in the course material. It was agreed that the course needed to be highlighted through Regional Hydrographic Commissions with the purpose of raising awareness of the course and encouraging additional requests for its delivery. The IOC highlighted the importance of encouraging and incentivising national Hydrographic Offices to participate in the historic data recovery and data archaeology initiatives, as they hold substantial quantities of data of significant value in long term sea level monitoring.

It was agreed that comparing tidal predictions generated as a result of analysis of common datasets by different analysis software, capacity building/development and historic data recovery and data archaeology were three areas in which there was a great deal of common activity and on which joint efforts should be focused. There was also widespread support for a further collocated meeting in the future.

Hydrographic Dictionary

This element addresses the development, maintenance and extension of IHO Publication S-32 - *Hydrographic Dictionary* in English, French and Spanish, and the provision of technical advice as appropriate.

Maintain and extend the IHO Hydrographic Dictionary in English, French and Spanish.

Although the Hydrographic Dictionary Working Group (HDWG) did not meet in 2019, considerable progress has been made on the development of the online dictionary to allow the inclusion of multiple language versions. The database application has replaced the previous Wiki version, which has been withdrawn. Work on the Chinese and Indonesian language versions have been completed along with the development of a template for use by other Working Groups when submitting new terms or amendments to the dictionary. Although included in the online version, work continues on the French and Spanish versions to align these languages with the reference version and allow smooth cross-referencing with the other language versions. Work remains ongoing on the task of translating the terms into Arabic and the completion of a Malaysian language version.

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HSSC11 agreed to investigate the proposal to remove S-32 from the list of publications covered by IHO Resolution 2/2007, as amended, so that it can be aligned with the processes used to maintain the IHO GI Registry through the Concept Registry Domain Control Body, in which it is planned the HDWG will participate. It has been agreed that a comprehensive review of the complete set of terms currently contained in the reference database should be undertaken to achieve a focused and manageable list of terms for which the HDWG should be responsible.

ABLOS

This element addresses the developments related to the hydrographic aspects of the United Nations Convention on the Law of the Sea (UNCLOS), the maintenance of the relevant IHO publications, and the provision of technical advice as appropriate.

Organize and prepare the Advisory Board on the Technical Aspects of the Law of the Sea (ABLOS) annual business meeting

The Advisory Board on the Technical Aspects of the Law of the Sea (ABLOS) is a joint board of the International Hydrographic Organization (IHO) and the International Association of Geodesy (IAG). The ABLOS comprises four representatives from IHO Member States and four representatives from the IAG. The United Nations Division for Ocean Affairs and Law of the Sea (UN-DOALOS) and the Secretariat of the IHO provide one ex-officio member each. The ABLOS is charged with providing advice, guidance and, where applicable, offering expert interpretation of the hydrographic, geodetic and marine geo-scientific aspects of the Law of the Sea to the parent Organizations, their Member States or to other organizations on request. It also reviews State practice and jurisprudence on Law of the Sea matters which are relevant to the work of the Board to enable it to provide expert advice when needed. The ABLOS also studies, promotes and encourages the development of appropriate techniques in the application of the technical provisions contained within the UN Convention on the Law of the Sea (UNCLOS). IHO publication C-51-*Manual on the Technical Aspects of the United Nations Convention on the Law of the Sea* is maintained by the ABLOS.

The 26th Business Meeting of ABLOS was held at the IHO Secretariat in Monaco on 7 and 10 October 2019. The 10th ABLOS Conference, titled '*Opportunities and Challenges in the Governance of the Planet Ocean*' took place from 8 to 9 October 2019 and also was held at the IHO Secretariat.

26th Business Meeting of ABLOS

The 26th ABLOS Business Meeting, under the chairmanship of Professor Niels Andersen (IAG – Denmark), met with members and observers from Australia, Brazil, Chile, Denmark, France, Republic of Korea the United Kingdom (UK) and United States present; the appointed observers from Sweden (IAG) and India (IHO) sent apologies; representatives from Qatar and Japan also attended.

The first session of the business meeting completed final preparations for the 10th ABLOS Conference.

ABLOS members and observers discussed notable topics from the various conferences, seminars and workshops that they had attended and undertaken since the previous business meeting. The meeting also discussed the ABLOS capacity building training course, the revision of the material and its ownership and a small group was established to lead this work.

ABLOS Members gathered for ABLOS BM26 in

During the 2nd session of the Business Meeting the Terms of Reference and Rules of Procedure for the ABLOS and the Conference Fund Guidelines were reviewed and a number of editorial amendments were identified. The ABLOS noted that two IHO appointed members and one AIG appointed member were due to end their terms in 2021.

The final actions to complete Edition 6.0.0 of the TALOS Manual - C-51 – Manual on Technical Aspects of the United Nations Convention on the Law of the Sea - 1982 – were agreed. In addition the French and Chilean members of the ABLOS provided progress reports on the French and Spanish translations of Edition 6.0.0. It was also agreed to start a holistic review of the C-51 in preparation for an Edition 7.0.0.

The ABLOS also identified the main resultant output and action from the 10th Conference and the ABLOS agreed to investigate the legal status of Crowdsourced Bathymetry (CSB) with respect to UNCLOS. It was envisaged that opinion papers would be developed for publication and supporting presentations made at appropriate events to help clarify the status of CSB and potentially gain wider national acceptance for the activity.

The focus of the regional seminar in Brazil, which will be held immediately following the next Business Meeting, was discussed and agreed. The meeting then considered the theme, title and keynote speaker for the next Conference, the 11th ABLOS Conference, which will be held in Monaco in 2021. It was agreed that there was a need to maintain the momentum generated at the 10th Conference and therefore dates, the title and keynote speaker needed to be advertised at least 18 months ahead of the proposed dates. A Conference organizing committee was formed to undertake these tasks.

On completion of the ABLOS Conference, Mrs Izabel King-Jeck (IHO-Brazil) assumed the role of Chair and Dr Juan-Carlos Báez (IAG – Chile) was elected as Vice-Chair.

10th ABLOS Conference

Participants at the 10th ABLOS Conference

The 10th ABLOS Conference was attended by 70 delegates and 25 different States were represented, (Australia, Belgium, Brazil, Canada, Chile, China, Denmark, Faeroes Islands, France, Germany, Indonesia, Japan, Kuwait, Netherlands, New Zealand, Norway, Oman, Portugal, Qatar, Republic of Korea, Saudi Arabia, South Africa, Sweden, United Kingdom and USA). The Conference included 20 presentations covering a wide variety of topics and issues in relation with the theme "*Opportunities and Challenges in the Governance of the Planet Ocean*". IHO Secretary-General, Dr Mathias Jonas, welcomed the delegates on behalf of the IHO. The opening key note address was given by Professor Ronán Long, Director of World Maritime University-Sasakawa Global Ocean Institute. The general theme of the conference was the growing recognition that the oceans are crucial to global sustainability and play a key equilibrating role in global climate as the primary sink for excess heat and carbon present in the global climate system and represent a vital repository and supporter of global biological diversity. Noting coastal and ocean areas are the drivers for the global economy, especially through sea-borne trade as well as via a rising 'Blue Economy' around the world, and play a crucial and increasingly important role in global food security. These areas are therefore of critical importance across scales, from the global to the regional, national and sub-national coastal community levels. Acknowledging that the oceans are also increasingly under threat, notably as a result of enhanced competition for coastal and marine resources, and intense and diverse uses of coastal and marine spaces, threatening their sustainability. All too frequently this competition leads to friction and tension among marine users and incompatible spatial and temporal overlaps between uses of ocean space. The impacts of climate change on the oceans further compound these issues. Governing our 'Planet Ocean' therefore represents a vital and pressing opportunity and challenge. The conference provided an opportunity to reflect on, principally, legal and technical aspects relating to a range of these themes. The presentations on various aspects of the Law of the Sea generated numerous questions and comments in plenary and much discussion in the margins during the breaks.

Project Team on Standards for Hydrographic Surveys (HSPT)

- **HSPT4**

Participants of the 4th meeting of the HSSC HSPT at IHO, Monaco

The Project Team on Standards for Hydrographic Surveys (HSPT), which is tasked by the IHO Hydrographic Services and Standards Committee (HSSC) to prepare a draft 6th Edition of IHO publication S-44 - Standards for Hydrographic Surveys, held its 4th meeting (HSPT4) at the IHO Secretariat in Monaco, from 3 to 6 December 2019 under the chairmanship of Christophe Vrignaud (France). 23 representatives from 11 Member States (Brazil, Canada, France, Germany, Italy, Netherlands, Norway, Portugal, Sweden, United Kingdom and United States), and expert contributors from AML Oceanographic, Argans, EOMAP, Fugro, International Federation of Hydrographic Societies (IFHS), and iXblue attended the meeting. Director Abri Kampfer and Assistant Director David Wyatt represented the IHO Secretariat.

The HSPT received presentations from Argans and EOMAP covering the data gathering, limitations, quality assurance and potential of Satellite Derived Bathymetry (SBD). The presenters also provided tentative standards for classifying the resultant data for consideration by the HSPT.

The remainder of the meeting was spent reviewing the feedback and comments received from the Member State and Stakeholder engagement on the draft 6th Edition of S-44. The introduction, new chapters, annexes and associated tables were comprehensively revised. In response to significant demand, a new 'Exclusive Order' was proposed with more demanding specifications than the current Special Order. It was noted that a number of national Hydrographic Offices were already issuing survey project contracts with similar specifications, although it was acknowledged that the proposed specifications would not be applicable to all Member States. The HSPT agreed on the necessary inter-sessional tasks and identified milestones, to allow for the collation of the final draft 6th Edition of S-44.

It was agreed that a further meeting would be required to review the final draft of the 6th Edition of S-44, in preparation for presentation to the HSSC.

Development of related International Standards, specifications and guidance

The 16th PRIMAR Technical Experts Working Group (TEWG) meeting took place in Stavanger, Norway from 29 to 30 October 2019. Twenty Member State representatives from Croatia, Finland,

Estonia, France, Latvia, Norway, Poland, Sweden, Russian Federation and Vietnam attended the meeting. Seventeen representatives from non-Member States, RENC organizations, industry and academia also attended the meeting. The IHO Secretariat was represented by Assistant Director Anthony Pharaoh.

The participants of the 16th PRIMAR Technical Experts Working Group Meeting.

The main topics and the major outcomes from the 26th PRIMAR Advisory Committee (PAC) meeting (Stavanger, 2-3 October 2019) were presented.

The meeting discussed the important work being undertaken to improve RENC cooperation and to identify ENC overlaps issues, and the need to harmonize ENC licensing models. It was reported that there are currently 16000 ENC's in the PRIMAR catalogue and new data from Albania and China has been released since the last TEWG meeting. The possible distribution of digital publications was discussed and an investigation to determine what types of information should be included in these publications, has been carried out. Several S-58 ENC validation tests were discussed and presentations on the SevenCs Analyser and Navico dKart Inspector applications were provided.

A presentation on the status of S-100 was provided. This reported on the progress with implementing the S-100 data protection scheme and plans for distributing S-100 based products. Industry members from SevenCs and Navico provided presentations on their S-57 to S-101 ENC converters and their plans to implement applications that will produce and consume S-100 based data. A presentation on an S-102 demonstrator project was provided. The project is intended to test how to distribute and use S-102 bathymetric data in an operational environment. Members were invited to contribute S-102 test data for the project.

IMO Experts Group on Data Harmonizing (EGDH)

The 1st session of the IMO Experts Group on Data Harmonization (EGDH-1) meeting took place from 04 to 08 November 2019 at the IMO Headquarters in London, United Kingdom, under the chairmanship of Mr Mikael Renz (Sweden).

EGDH-1 was attended by representatives from the following Member States: Denmark, France, Germany, Ghana, Liberia, Marshall Islands, Netherlands, Norway, Singapore and Ukraine. The meeting was also attended by delegates from the United Nations Economic Commission for Europe (UNECE), World Customs Organization (WCO), European Commission (EC), International Chamber of Shipping (ICS), International Organization for Standardization (ISO), International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), International Radio Maritime Committee (CIRM), Baltic and International Maritime Council (BIMCO), International Association of Classification Societies (IACS), Oil Companies International Marine Forum (OCIMF),

International Transport Workers' Federation (ITF) and International Port Community Systems Association (IPCSA). Director Abri Kampfer represented the IHO Secretariat.

EGDH-1 in session

Director Kampfer provided a report on the status on the S-100 framework Standard and highlighted the changes and extensions included in S-100 Edition 4.0.0. The report also included an update on the status of the suite of S-100 based product specifications currently under development by various bodies and the IHO GI Registry operated by the IHO Secretariat. The meeting acknowledged the potential for developing common work in the future between the IMO FAL Committee, and the competent bodies of IALA and IHO on S-127 – Marine Traffic Management. IHO and IALA informed the Group of the possibilities to use MRN as unique identifier not only for objects but also for reports and publications, and IALA invited IMO to become a Domain Manager. The meeting noted the IHO website (http://s100.iho.int/S100/) which was a visual representation of the scope of the S-100.

Since the EGDH was meeting for the first time, an introduction to the IMO Compendium was made to ensure that the meeting had the same understanding at the starting point of the discussions. The IMO data set, the IMO Reference Data Model and the Annexes of the IMO Compendium (FAL.5-Circ.41) were introduced by the Organizations that had collaborated to create them. It was recalled that phase 1 of the revision of the IMO Compendium was completed by FAL 43, with data elements included in the FAL Convention, security and waste messages. The first meeting of the EGDH was the starting point of phase 2 to extend the IMO Compendium to other data elements related to the information normally exchanged between ship and shore. During the discussions, the Group amended the definitions of data elements, the code list of data elements and added new business rules to data elements.

Inputs to the IMO Reference Data Model on port logistic operational data and real time data that will allow easy implementation of the IMO Just-In-Time Concept were discussed. The need for enhanced communication between the terminal and the port was also identified. The meeting identified clear links and overlaps with some Maritime Services in the context of e-navigation with organizations conducting ongoing work. The EGDH concluded that the IMO Compendium was a way to bridge the gap between different standards and was not meant to create new standards or change existing standards or conventions. The aim was to facilitate electronic messaging. The meeting agreed in principle the need to align the work of the EGDH with the work of NCSR Sub-committee on e-navigation.

After some consideration, the meeting prepared the terms of reference for the two next meetings of the EGDH that will take place in 2020.

WORK PROGRAMME 3
Inter-Regional Coordination and Support

Introduction

The IHO Work Programme 3 "Inter-Regional Coordination and Support" seeks to establish, coordinate and enhance cooperation in hydrographic activities on a regional basis, and between regions, especially on matters associated with the coordination of global surveying, nautical charting and ocean mapping, dissemination of maritime safety information (MSI) and capacity building (CB), including education and training. IHO Work Programme 3 is implemented under the principal responsibility of the Inter-Regional Coordination Committee (IRCC).

Inter-Regional Coordination Committee (IRCC)

The IRCC promotes and coordinates those activities that might benefit from a regional approach. The principal objective of the IRCC is to establish, coordinate and enhance cooperation in hydrographic activities among States on a regional basis, and between regions; establish cooperation to enhance the delivery of capacity building programmes; monitor the work of relevant IHO Inter-Organizational Bodies engaged in activities that require inter-regional cooperation and coordination; promote cooperation between pertinent regional organizations; and review and implement the IHO Capacity Building Strategy, promoting capacity building initiatives.

Conduct annual meeting of IRCC

The 11th meeting of the IHO Inter-Regional Coordination Committee (IRCC11) was held in Genoa, Italy, from 3 to 5 June, hosted by the Italian Hydrographic Institute. The meeting was chaired by Mr Parry Oei (Singapore) and attended by 47 participants from 23 Member States and two observing Organizations. All but one of the Regional Hydrographic Commissions (RHCs) and all subordinate bodies of IRCC were represented. The ROPME Sea Area Hydrographic Commission (RSAHC) was not represented. The opening address was delivered by the Deputy Chief of the Italian Navy, Vice Admiral Paolo TREU. The IHO Secretariat was represented by Secretary-General, Dr Mathias Jonas (HCA Chair), Director Mustafa Iptes (IRCC Secretary) and Assistant Director Alberto Costa Neves (IRCC Assistant Secretary).

The IRCC reviewed the reports and activities of the RHCs and of its subordinate bodies. It also received reports and input from other IHO bodies and from external stakeholders. The meeting was informed of the difficulties in ensuring Maritime Safety Information (MSI) infrastructures in the West and Central Africa region, where there are only three Member States and 18 Associate Members, with only two hydrographic services in place. The Committee urged close liaison between regional CB Coordinators and the WWNWS-SC on the programming of and candidate selection for MSI training.

Participants acknowledged the significant effort of CB Coordinators to assess the needs in the regions, to identify national and regional projects that may contribute to the Capacity Building Work Plan (CBWP) and to coordinate the support for countries in need. The IRCC acknowledged the concerns of the Capacity Building Sub-Committee (CBSC) due to the lack of funding to cover all projects identified within the CBWP. The Committee recognized the work done by the IBSC in the delivery of Edition 2.1.0 of the companion document *Guidelines for the Implementation of the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers* (May 2019). The

meeting acknowledged the generous financial support from the Republic of Korea and the Nippon Foundation of Japan and the in-kind support from Member States and industry stakeholders.

The meeting identified the need for a regional engagement to encourage Member States to use CATZOC to generate the input to C-55 (*Status of Hydrographic Surveying and Nautical Charting Worldwide*) in a consistent and harmonized way. For this to be effective, there is the need to encode meaningful values of CATZOC in ENCs. Reports were received on the status of populating CATZOCs in ENCs, paper charts generated automatically from ENCs, high resolution ENCs and on possibilities to support and/or regulate the chart production for leisure boats.

The importance of data quality and consistency was considered and the Committee invited RHCs to encourage Member States to distribute their ENCs via the RENCs and to provide their agreement for making CATZOC values available in the additional layers of INToGIS II (Manager Mode, available to MS only). Participants noted that work continues by stakeholders to improve coverage and to manage overlaps and the Committee approved a revision to the WENDWG Terms of Reference that support an implementation strategy for S-100 based products, including S-101 ENCs. Participants noted the early draft of the provision of S-100 services roadmap. These developments will eventually lead to the establishment of a global coordination of navigation services principles in cooperation with IMO and IALA.

The meeting noted the improvements to the IHO ENC Catalogue and commended IC-ENC and PRIMAR for the ongoing support to ENC producers and user communities and the EAHC Regional ENC Coordination Centre (RECC) for its progress in establishing its operations. It also commended Republic of Korea and other stakeholders for their hard work in developing INToGIS Phase II.

Progress was reported on surveying aspects, with the developments on the vertical Common Reference Surfaces, risk assessments and resurvey plans, Satellite Derived-Bathymetry (SDB), depth contouring algorithms, autonomous surveys with emphasis to very shallow waters and on new hydrographic vessels reported in Fiji, Morocco and Nigeria. Progress was noted in Crowdsourced Bathymetry (CSB), the new IHO Publication B-12 (*Guidance on Crowdsourced Bathymetry)* and the need for RHCs to engage and encourage Member States to release datasets or subsets into the public domain via the IHO Data Center for Digital Bathymetry (DCDB). Reports were received on increased data contributions to the DCDB and for GEBCO, highlighting the positive impact of GEBCO Seabed 2030 Project.

The Committee endorsed the draft amended IHO Resolutions 2/1997 *Establishment of Regional Hydrographic Commissions* and 1/2005 *IHO Response to Disasters*. MapAction, a humanitarian mapping charity, presented its work and the potential synergies in responding to disasters by working with the IHO and with RHCs.

Participants of the 11th meeting of IRCC

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The meeting reviewed the progress on global Marine Spatial Data Infrastructure (MSDI) activities and the outcome of the MSDI Concept Development Study jointly conducted by the Open Geospatial Consortium (OGC) and the IHO, funded by USA-NGA. A joint report is under preparation. It also acknowledged the work of the IHO Project Team on the implementation of the UN- GGIM Shared Guiding Principles for Geospatial Information within the IHO. The co-Chair of the UN-GGIM Working Group on Marine Geospatial Information (WGMGI) updated the meeting on its programme of work.

The IRCC endorsed the amendments to the IHO Publication B-6 (*Standardization of Undersea Feature Names)* and the amendments to the IHO Resolution 2/2007 *Principles and Procedures for making changes to IHO Technical Standards and Specifications* as amended. The meeting was informed on the progress made by the Strategic Plan Review Working Group (SPRWG) and on the possible impact on the implementation of the IRCC work programme.

The Committee was informed of the tragic passing of Mr Ian Halls (Australia), editor of the International Hydrographic Review (IHR) from 2013 to 2019 and acknowledged his excellent work. IHO Assistant Director Alberto Costa Neves was appointed as acting Editor for the November 2019 Edition of the Review. RHC Chairs were invited to search proactively for articles on good science and/or research level for publication in the Review and to support their representatives in the IHR Editorial Board. Developments in the infrastructure of the IHO Secretariat were reported, including on the IHO GIS, databases, online registration system and on-line form system and how they impact the RHCs and the Member States' activities.

The International Cable Protection Committee (ICPC) reported its activities and the Committee noted the growing threat to submarine cable infrastructure from uncoordinated deep seabed mining activity and the need to chart cables to full ocean depth in these areas, recognizing the need for ICPC members to provide as-laid cable data in a timely manner. It also noted the dialogue of ICPC with OGC with respect to commissioning an Interoperability Experiment and future Pilot project with the objective to develop a S-4xx submarine cable product specification.

The next meeting of the IRCC is planned to be held in Gdansk, Poland, from 1 to 3 June 2020, hosted by the Hydrographic Office of the Polish Navy.

Cooperation with Member States and attendance at relevant meetings

The objective of this element of the Work Programme is to facilitate coordination, cooperation and collaboration among IHO Member States in order to improve the provision of hydrographic and charting services and products through the structure of the 15 RHCs and the IHO Hydrographic Commission on Antarctica.

This element is largely accomplished through the meetings of the RHCs. The frequency of meetings of the RHCs varies from annually to triennially, depending on the region. RHC meetings continued to increase in importance as they exercise an increasingly active role in the overall planning, execution and assessment of the IHO Work Programme as it relates to their regions. A Director, sometimes accompanied by an Assistant Director, represented the IHO Secretariat at the RHC meetings, providing guidance and assistance on IHO matters.

Arctic Regional Hydrographic Commission

The 9th Conference of the Arctic Regional Hydrographic Commission (ARHC) was held in Murmansk, Russia, from 17 to 19 September.

Twenty five participants representing five ARHC Members (Canada, Denmark, Norway, Russia and the USA), three Associate Members (Finland, Iceland and Italy) participated in the Conference.

According to the proposal of the host country, Russia, the ARHC Conference was chaired by Mr Evert Flier of the Norwegian Hydrographic Service (Kartverket). The IHO Secretariat was represented by Secretary-General Dr Mathias Jonas.

The ARHC Members were informed by the Secretary-General of the strategic issues that will be on the agenda of the 3rd meeting of the Council and the preparations of the 2nd Assembly in April 2020.

All participants reported on their activities in the Arctic region since the last Conference. The Conference took note of items such as manned and unmanned survey technology, national survey programs, ENC re-scheming for regular grids, new chart production systems to enable paper chart production from ENCs, the implementation of national SDI solutions and other themes of relevance for all Hydrographic Offices of the region. Special focus was given to the collaboration of ARMSDIWG with ARCTIC-SDI for the purpose of joint dissemination of complementing data sets of different domains covering the arctic region.

The Secretary-General invited ARHC members to identify further potential sources of bathymetric measurements and survey data providers to facilitate the further completion of the DCDB data holdings and to contribute proactively to the Seabed2030 project. The Commission nominated Mr Evert Flier as ARHC representative to liaise with the SeaBed2030 and authorized the ARHC Chair to sign a Memorandum of Understanding for enhanced collaboration with PAME (Arctic Council's working group on the Protection of the Arctic Marine Environment). In view of this undertaking, it was proposed to take note of the new Antarctic Treaty Consultative Meeting (ATCM) Resolution on hydrography, which was adopted at ATCM42 and to consider whether it would be appropriate to pursue this along the same lines in collaboration with PAME.

The Conference was complemented by a technical visit to the historic Icebreaker Lenin. The vessel was commissioned in service in 1959 and was the first of its kind equipped with a nuclear propulsion system and represents a historic hallmark in ship building.

At the end of the meeting, RAdm Shepard Smith, (NOAA, USA) was elected as the new Chair of the ARHC. It was agreed that the next meeting of the ARHC to be held from 10 to 14 August 2020 in Nome, Alaska, USA. It was agreed to have an extraordinary ARHC-meeting, for core members only, at the A-2 with its main purpose to revise the ARHC statutes.

Participants of the ARHC-9, Murmansk, Russia

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Baltic Sea Hydrographic Commission

The 24th Conference of the Baltic Sea Hydrographic Commission (BSHC24) was held in Gdańsk, Poland, from 11 to 12 September, under the Chairmanship of Ms Pia Dahl Højgaard, (Denmark). Seven out of eight full members of the Commission (Denmark, Estonia, Finland, Germany, Latvia, Poland, and Sweden) and associate member Lithuania were represented at the Conference. The delegation of the Russian Federation did not participate. The United Kingdom and the United States of America were also represented at the Conference as Observers. The IHO Secretariat was represented by Secretary-General Dr Mathias Jonas.

BSHC24 covered a wide range of regional topics including developments in each of the Member States, the latest status of hydrographic surveying and nautical charting including INT Charts, ENC production and BSHC cooperative projects. The members of the BSHC reported on their national hydrographic, cartographic and Maritime Safety Information activities since the 23rd meeting. They also presented new developments with regard to surveying, chart production and maritime traffic management.

The Commission considered the outcome of the 11th meetings of the Hydrographic Services and Standards Committee and the Inter-Regional Coordination Committee (IRCC) including the 9th meeting of World Wide ENC Database Working Group (WEND-WG).

Secretary-General Dr Jonas reported on the IHO Work Programme and the Organization's activities during the previous year and shared his impressions about the considerations of the 11th Meeting of the Inter-Regional Coordination Committee (IRCC11). He also provided the Commission with general information on 3rd meeting of the IHO Council (C-3) held in October in Monaco, highlighting the fact the five (Denmark, Finland, Germany, Sweden, Russian Federation) of the nine BSHC members will be present at the Council. He also reported about the preparations of the 2nd Assembly in April 2020 and the triennium to celebrate the hundred years of existence of the IHO.

The Commission reviewed regional initiatives in particular the activities of the Monitoring Re-survey Working Group (MWG), Baltic Sea Bathymetric Database Working Group (BSBDWG), joint North Sea and Baltic Sea Marine Spatial Data Information Working Group (NS-BSMSDIWG), Baltic Sea International Charting Coordination Working Group (BSICCWG), the Chart Datum Working Group (CDWG) and the new installed Maritime Safety Information Working Group (MSIWG).

Sweden reported about the IHO-EU network working group activities. The report confirmed the general rise of awareness of the role and the duties of Hydrographic Offices and the overarching collaborative arrangements of the IHO on affected EU bodies. The common interest lays with the EMODNET portal theme to present high quality bathymetry as open data. It was also considered the discussion within the EU whether to adopt navigational chart products to the range of the revision of the EU Directive of Public Sector Information (PSI).

The Commission considered concerted activities for an area-wide gravity measurement campaign featuring improved geoid computations under the auspices of the Chart Datum Working Group (CDWG). Additional measurement needs were identified for Swedish, Polish and Estonian waters.

The Commission renewed its commitment to the continued maintenance of the BSHC internet portal hosted by Sweden including the provision of a gridded bathymetry model for the whole Baltic. It was noted that the BSHC website received good public perception by a significant number of visitors and downloads. The member states reaffirmed these activities as their regional contribution to the Seabed 2030 project.

Sweden informed about its intentions to apply for EU funding for a FAMOS follow-up project named FASTMOS. This project will be designed to demonstrate the collaborative application of several S-100 based products in the area of the Sound, the Great Belt, the Kadettrenden, Irbe and the Quark. Sweden invited BSHC members with regional association to these areas to join the project application phase.

Germany proposed to set up a BSHC Marine Data Portal as future testbed for S-100 based data services. BSHC welcomed the proposal, encouraged the partners to outline future cooperation on this subject and suggested to synchronize with the drafting phase with the FASTMOS project.

BSHC also discussed the development of the S-100 implementation Decade in Baltic Sea Area but agreed to postpone steps to be taken after the discussion at Council and Assembly level.

At the end of the meeting, Captain (PLN) Andrzej Kowalski, (Poland) was elected as the new Chair of the BSHC. It was agreed that the next meeting of the BSHC will be hosted in Stockholm by Sweden from 23 to 24 September 2020.

Participants of the 24th BSHC Conference in Gdańsk, Poland

East Asia Hydrographic Commission

The 6th Conference of the East Asia Regional Hydrographic Commission Steering Committee (EAHC-SC) was held from 20 to 22 February in Bali, Indonesia.

Fifty seven participants representing nine out of the ten EAHC Members (Brunei Darussalam, China (including Hong Kong), Indonesia, Japan, Malaysia, Republic of Korea, Philippines, Singapore and Thailand) and four observers (Vietnam, Cambodia, United Kingdom and United States of America) participated in the Conference.

The EAHC Conference was chaired by Dr Yukihiro Kato, Chief Hydrographer of Japan, assisted by Mr Shigeru Nakabayashi, from JHOD (Japan Hydrographic and Oceanographic Department). Dr Mathias Jonas, Secretary-General of the IHO, represented the IHO Secretariat. He delivered a report on the relevant issues undertaken since the 2nd IHO Council held in October 2018, under the three pillars of the IHO Work Programme namely, Corporate Affairs, Hydrographic Services and Standards and Inter-Regional Coordination and Support. In the course of his report he explained the increasing relevance of the IHO contributions to the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), the Secretariat´s proposals on how to support the UN Decade of the Ocean Science for Sustainable Development through collaboration with IOC (Intergovernmental Oceanographic Commission) of UNESCO, the joint Sponsorship of the GEBCO Seabed2030 project and the uptake of Crowd Source Bathymetry as a practical activity. He elaborated further on the recent progression within the S-100 framework and the prospects of S-100 related hydrographic standards application through the Member States following a future implementation plan. He finally provided insight on the renewed IHO GIS services and other Secretariat's IT-improvements. For continuation in the IHO Council operations following the second Assembly in 2020, he emphasized the task of EAHC to consider the nomination of Council members to occupy the two Council seats allocated to the EAHC.

Ltest achievements in Capacity Building and the implementation phase of the East Asia Regional ENC Coordination Center (EA-RECC), operational in Hong Kong, were considered by the steering committee in greater detail. Hong Kong, China made a proposal on the EA-RECC governance and future financial arrangements for the distribution of ENCs via EA-RECC. The EAHC agreed on the proposed EA-RECC ToR and RoPs and agreed on further deliberations about technical and financial aspects in the course of the current year. Deliberations how to treat the subject of South China ENCs were also considered.

The Steering Committee was informed on the work of the subordinate Working Groups of the EAHC. Singapore proposed the renaming of the S-100 study group as the S-100 working group and to set a target date for full S-101 transition by 2025 for the East Asian region. In order to prepare best for this significant turnover, a proposal for an S-101 based test bed for the Malacca and Singapore Straits was discussed intensively. Consensus was reached that added value for the test bed users could be gained through combination of a variety of S-100 based products, namely S-102, S-104, S-111, S-112 and S-122.

In the light of the new IHO Convention and the ongoing revision process of IHO Resolution 2/1997 pertaining to the constitution of the Regional Hydrographic Commission, the EAHC decided to establish a Status Amendments Working Group to work out proposals for potential revisions of the EAHC statutes in place to be endorsed by the next EAHC SC in 2020.

An important issue was the consideration of the impressive evolvement of national MSDI activities within the region. The Chair of the EAHC MSDI-WG suggested considering a true regional MSDI approach taking the Baltic Sea and the Arctic region as examples for best practice. The Commission decided on follow-up activities through a comprehensive review of the EAHC-MSDIWG work plan.

These deliberations were followed by the report of the Training, Research and Development Center - Board of Directors - TRDC-BOD. In 2018 the Centre provided courses on the use of GNSS for tide correction for survey and carto production data base system development. The courses on MSI, risk assessment for hydrographic survey and charting management for the safety of navigation have been scheduled in the year of 2019.

The Steering Committee approved the 2020 capacity building plan including another technical visit to Cambodia and agreed on a review of the 5 year Capacity Building Programme to align better with IHO`s and EAHC`s strategic goals, to review methods of learning and access to resources, e.g. e-learning, to address user demands for hydrographic and non-hydrographic users. The EAHC Steering Committee agreed to share the basic carto and hydro course syllabi and materials with the RHCs represented at the IHO CBSC.

Participants of the 6th Conference of the East Asia Hydrographic Commission Steering Committee in Bali, Indonesia

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Japan, as NAVAREA XI Coordinator, reported on recent developments discussed at the last WWNWS-SC meeting in Monaco in August 2018. Japan highlighted that the Operational Manual has to be updated due to new communication providers, namely Iridium, coming into service. Special emphasis was put on the report of the Strategic Team Advance Roadmap (STAR) Task Group. This group is tasked to identify strategic directions for the future targets of EAHC. The Commission agreed to put special emphasis on capacity building, autonomous equipment and MSDI and considered the work of the group as excellent preparatory work for the ongoing IHO Strategic Plan revision process.

United States, as an observer, reported on the availability of updated global geoid model and magnetic field model. The presentation triggered a wider discussion about open data policy, seconded by United Kingdom´s observer's presentation on the interrelation of hydrography to the United Nations Sustainable Development Goals (SDG).

Singapore proposed a resolution to identify appropriate activities within the collaborative framework of the EAHC to respond to the challenge of climate change. Based on the proposal of Singapore, the EAHC-SC agreed to work on a report to address the contribution and support of the Commission in terms of data sharing to support the monitoring and study of climate change and the wider framework of the UN Sustainable Development Goals, namely SDG14. Further work on this topic was put on the EAHC STAR group with a target date for endorsement by EAHC Steering Committee of 31 December 2019.

China reported on the expected completion of the Chinese version of the IHO Hydrographic Dictionary S-32 under the new paradigm. The presentation was supplemented by statements of some of the EAHC-SC members to consider national versions of the dictionary within the years to come.

The next meeting of the East Asian Hydrographic Commission Steering Committee was planned to be held in Tokyo, Japan in the first quarter of 2020.

Vice Admiral Wuspo Lukito, Vice Chief of Naval Staff of the Indonesian Navy opens the 2019 EAHC-SC Conference with three strikes of the gong.

Meso American - Caribbean Sea Hydrographic Commission

The 20th Conference of the Meso American - Caribbean Sea Hydrographic Commission (MACHC) was held in Santo Domingo, Dominican Republic, from 2 to 6 December, with 92 participants representing 14 Member States, eight Associate Members, one observer State, five overseas territories, eight observer organizations and 11 industry members. Director Mustafa Iptes and Assistant Director Alberto Costa Neves represented the IHO Secretariat.

Participants to the 20th Meeting of the Meso American – Caribbean Sea Hydrographic Commission

The Conference was hosted by the Dominican Republic Navy Hydrographic Service and held in Santo Domingo. It was chaired by Mrs Kathryn Ries (United States) and opened by Vice Admiral Miguel Enrique Peña Acosta, Vice Minister of Defence, and by Vice Admiral Emilio Recio Segura, Head of the Dominican Republic Navy. Around 120 people attended the opening ceremony.

During the meeting, Guyana signed the Statutes of the MACHC as a full Member following its accession to the Convention on the IHO on May 2019.

The Commission was informed on the work, and the impact, of the IHO and its main bodies. Focus was given on the preparation for the 2nd Session of the IHO Assembly and on the alignment of the work of the three bodies of the MACHC: the International Chart Coordination Working Group (MICC), the Marine Spatial Data Infrastructure Working Group (MMSDIWG) and the Capacity Building Committee (CBC). MACHC Members selected the two representatives to the Council for the period 2020-2022 (Brazil and Netherlands).

Mr Rene Duesbury (Guyana) signs the Statutes of the MACHC as a full Member in the presence of the Chair, Mrs Kathryn Ries (USA) and Director Mustafa Iptes

Breakout groups were formed to consider the achievements, challenges, plans and capacity building needs. Recommendations were incorporated to the regional plans of the Commission. Coastal States in the region provided updated information on the status of hydrographic surveys, nautical charting and safety of navigation as well as on the contact information in hydrographic offices. The analysis of the reports allowed the MACHC to take important decisions regarding the coordination of the efforts in the region during the intersessional period.

Industry members provided insightful presentations on trends and perspectives in Latin America, technological developments, quality assurance, S-100 tools, autonomous surveys, data management and standards of competence. Their contribution to the work of the Commission and of the coastal states was well appreciated.

Presence of international and regional organizations provided for inputs and shared experiences that allow better coordination of efforts within the region, in areas of capacity building, ocean mapping, safety of navigation, response to disasters, support to sustainable development, access to funding, data management, environmental monitoring and risk assessment. The University of the West Indies (Jamaica) reported on the status of its work on Economic Assessment of Risks in Maritime Navigation across the Greater Caribbean Region and on the Global Statistical Analysis of Marine Incidents.

Participants updated the national details of the MACHC Response to Disasters Framework and were introduced to the relevant part of the MACHC website (www.iho-machc.org) designed to support the region when responding to disasters. Feedback of the responses to Hurricane Dorian that hit the region in August 2019 was presented by France, UK and the NGO MapAction, while Industry members covered technological developments that support responses to disasters.

The meeting was introduced to the concept plan jointly drafted by the IHO/IALA Capacity Building Initiative aimed at building maritime and marine capacity in the Caribbean for climate resilience and sustainable development. This concept plan will be further considered by the IHO-IMO-WMO-IOC-IALA-IAEA-FIG-IMPA Joint Capacity Building (CB) Group to seek funding from donor agencies. Participants agreed on the update of the three-year CB Plan and the needs of the coastal States for the coming years.

The meeting was informed on the progress done by the MICC and of the progress in ENC coverage in the region reaching 933 ENCs, from 914 available in 2018. The region continued working to cover large scale ENC gaps identified by Cruise Ship Ports Gap Analysis and to solve six identified overlaps. There is progress in the INT Charts with 51 produced and 33 schemed.

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The Conference noted the progress done following the creation of the MMSDIWG, through the engagement of stakeholders on use cases. A survey on coastal States' inventory allow the WG to identify data holders that are listed in the MACHC website. Status reports were received from the UN-GGIM Working Group on Marine Geospatial Information (WGMGI) Co-Chair, from GEBCO and its Seabed 2030 project and from the Caribbean Marine Atlas (CMA). Industry participants provided insightful contribution related to SDI and data management.

The next MACHC meeting to be held in the United States of America, from 30 November to 4 December 2020.

IHO Capacity Building Seminar on Hydrographic Governance and Introduction to Marine Spatial Data Infrastructure (MSDI):

An IHO Capacity Building Seminar on Hydrographic Governance and Introduction to Marine Spatial Data Infrastructure (MSDI) was held on 2 and 3 December, preceding the MACHC Conference. The seminar received the contribution from IHO Member States and Secretariat, International Maritime Organization (IMO), International Association of Aids to Navigation and Lighthouse Authorities (IALA) and from several industry stakeholders. 65 participants of the MACHC20 also attended the Seminar and received relevant information and actively contributed to key aspects of governance both at national and at regional levels, including the development of MSDI.

Participants to the Seminar on Hydrographic Governance and Marine Spatial Data Infrastructure (MSDI)

Mediterranean and Black Seas Hydrographic Commission

The 21st Conference of the Mediterranean and Black Seas Hydrographic Commission (MBSHC) was held in Cádiz, Spain from 11 to 13 June, hosted by the Instituto Hidrográfico de la Marina (IHM), the Spanish Hydrographic Office. The Conference was chaired by Rear-Admiral Luigi Sinapi, Director of the Italian Hydrographic Service (IIM). A total of 47 representatives from 18 Member States of the MBSHC (Algeria, Bulgaria, Croatia, Cyprus, Egypt, France, Georgia, Greece, Italy, Malta, Montenegro, Morocco, Romania, Russian Federation, Slovenia, Spain, Turkey and Ukraine) and two Associate Member States (United Kingdom and United States of America) participated in the Conference. Albania, the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), the Intergovernmental Oceanographic Commission (IOC) of UNESCO, the Mediterranean Science Commission (CIESM), IC-ENC and PRIMAR, as the two Regional ENC Coordinating Centres (RENC), were represented as observers. Seven stakeholders from industry participated as invited expert contributors. The IHO Secretariat was represented by Director Mustafa

Iptes, Assistant Director Yves Guillam and Spanish Translator Mary Paz Muro. A total of sixty-seven participants attended the Conference.

Participants of the 21st Conference of the MBSHC

The Conference was opened by Vice-Admiral Juan Luis Sobrino Pérez-Crespo, Commander of the Maritime Action in Spain, who highlighted the importance of hydrography not only in support of safety of navigation but also as a geospatial data foundation for the planning and management of maritime affairs.

The MBSHC received about 20 national reports from Member States. Some of them, like the one from Croatia, were supported by very efficient presentations as they provided not only highlights but also conclusions, strategic priorities and high priority topics suggested for discussion at the Conference. Director Iptes reported on the IHO corporate matters and the work programme in general and on the main outcome of the last IRCC meeting (IRCC-11). The Members were informed on the programme and the main deadlines for the preparation of the 2nd session of the Assembly, which include the selection process of the Council Members. They were also invited to use the new online formstack service as far as possible to update their entries (C-55, P-5) and respond to IHO Circular Letters. Members were also invited to provide their input to update the MBSHC Statutes in accordance with the final amendments to the IHO Resolution 2/1997 that were endorsed at IRCC-11.

All the presentations made either by observers or industry participants and stakeholders were very educative, in particular for those who participated in the Conference for the first time. The IOC representative provided a clear status report of the tsunami warning systems in the region and the current challenges and gaps faced by the coastal States of the Mediterranean Sea. The NAVAREA Coordinator was invited to participate in the NEAMWave 20 exercise.

The endorsement of the IALA Risk Management Toolbox by the IMO through the SN.1/Circ.296 was noted as well as the capacity building opportunities for the development and the maintenance of Aids to Navigation (AtoN) provided by IALA.

The MBSHC Chair, reported also as HSSC Chair, provided a clear picture of the technical developments made under the S-100 framework as well as on the implementation strategy of S-100 based products, which is under preparation for being reviewed at the next Council meeting. It was noted that very few MBSHC Member States had actually started to get involved in S-100 based products developments.

One of the remaining and core activities of the Commission was the establishment of agreed ENC and INT chart schemes. The MBSHC was firstly informed that a survey on the *Future of the Nautical Paper Chart*, prepared by the Nautical Cartography Working Group and endorsed by HSSC, was about to be launched (IHO CL 29/2019 refers). In application of the IHO Resolution 1/2018 on overlapping ENC cells, the MBSHC noted the risk assessment reports provided by interested parties and the associated political statements. At the end of the Conference, Shom (France) resigned from the role of Chart Coordinator and was commended for its commitment and achievements for more than 40 years as Region F Chart Coordinator. The Chart Coordinator role was taken over by the IIM (Italy).

A report on Maritime Safety Information (MSI) activities in NAVAREA III was presented by Spain and reviewed by the Commission. The recent activities of the Working Group for the Safety of Navigation in the Black and Azov Seas (BASWG) were also presented by the Chair of BASWG (Turkey).

At the end of the Conference, Captain (Dir) José Daniel Gonzalez-Aller Lacalle took over as Chair of the MBSHC and the Commission welcomed the offer made by Slovenia to host the 22nd Conference of the MBSHC in 2021.

Nordic Hydrographic Commission

The 63rd Meeting of the Nordic Hydrographic Commission (NHC) was held in Helsinki, Finland, under the chairmanship of Rainer Mustaniemi, National Hydrographer of Finland. Representatives from all NHC Member States, namely Sweden, Denmark, Finland, Iceland and Norway attended the meeting. The IHO Secretariat was represented by Director Abri Kampfer.

The NHC63 agenda covered a wide range of topics of mutual interest with the Member States' reports and the additional briefs on the activities of the International Hydrographic Organization (IHO), Inter-regional Coordination Committee, WEND Working Group, Maritime Spatial Data Infrastructure Working Group, Crowd-Sourced Bathymetry Working Group and IHO/IOC GEBCO Project. Director Kampfer briefed the Commission on current IHO activities and the preparations for the forthcoming 3rd Council meeting and second session of the IHO Assembly. Feedback was received on the activities of the IHO-European Union Network Working Group (IENWG). The two Regional ENC Coordinating Centres, Primar and IC-ENC, reported on their activities

Some of the topics provoking in-depth discussions included:

- Report from the Nordic Strategic Workshop;
- Crowdsource bathymetry data policies
- New concepts for the provision of S-100 based data products;
- The ADAPT project in Sweden in optimizing seagoing public transport in an archipelagic environment.

The participants of the NHC63 meeting.

Feedback was provided by the two NHC expert groups, the Nordic Surveys Expert Group (NSEG) and the Nordic Chart Production Expert Group (NCPEG). Experience where also shared on national projects and organisational restructuring of national hydrographic services.

An Open Session was convened as a post meeting event and two industry presentations were delivered "Introduction to Fugro's Rapid Airborne Multibeam Mapping System (RAMMS)'' and "Shallow Area Hydrographic Survey Project in the Baltic Sea Using a Combination of MBES and Bathymetric LiDAR''. Both presentations were well received and generated some discussion.

On completion of the meeting Iceland assumed the responsibility as Chair and Vice-Chair in accordance with the prescripts of the NHC Statutes. The 64th NHC meeting to be held in Iceland in March 2020.

North Indian Ocean Hydrographic Commission

The 19th Conference of the North Indian Ocean Hydrographic Commission (NIOHC) was held in Muscat, Oman, from 26 to 28 March, under the chairmanship of Rear Admiral Tim Lowe, National Hydrographer of the United Kingdom. Participants were welcomed at the opening ceremony by Rear Admiral Abdullah bin Khamis bin Abdullah Al Raisi, Commander of the Royal Navy of Oman.

NIOHC Member State representatives from Bangladesh, Egypt, India, Indonesia, Myanmar, Pakistan, Saudi Arabia, Sri Lanka, Thailand and the United Kingdom (UK) attended the meeting together with representatives of Associate Members from Australia, France, Mauritius, Oman, Seychelles and USA. The Russian Federation, Somalia and Yemen were represented as Observer States. Representatives of the Intergovernmental Maritime Organization (IMO), International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and several industry stakeholders also attended as invited observers. Director Mustafa Iptes and Assistant Director David Wyatt represented the IHO Secretariat. Following the opening ceremony, Director Iptes called on Rear Admiral bin Abdullah Al Raisi, Commander of the Royal Navy of Oman and was informed that Oman will actively continue to support the IHO activities in the region.

Director Iptes exchanges gifts with Commander of the Royal Navy of Oman.

The NIOHC19 meeting was preceded by a half day seminar on National Obligations for the Provision of Safety of Navigation Services, which was attended, in addition to NIOHC members, associates and observers, by Somalia and Yemen. The INT Chart Coordination Working Group (NICCWG) held a meeting in the afternoon of 25 March after which a report was prepared for the NIOHC19 conference.

The NIOHC received reports from Member States, Associate Member States and the IHO Secretariat as well as summary reports on the second meeting of the IHO Council and last meetings of the IHO Hydrographic Services and Standards Committee and the Inter Regional Coordination Committee. Director Iptes briefed the Commission on current IHO activities and the preparations for the forthcoming Third Council meeting and second session of the IHO Assembly. The meeting also received reports on progress and issues related to the work of the Marine Spatial Data Infrastructures Working Group, relevant activities that had taken place in the International Maritime Organization, including relevant outcomes of the 6th meeting of the IMO Sub-Committee on Navigation, Communications and Search and Rescue (NCSR 6) and an update from the NAVAREA VIII coordinator.

A Capacity Building (CB) plan was developed for submission to the 17th meeting of the IHO Capacity Building Sub-Committee (CBSC17). The Commission established a CB Working Group to help develop future applications for submission to the CBSC, in addition the Commission also established a Working Group to review the NIOHC Statutes and recommend revisions and amendments to the next NIOHC conference in 2020.

The meeting received a number of presentations from industry representatives. These highlighted new technologies and training opportunities available to the region. Industry representatives were keen to emphasize their willingness to engage with the NIOHC and its members to assist with the development of hydrographic and cartographic capabilities within the region.

Participants of the NIOHC19 Conference.

Sri Lanka, the Vice-Chair of the NIOHC, assumed the role of Chair of the NIOHC after four months in accordance with the Statutes of the Commission. The NIOHC elected Indonesia to assume the Vice-Chair position for the next period. Sri Lanka indicated to host the 20th meeting of the Commission in Colombo, Sri Lanka in 2020. It was agreed to hold an INT Chart Coordination Working Group meeting prior to NIOHC20.

ROPME Sea Area Hydrographic Commission

The 8th meeting of the ROPME (Regional Organization for the Protection of the Marine Environment) Sea Area Hydrographic Commission (RSAHC) was held in Islamabad, Pakistan, from 18 to 20 February. The meeting was opened by Captain Muhammad Khalid, Hydrographer of Pakistan, in the presence of Vice Admiral Kaleem Shaukad, Vice Chief of Pakistan Naval Staff. Representatives from RSAHC Member States Islamic Republic of Iran, Oman, Pakistan and Saudi Arabia attended the meeting with United Kingdom attending as an Associate Member and observers from a number of organizations, authorities and representatives from industry. Director Mustafa Iptes and Assistant Director David Wyatt represented the IHO Secretariat.

The meeting received national reports from Member and Associate Member States and the IHO Secretariat after which the meeting received reports on the Crowdsourced Bathymetry (CSB) initiative, IHO-IOC GEBCO project, GEBCO Seabed 2030 project and on Worldwide ENC Data Base (WEND) issues. Delegates were encouraged to provide regular updates to the IHO Yearbook (P-5) and IHO publication C-55 - *Status of Hydrographic Surveying and Nautical Charting Worldwide*. Details of regional INT Chart and electronic navigational chart (ENC) coverage were presented by the regional coordinator (Iran); a number of issues were identified and actions were agreed. The NAVAREA IX Coordinator (Pakistan) provided an up-date on issues relating to the World-Wide Navigational Warning Service (WWNWS) and outcomes from related IMO meetings were reviewed. Director Iptes briefed the Commission on IHO issues and activities as well as the two Council meetings and the second session of the IHO Assembly.

The meeting included presentations from industry representatives that highlighted technologies and training opportunities available to the region. Industry representatives were keen to emphasise their willingness to engage with the RSAHC and its members to assist with the development of hydrographic and cartographic capability within the region. These presentations were followed by a presentation from the regional Capacity Building (CB) Coordinator (Iran). All the presentations generated considerable debate on various issues and regional requirements. A comprehensive list of CB requirements was developed for submission to the IHO Capacity Building Sub Committee (CBSC) that will meet in May in Italy. Presentations were also given on the IHO-IOC GEBCO Project, the Seabed 2030 project and the IHO CSB initiative, all of which supported the request that Member States contribute to the GEBCO programme through the provision of shallow water bathymetric data to the IHO Data Centre for Digital Bathymetry (DCDB).

Director Iptes addresses delegates at the Opening Ceremony of RSAHC8

The participants reviewed the Commission statutes and agreed to an amendment to include a fixed term for the role of Chair with the Vice-Chair automatically taking over as Chair after each meeting. The Islamic Republic of Iran assumed the role of the Chair of the Commission with Oman elected as Vice-Chair. The Commission also confirmed that the Chair (IR of Iran) and Vice-Chair (Oman)

would occupy the two seats on the IHO Council allocated to the RSAHC for the period April 2020 to April 2023.

With the objective of increasing participation of member states, the RSAHC decided to have a 2nd Extraordinary meeting of the RSAHC in February 2020 before the 2nd session of the IHO Assembly,

Participants to the RSAHC8 Meeting

Southern Africa and Islands Hydrographic Commission

The 16th Conference of the Southern African and Islands Hydrographic Commission (SAIHC) was held from 3 to 5 September 2019 in Cape Town, South Africa. The following SAIHC Member States attended the Conference; France, Mozambique, Mauritius, Norway, South Africa and the United Kingdom. Namibia, Portugal, India, Tanzania, Comoros, Madagascar, Malawi and Kenya attended as Associate Members. Only one Member State, Seychelles, and one Associate Member State, Angola, were unable to attend the Conference. Delegates from the International Maritime Organisation (IMO), International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), Southern and East African and Islands Regional Group for Safety of Navigation and Marine Environment Protection (SEAIGNEP) and industry stakeholder participants from Kongsberg Maritime, AML Oceanographic, Chartwise, Unique Hydra, Teledyne Caris, UnderWater Surveys, Navico, iXBlue and Fugro participated in the Conference as observers. Director Abri Kampfer represented the IHO Secretariat.

The Conference was hosted by the South African Navy Hydrographic Office (SANHO). The SAIHC Chair, Rear Admiral Tim Lowe (UK) opened the Conference and invited Captain Theo Stokes, National Hydrographer of South Africa to provide the opening address. Each of the coastal States present provided an update on their activities since the last Conference that took place in Seychelles in August 2018 and although there is some progress on coordination of hydrographic activities in some countries with the establishment of National Hydrographic Committees, meetings are infrequent. The capacity building needs of the region remains vast and bi-lateral agreements and regional capacity building efforts should be considered in addition to the IHO capacity building programme. South Africa presented on the progress of the creation of an online MSI course that

may be very fruitful to improve MSI awareness and create much needed capacity within the coastal States in the region.

The 16th Conference included a meeting of the SAIHC International Charting Coordination Working Group (ICCWG) during which the status of INT chart and ENC production in the region was discussed and decisions were made on finalising the SAIHC ENC Schema and resolving the ENC overlaps. A presentation on the current and future functionalities of the IHO INToGIS II was well received.

There were presentations and discussions on Marine Spatial Data initiatives and the Conference received feedback from the newly established SAIHC MSDIWG, led by UK, and it was emphasised that the group could play an important role in the discovery of regional data portals and assist in unlocking the "Blue Economy" of the region. An excellent presentation by Ms Lauren Williams from the Department of Environmental Affairs on the South African Marine Spatial Planning and National Oceans and Coastal Information Management System provided a good example of a national Maritime Spatial Planning effort and the potential benefits that can be achieved. GEBCO activities, presented by Evert Flier (Norway) included information on the GEBCO–Nippon Foundation Seabed 2030 Project and feedback on the IHO Crowdsource Bathymetry WG. Coastal States were reminded of the importance of responding to the questionnaire attached to IHO CL 11/2019 to indicate support for crowdsource activity within their waters of national jurisdiction, including any caveats.

Participants of the 16th SAIHC Conference

The IHO Capacity Building Programme for the region was discussed and the need to refine the SAIHC Capacity Building Strategy was identified. Other topics discussed during the meeting included; feedback on outcomes from the IHO Council, HSSC, IRCC, WEND WG, MSDI WG and C-55 information. Procedures for dealing with marine disasters were discussed and a presentation by Mozambique on lessons learnt from dealing with the effects of the destructive cyclones Idai and Kenneth that struck Mozambique and neighbouring countries prompted an action to develop a Disaster Response Framework for the SAIHC Region. A report on Maritime Safety Information (MSI) activities in NAVAREA VII was presented by South Africa and reviewed by the Commission. Feedback was also provided by India on NAVAREA VIII activities. It was quite evident that few countries in the region communicate with their NAVAREA Coordinator and more effort are required for the submission of maritime safety information for NAVAREAS VII and VIII. All coastal States in the region were urged to nominate participants for the upcoming MSI Training Course, but care should be taken that the nominees will be utilised in a MSI role on completion of their training. Presentations were also provided by each of the industry participants. All the presentations made either by observers or industry participants and stakeholders were very educative, in particular for those who participated in the Conference for the first time.

IHO/SAIHC Seminar for Raising Hydrographic Awareness:

The 16th meeting of the Commission was preceded by a seminar for Raising Hydrographic Awareness sponsored by the IHO capacity building fund and delivered by representatives from the IHO Secretariat, IMO, IALA and the UK. The seminar was intended to provide the representatives of the SAIHC with information to assist in the development and strengthening of hydrographic capacity to meet their international obligations under SOLAS and to support economic growth and protection of the marine environment.

Participants of the SAIHC Seminar for Raising Hydrographic Awareness

South-West Atlantic Hydrographic Commission

The 13th meeting of the South West Atlantic Hydrographic Commission (SWAtHC) was hosted by the *Servicio de Hidrografía Naval* (*SHN*) (the Argentinian Hydrographic Service), on 25 and 26 April in Buenos Aires. Twenty delegates attended the meeting, chaired by Captain Pablo Tabarez (Uruguay). All three IHO Member States of the Commission, Argentina, Brazil and Uruguay, were represented together with the Associate Member, Paraguay and the Observer State Bolivia. Three industry stakeholders (Teledyne CARIS, Kongsberg and IIC Technologies) participated in the meeting as Observers. The IHO Secretariat was represented by Director Mustafa Iptes and Assistant Director Alberto Costa Neves.

The meeting considered measures to raise the hydrographic awareness of Paraguay and Bolivia on the importance of becoming IHO Member States and the benefits of hydrography as part of the national infrastructure.

Argentina reported on the progress of hydrographic surveys and the new charts and new editions in paper and electronic charts for both the coastal and inland waters. A new chart scheme for the Parana River was established. The meeting was informed on the contribution to the national spatial data infrastructure and to the national research system. Progress was reported in the International Bathymetric Chart of the Southern Ocean (IBCSO) and in the national water level framework. An MSI trainer was nominated during the meeting to support the provision of training in the region.

Brazil informed the meeting on the recent hydrographic surveys in coastal and inland waters, including the contribution to the delimitation of the extension of the continental shelf project. The incorporation of a new survey vessel was announced to the meeting. The branch of the Paraguay-Parana Waterway under Brazilian responsibility was 100% covered by inland ENCs (1 840km). Brazil announced the new tools to use social media for promulgation of information and the current prediction system for ports. Brazil further informed the meeting that one student from Bolivia and one from Angola are currently enrolled at the Category "A" Hydrographic Programme on a scholarship support.

Uruguay reported progress in surveys in coastal areas and in inland waters. New charts and new editions were issued since the last meeting. Transition from offset to print-on-demand continues and now accounts for 2/3 of the total production. The participation in water level monitoring and other environmental projects were reported to the meeting.

Paraguay reported on the actions taken since the 2014 IHO Technical Visit and received indications of support from Member States to sustain progress. Paraguay has the third largest river fleet in the world. Bolivia reported numerous hydrographic surveys in its nearly 2 900 rivers and water bodies, including a survey in three reservoirs at 5 200 m altitude. Bolivia informed the meeting on the preparation of a cartographic plan, the ongoing project of a hydrographic act and the support of capacity building from neighbouring countries in the region. A strong interest in joining the IHO was manifested during the meeting.

The meeting considered the way ahead for cooperation and capacity building, the close cooperation with the Intergovernmental Committee of the Paraguay-Parana Waterway, the contribution to the GEBCO Seabed 2030 project, the developments of inland ENCs in cooperation with the Inland ENC Harmonization Group (IEHG) and the coordination of Member States to participate in all bodies of the IHO.

Participants celebrated the fact that there are no significant overlaps in the region and that work is in progress to eliminate the existing ones. A gap between Brazil and Uruguay ENCs was recently identified and eliminated, in accordance with the IHO Resolutions and WEND Principles. Additionally, all ENCs have their CATZOCs assessed, an indication of the good work and cooperation that exists in the region. The region developed its ENC scheme that was presented to the WENDWG9 meeting and will be input to the INT2GIS II system.

Receptions were held on the Brazilian Oceanographic Vessel *Antares* that had called in the port of Buenos Aires and at the Corvette Uruguay, a maritime museum of the Argentinean Navy.

The next Conference will take place on 5 and 6 March 2020 in Brazil, the exact date to be confirmed.

Participants of the SWAtHC13 meeting.

South West Pacific Hydrographic Commission

The 16th Conference of the South West Pacific Hydrographic Commission (SWPHC) was hosted by the Department of Justice, Lands and Survey of Niue from 13 to 15 February in the Scenic Matavai Resort. Representatives from all nine Member States of the Commission (Australia, Fiji, France, New Zealand, Papua New Guinea, Tonga, United Kingdom, United States of America and Vanuatu), and from all eight Associate Members (Cook Islands, Indonesia, Kiribati, Nauru, Niue, Palau, Samoa and Solomon Islands) attended the conference. Three Observer States (Marshall Islands, Tokelau and Tuvalu), the Pacific Community (SPC) and six representatives from industry

also participated, a total of 55 participants representing all the coastal States in the region. The IHO Secretariat was represented by Director Abri Kampfer and Assistant Director Alberto Costa Neves.

The conference was opened by the Hon. Pokotoa Sipeli (Niue's Minister of Infrastructure), and chaired by Commodore Fiona Freeman (Australia). Each of the coastal States provided an update on their activities since the last meeting that took place in Fiji in 2018.

Participants in the 16th Conference of the South West Pacific Hydrographic Commission

The conference noted the support provided by the five Primary Charting Authorities (PCA) to the Small Islands Developing States (SIDS) and the recent developments in surveys, charting and maritime safety information (MSI). New Zealand informed the participants on the progress with surveys and charting made in-house and abroad through the Pacific Regional Navigation Initiative (PRNI) for five SIDS. Australia reported on the developments in its own waters and on the two supported SIDS. UK described the developments in the five SIDS and its overseas territories, by means of the Commonwealth Marine Economies (CME) Programme. Progress was also noted by the US in support of its overseas territories and three supported SIDS. France reported on the progress in its overseas territories and domains in the region.

SPC briefed the Commission on the development of its Pacific Safety of Navigation Project and the progress conducting hydrographic and geodetic surveys, implementing Aids to Navigation and supporting data discovery in the region. SPC presented the work of the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) and its World-Wide Academy, and informed the meeting on the establishment of the International Maritime Organization's regional representative, stationed at SPC's Fiji office.

The conference assessed the impact of capacity building through regional programs and through the IHO Capacity Building Programme. This continuous support has proved valuable for raising awareness on the importance of hydrography and bringing maturity in all phases of capacity building. The reports from the two NAVAREA Coordinators (Australia and New Zealand) indicated significant improvements in the provision of MSI in the region.

Participants showed renewed interest for progressing their marine spatial data infrastructure (MSDI) due to the significant impact it can bring to the national economy. They received briefings on the status of the GEBCO Seabed 2030 Project and the possibilities for contributing with data, both existing or through new surveys.

The conference noted with satisfaction that there are few ENC overlaps in the region and none with significant navigational risk. The International Charting Coordination Working Group (ICCWG) also reported progress to remediate the existing CATZOCs that are unassessed.

Other relevant agenda items involved data discovery and portals, response to disasters, outcomes of relevant IHO bodies and the need to establish tide gauges, seeking cooperation with existing international and regional projects. The revision of the IHO Resolutions 1/2005 *IHO Response to Disasters* and 2/1997 *Regional Hydrographic Commissions* were also discussed in order to provide input from the region.

IHO/SWPHC Technical Workshop on Implementing Hydrographic Governance

The 16th Conference of the Commission was preceded by a technical workshop on *Response to Disasters and Data Discovery*, sponsored by the IHO capacity building fund. The aim of the session on Response to Disasters was to make SIDS in the region aware of the role of the IHO and the SWPHC in the aftermath of a disaster and to understand what procedures are needed to identify appropriate action and support. Another objective was to provide guidance to SIDS to establish national procedures and guidelines.

The session on Data Discovery aimed at providing an overview of discovery tools, search capabilities, use of metadata and data, mechanisms to share data (release agreements, bilateral arrangements) and the establishment of geospatial portals. Fourteen presenters briefed the participants to the workshop. Their presentations are available on the IHO website under the SWPHC page.

Participants in the Workshop on Response to Disasters and Data Discovery preceding the SWPHC16

USA-Canada Hydrographic Commission

The 42nd meeting of the United States – Canada Hydrographic Commission (USCHC) was held on 18 March in Biloxi, Mississippi, United States of America. USCHC42 took place in conjunction with the US Hydro Conference 2019. The meeting was co-chaired by Director, Office of Coast Survey of the USA, Rear Admiral Shepard Smith and the Hydrographer General of Canada, Ms Geneviève Bechard respectively. Twenty five participants attended the meeting, including representatives from the Canadian Hydrographic Service (CHS) and the Departments of National Defense (DND) and Fisheries and Oceans (DFO), the National Oceanographic and Atmospheric Administration (NOAA), National Geospatial-Intelligence Agency (NGA), US Navy and US Army Corps of Engineers (USACE) and the United Kingdom Hydrographic Office (UKHO) as an observer. Secretary-General Dr Mathias Jonas represented the IHO Secretariat.

The USCHC42 agenda covered a wide range of topics of mutual interest with the Member States' reports and the additional briefs on the activities of the International Hydrographic Organization (IHO), WEND Working Group, Maritime Spatial Data Infrastructure Working Group, Crowdsourced Bathymetry Working Group and IHO/IOC GEBCO Project. Dr Mathias Jonas reported on the IHO

Work Programme and the Organization's activities since the second IHO Council held in October 2018.

Some of the topics provoking in-depth discussions included:

- Management of survey and charting activities in border areas and the arctic region;
- Marine Spatial Data Infrastructures (MSDI);
- Crowdsourced bathymetry and the operation of DCDB on behalf of the IHO through NOAA;
- The future of the paper chart; and
- New concepts for the provision of S-100 based data products.

Several technical presentations were also made that were complementary to the discussions, including: joint gridded ENC plans and implications; bathymetric data in the cloud; update of local vertical and horizontal reference datum as well as updates of the global geoid and magnetism models.

The IHO Secretary-General gave a key note address during the opening ceremony of the US Hydro Conference. Under the title "Challenging the norm in Hydrography" he presented his vision of the future developments in all relevant fields of contemporary hydrography such as survey, production of hydrographic products and their future provision. He placed special emphasis on the uptake of unmanned operation of maritime craft and identified hydrographic measurement campaigns as the frontrunner in many aspects of autonomous shipping.

The 43rd USCHC meeting will be held in Québec, Canada in March 2020.

The participants of the USCHC42 meeting.

Hydrographic Commission on Antarctica

The 16th Conference of the IHO Hydrographic Commission on Antarctica took place at the Grandior Hotel in Prague, Czech Republic from 3 to 5 July, for the first time in a landlocked State taking the opportunity of conducting an HCA Seminar at the XLII Antarctic Treaty Consultative Meeting (ATCM), raising the awareness of ATCM delegates on the importance of hydrography. Since the Czech Republic is not an IHO Member, the Secretariat had the organizing role for the event.

The Conference was chaired by Dr Mathias Jonas, Secretary-General of the IHO, supported by Assistant Director Yves Guillam, HCA Secretary and Ms Caroline Fontanili (IHO Secretariat). Sixteen delegates from 10 Member States (Australia, Chile, Colombia, Germany, Italy, Norway, Republic of Korea, Spain, United Kingdom, USA) and one subject matter expert (GEBCO IBCSO Chair), attended the meeting. Apologies were received from several countries who were unable to attend but provided their national reports.

Participants of the 16th Conference of the IHO Hydrographic Commission on Antarctica

The HCA reviewed progress since its 15th Conference, held in 2018, and received reports from the IHO Member States present. Reports received from Member States not present were delivered by the Secretariat. The reports remarkably demonstrated that numerous HCA members are strengthening their engagement for the Antarctic in terms of new ship´s capacity for survey and research, facility infrastructure improvements and investment in new carrier technology such as Autonomous Surface Vessels.

The Chair delivered the Secretariat´s Report. He explained the association of the Commission to the relevant IHO bodies, namely IRCC, the IHO Council and the IHO Assembly and provided information on the preparations of the centenary celebrations of the international cooperation in hydrography with the peak event of the 100th anniversary of the IHO in 2021.

The Chair informed HCA members that Turkey was in discussion with the IHO regarding membership to the HCA. Turkey made some survey activities in Antarctica and offered to share data with the HCA Hydrographic Priorities Working Group (HPWG) and chart producing countries.

Mr Andy Willett (UKHO), Chair of the HCA Hydrographic Priorities Working Group (HPWG), noted the solid progress in the review of paper chart and ENC schemes for Region M along with the review of maritime shipping routes (MSR) and updating of the survey priorities list. There was a proposal to add one new MSR to support new INT charts aligned with IAATO ship statistics. The HPWG Chair noted the use of IAATO real time AIS to monitor vessel locations and deficiencies in navigational coverage.

As it was his last meeting, Mr Andy Willett was commended for his outstanding contribution in HCA activities.

The HCA Secretariat discussed the INToGIS Phase II Project. Upgrades will include Polar Regions (Arctic and Antarctic) with ENC scheme management procedures (S-11 Part A, Ed 3.1.0 refers), CATZOC values and additional AIS traffic density. The HCA Secretariat also informed the participants on the transition in progress for the HCA GIS, from the current quite confidential situation to Quantarctica (https://quantarctica.npolar.no/) in which the HCA GIS datasets will be getting the status of “Quantarctica Friendly Dataset” and therefore will be discovered and used by a much wider audience.

The Conference occurred in conjunction with the XLII Antarctic Treaty Consultative Meeting where the IHO was invited to present a seminar on the status and impact of hydrography in Antarctic waters. In the HCA Conference, priority was therefore given to the final preparation of this seminar.

The Secretary-General of the IHO and the National Hydrographers of Chile and the United Kingdom presented papers on international collaboration, safety of navigation and crowd sourced bathymetry. They were strongly supported by some delegations such as Australia, Italy, Norway, Spain and the United States of America. A new Resolution on hydrography initially proposed by Norway and co-sponsored by Italy, New Zealand and the United States, was adopted. This event also enabled re-engagement with COMNAP and SCAR. One of the lessons learnt from ATCM was the lack of communication within nations to engage and even raise the awareness of IHO activities.

Noting the 2nd Session of the IHO Assembly in April 2020, the Chair proposed that the 17th Conference of the IHO Hydrographic Commission on Antarctica be held in 2021. Location is planned to be Monaco, but it was noted that ATCM XLIV 2021 is expected to take place in Paris. The Secretariat will investigate with Shom (France) whether it will be possible to host the HCA Conference back-to-back with the ATCM XLIV.

HCA Seminar at ATCM XLII

WEND Working Group

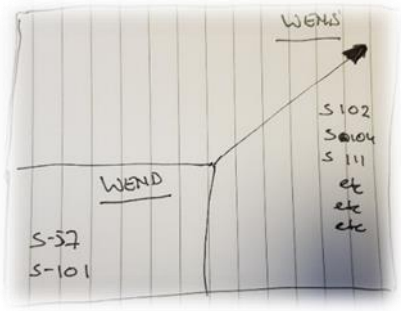
The 9th meeting of the Worldwide ENC Database Working Group (WENDWG) took place in Brest, France, hosted by the Hydrographic and Oceanographic Service of France (Shom), from 26 to 28 February, in conjunction with the 4th joint meeting of the Regional ENC Coordinating Centres (RENC), IC-ENC, PRIMAR and, for the first time, the EA-RECC (Regional ENC Coordination Centre) of the East Asia Hydrographic Commission. The meeting was chaired by Mr Jamie McMichael-Phillips (United Kingdom). Twenty-one delegates from 11 Member States (Brazil, China, Finland, France, Italy, Netherlands, Norway, Republic of Korea, Sweden, United Kingdom and United States) representing 13 Regional Hydrographic Commissions (ARHC, BSHC, EAHC, EAtHC, MACHC, MBSHC, NHC, NSHC, RSAHC, SAIHC, SWAtHC, SWPHC and USCHC), the Chairs of the IC-ENC Steering Committee and PRIMAR Advisory Committee and the directors of the RENCs attended the meeting. Director Mustafa Iptes and Assistant Director Yves Guillam (Secretary) represented the IHO Secretariat.

At the opening session of the meeting, Ingenieur general Bruno Frachon, Director General of Shom, welcomed the participants and highlighted the fact that the WENDWG had been a major asset for the last decade for the IHO, when actually entering the digital age with the timely delivery of

qualified, updated and consistent ENCs for ECDIS. He also stressed the importance of preparing the future.

The Chair reported on the main outcomes of the last IRCC meeting held in Goa, India (June 2018), where the Committee agreed to amend the Terms of Reference of the WENDWG. As a consequence, the WENDWG is now requested to develop options to expand the value of the Worldwide ENC database to all marine data users. In particular, it is tasked to support non-ECDIS maritime community through license management of ENC data as well as the Seabed 2030 Project. Some pragmatic actions were agreed for these purposes, thanks to a joint effort provided by the RENCs with some technical support offered by NOAA/USA.

The IHO Secretariat reported on the decisions and actions from the 2nd meeting of the IHO Council (October 2018) that have an impact on the activities of the WENDWG. Two fruitful workshop sessions were organized to address the different issues raised at the IHO Council. Subsequently, the meeting agreed to submit a proposal at the next IRCC aiming to develop new WEND-like Principles as a possible component of the S-100 Implementation Strategy.



Conceptual sketch, "from the WEND to WENS (Worldwide Electronic Navigation Services)"

Following the reports provided by the representatives of the RHCs and on a more technical side, several actions were agreed to assess the feasibility of the operational implementation of the IHO Resolution 1/2018 - *Elimination of overlapping ENC data in areas of demonstrable risk to the safety of navigation* -, noting that in some Charting Regions the situation is not improving. The RENCs will try, for instance, to improve their tracking and accounting procedures, in support of ENC Producers and RHCs, while the IHO Secretariat is now preparing the commissioning of the enhanced version of the INToGIS system (INToGIS II), which includes an ENC overlap checker function. Thanks to this development supported by KHOA, NOAA for the AIS (Automatic Identification System) traffic density database, NGA for the Worldwide Ports database and the RENCs, the International Charting Coordination Working Groups will soon be able to build their own assessment with regard to ENCs Schemes, ENCs Coverage and Overlaps and possible important CATZOC inconsistencies. The IHO Secretariat commended the ARHC, BSHC, EAtHC and MBSHC Charting Regions Coordinators for their involvement in the experimentation phase of INToGIS II.

In conclusion of a decision made at the 8th meeting of the IRCC, the meeting welcomed the latest version of the IHO ENC Coverage Catalogue, which was fully aligned with the ENC Data Flow diagram.

WENDWG-9 participants at Shom, Brest, France

P-7

On 24 October, WENDWG Members were informed that Mr Jamie McMichael-Phillips was taking up the role of Director of the Nippon Foundation-GEBCO Seabed 2030 Project in early December and was obliged to stand down as Chair of the WENDWG after more than 9 ½ years in this position. Mr John Nyberg, the Vice-Chair, kindly agreed to step up to fill the role in accordance with the WENDWG Terms of Reference.

Increase participation by non-Member States

One of the important strategic goals of the IHO is to increase the participation of non-Member States in IHO activities. Taking the opportunities of attending regional and other international meetings and events, in particular during the RHC, UN headquarters and IMO meetings held during the year, the IHO Secretary-General, Directors and Assistant Directors visited and briefed high level governmental officials directly and through their diplomatic representatives as part of the IHO awareness-raising campaign. Non-Member States of the IHO were also encouraged and invited to participate in the RHC meetings, CB initiatives and relevant IHO meetings. The awareness-raising campaign is also conducted during the CB Technical and High-Level Visits.

- **Accession of a New Member States and Suspension of a Member**

The accessions of Guyana, Solomon Islands, Ghana and Samoa to the IHO Convention as new IHO Member States in 2019 brought the IHO Membership to 93 Member States. In November, Vanuatu was suspended from the membership of the IHO.

Capacity Building Management

The IHO Capacity Building programme is a strategic objective of the organization that considers the hydrographic maturity of coastal States and provides targeted training, technical assistance and awareness-raising seminars aimed at improving the status of hydrographic surveying and nautical charting and the delivery of maritime safety information in regions, particularly for developing countries.

The IHO Capacity Building programme is funded from the IHO budget and is supplemented by additional financial support from Member States (currently the Nippon Foundation of Japan, and the Republic of Korea) with in-kind support from Member States and from industry. However, considering the growing demands for IHO Capacity Building activities, more funds and contributions are required. For this reason, the Secretary-General and Directors continued the Secretariat's campaign to find new donor States and funding organizations.

The level of activity of the IHO Capacity Building (CB) Programme remained at the same level as in 2019. Expenditure in the IHO 2019 CB Work Programme was 872 832 Euros, 1% smaller than the budget for the previous year. The 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. In 2019, 91% of the budgeted work program was executed and paid for.

One Director, one Assistant Director, one CB Assistant and some other members of the staff were directly engaged in supporting the CB programme.

Capacity Building Sub-Committee (CBSC)

The 17th meeting of the IHO Capacity Building Sub-Committee (CBSC17) was held in Genoa, Italy, from 29 to 31 May, hosted by the Italian Hydrographic Institute. The meeting was chaired by Mr Thomas Dehling (Germany) and attended by 29 participants representing 14 Regional Hydrographic Commissions (RHCs) and 20 Member States. The South West Atlantic Hydrographic Commission (SWAtHC) was not represented. The welcome address was provided by RAdm Luigi Sinapi,

National Hydrographer of Italy. The IHO Secretariat was represented by Director Mustafa Iptes, Assistant Director Alberto Costa Neves (CBSC Secretary) and Sandrine Brunel (CB Assistant).

The Sub-Committee considered that the IHO Capacity Building Strategy still proves to be very efficient and the implementation of the CB Procedures is very helpful in the execution of the CB Work Programme (CBWP). The meeting also agreed to prepare an input paper to the IHO Strategic Plan Review Working Group (SPRWG) in order to contribute to its development before submission to the meeting of the IHO Council (C-3).

Participants considered that Capacity Building was also key for the development of hydrographic services in developing countries that otherwise couldn't achieve the targets envisioned in the draft IHO Strategic Plan. In order to provide this support, regular and sustainable resources from Member States, stakeholders and the CB Fund is critical. The meeting considered ways to increase resources, including those contributions beyond the CB Fund and agreed that in order to attract donor organizations there is a need to take part in comprehensive projects with other international and regional organizations. In this regard the meeting was informed on the IHO-IMO-WMO-IOC-IALA-IAEA-FIG-IMPA Joint CB Group's initiative to organize a joint project to support Bangladesh, under the leadership of the IMO, under the UN "Delivering as One".

The meeting acknowledged the generous financial contributions of the Republic of Korea and of the Nippon Foundation of Japan, that has a major impact in the CBWP. These contributions jointly creates a number of opportunities for developing Member States in education programmes in Hydrography (Categories "A" and "B") and in Nautical Cartography (Category "B") that have been contributing to the increase in survey and charting worldwide. The contribution from Member States and Industry that provide in-kind support (provision of facilities, trainers, advice, etc.) was also acknowledged.

The draft CB Procedure 9 on Technical Visits was considered and approved by the Sub-Committee. The drafting group was tasked to create a template for the follow-on Implementation Visits to be considered at the next meeting. The meeting was also briefed by the C-55 Review Project Team (C-55RPT) on the limitations and recommendations for the use of CATZOC derived information to update the IHO Publication C-55 as a short-term solution. This will allow the input to be consistent and in a harmonized way. A longer-term solution was envisioned as part of modern MSDI and GIS environments. C-55RPT was tasked to define the scope for future work using a GIS approach.

Participants acknowledged the progress in the IHO Secretariat with the IT-based CB Management System (CBMS), essential to support the work of the CB Coordinators in the RHCs. The system was developed with the generous and intensive support from ROK in cooperation with the IHO Secretariat.

Reports received from the RHCs and from the IHO Secretariat showed progress in several areas with Guyana becoming the 90th Member State of the IHO, the development of new IBSC recognized programmes at both Category "A" and "B", the positive impact of the Maritime Safety Information (MSI) courses coordinated between the CBSC and the WWNWS-SC, the improved coordination with regional organizations and the impact of aid-programmes from foreign affairs of several Member States. The meeting acknowledged the assignment of a CB Coordinator in the RSAHC.

National and regional reports were received from the New Zealand Pacific Region Navigation Initiative (PRNI), the Risk Assessment Project in the Greater Caribbean Region (GCR), the United Kingdom Commonwealth Marine Economies (CME) Programme, the EAHC Training, Research and Development Center (TRDC), the Mexico FOCAHIMECA Project, the CB activities provided by Italy, the Japan International Cooperation Agency (JICA) training course and the training opportunities in Industry.

Participants of the 17th meeting of CBSC

The meeting updated and adjusted the 2019 CB Work Programme, considered the priorities identified by the Sub-Committee, the available and potential additional resources and approved the 2020 CB Management Plan and the 2020 CBWP.

The next meeting of the CBSC to be held in Gdansk, Poland, from 27 to 29 May 2020, hosted by the Hydrographic Office of the Polish Navy.

Manage Capacity Building Fund

The Republic of Korea and the Nippon Foundation of Japan made significant financial contributions to the CB Fund during the period of this report. Many other IHO Member States contributed significant in-kind resources to the CBWP, by providing the venue, instructors, local support, or other resources to ensure the effective implementation of CB activities. A statement of accounts for the CB Fund is contained in Part 2 of this Annual Report.

- **Develop and maintain a Capacity Building Management System**

The Secretariat, with the support of the Republic of Korea, continued to develop a more robust Capacity Building Management System using databases and online services, but at a very slow pace due the resource limitations.

Meetings with other organizations, funding agencies, private sector and academia

- **Joint IHO/IMO/WMO/IOC/IALA/IAEA/FIG/IMPA Capacity Building (CB) Coordination Meeting**

The 12th Joint IHO/IMO/WMO/IOC/IALA/IAEA/FIG/IMPA Capacity Building (CB) Coordination Meeting was held on 10 and 11 September 2019, at the headquarters of the International Maritime Organization (IMO) in London, United Kingdom. The annual meeting brought together eight representatives from the IHO, IMO, WMO, IALA and IMPA. The IOC representative provided a briefing via videoconference. The IAEA and FIG were not represented at the meeting. The IHO was represented by Director Mustafa Iptes (first day) and Assistant Director Alberto Costa Neves, Capacity Building Sub-Committee (CBSC) Secretary.

The objective of the meeting was to coordinate the efforts of international organizations for building and developing capacity in the maritime and marine communities. The meeting participants share resources in line with the United Nation concept of "Delivering as One" for effective, efficient,

coherent and better performing presence in developing countries. The coordinated international presence has the benefit of creating conditions for enhanced communication and cooperation within the countries and their national infrastructure.

Joint IHO/IMO/WMO/IOC/IALA/IAEA/FIG/IMPA Capacity Building Coordination Meeting

Participants reviewed the joint activities conducted in the intersessional period, in particular the seminars for raising awareness of relevant topics preceding the regular conferences of Regional Hydrographic Commissions (RHCs), namely the EAtHC, MACHC, NIOHC, SAIHC and SWPHC, the technical visit to Angola and the CB workshop held during the e-Navigation Underway Asia-Pacific. Future joint activities for technical visits and raising awareness seminars were considered, starting with a joint IMO-IHO-IALA-IMPA needs assessment visit to Iraq.

The meeting shared achievements, challenges and lessons learned with the implementation of the respective CB or Capacity Development (CD) strategies, the management of calendars, course catalogues and portals. The meeting also considered ways to collectively improve e-learning, having as example the IOC Ocean Teacher Global Academy (OTGA) hosting IHO courses on Tides and Water Level and on Maritime Safety Information (MSI), both being implemented.

The strategy to deal with funding agencies was considered during the meeting, and the promotion of joint projects. The development of a joint project to support inland water transportation in Bangladesh was progressing with meetings being held by the IMO with funding agencies. The meeting agreed to prepare a concept paper for building maritime and marine capacity in the Caribbean for climate-resilient and sustainable development. This concept will be presented to donors for implementation, as a response to, among others, the reports of the High-Level Symposium and the Regional Senior Maritime Administrators' Workshop in the Caribbean.

Participants were encouraged to promote and engage with the Working Group on Marine Geospatial Information (WGMGI), established under the United Nations Committee of Experts in Global Geospatial Information Management (UN-GGIM), with the development of an implementation plan for the United Nations Decade of Ocean Science for Sustainable Development (2021-2030) and with the Nippon Foundation-GEBCO Seabed 2030.

The development of a joint input to the IMO Member States Audit Scheme (IMSAS) was considered. The aim was to improve the assessment of the status of Safety of Navigation (SOLAS Chapter V) in a holistic way. IHO reported on its experience in offering support to IMO Member States in their preparation for IMSAS on aspects related to hydrography, nautical charting and MSI.

The meeting considered the impact of alumni from World Maritime University (WMU) and from the International Maritime Law Institute (IMLI) and how they are enabling progress in several aspects in the maritime sector in their countries and in their regions, a long-term return of investment. The impact of the Nippon Foundation's initiatives to support alumni was also noted with appreciation.

The next Joint CB Coordination Meeting to be held in August 2020 in Monaco, hosted by the IHO Secretariat.

- **Other meetings**

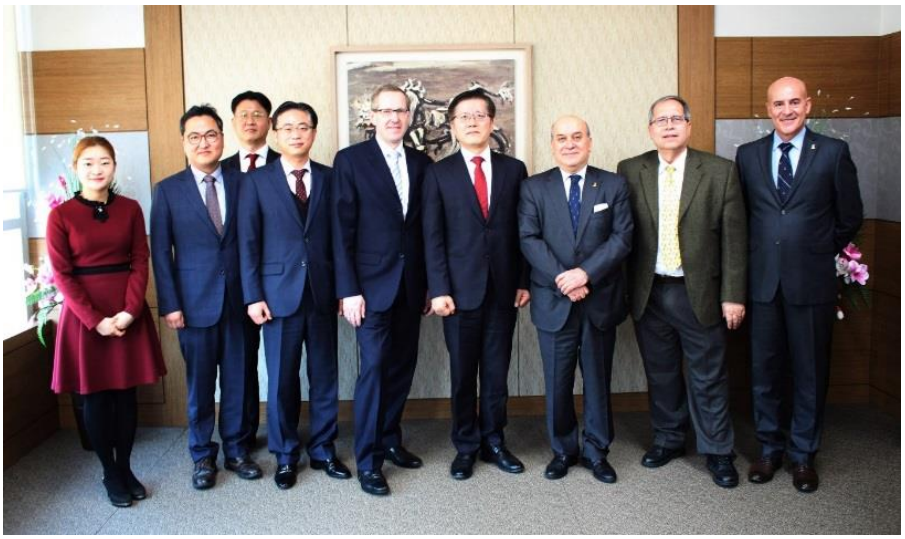
The 8th meeting of the IHO/ROK Programme Management Board (PMB8)

The 9th meeting of the IHO/Republic of Korea (ROK) Programme Management Board (PMB9) was held at the Korea Hydrographic and Oceanographic Agency (KHOA), Busan, Republic of Korea on 12 to 13 March 2019. The meeting comprised of delegates from ROK, the Chair of the CBSC,

representatives from the IHO Secretariat and the Hydrographic Sciences Programme Manager of the University of Southern Mississippi (USM). Participants were welcomed by KHOA Director General Mr Yong-seok KANG. Director Mustafa Iptes and Assistant Director Alberto Costa Neves (Secretary) represented the IHO Secretariat.

The PMB was established under the IHO - ROK Memorandum of Understanding (MoU) to identify directions for improving hydrography and nautical cartography worldwide through the capacity building activities funded by the ROK and to manage the IHO-ROK programme of technical cooperation. The meeting agreed on the need to revise the current MoU in order to update and adjust some of its provisions.

The meeting reviewed the progress and achievements of the various training and education activities sponsored by the ROK. The annual financial contribution from the ROK forms a significant part of the Capacity Building (CB) Fund used to support the annual IHO CB Work Programme (CBWP). Since its inception the ROK contribution has supported education programmes in hydrography and cartography, training for trainers' (TFT) courses, seminars and short courses on hydrographic surveys, ENC quality assurance, marine spatial data infrastructures, law of the sea, and tides and water levels, amongst others.



Participants at PMB9

The PMB considered the management aspects of supporting trainees on the Category "A" Hydrography Programme at the USM and the Category "B" Nautical Cartography Programme at the KHOA in order to effectively deliver high level education and training to participants from developing countries. During the meeting the selection board for the 2019-2020 edition of the Category "A" Programme was convened and the candidates from Mexico and Tunisia was selected, subject to final acceptance by the USM. The meeting was informed that the TFT training on basic hydrography delivered in mid-2019, originally limited to the East Asia Hydrographic Commission (EAHC) was opened to all IHO Member States.
The meeting was briefed on CB activities being conducted by the EAHC Technical, Research and Development Center (TRDC) and its developments of e-learning to better assist the international hydrographic community. The meeting agreed to boost the development of Maritime Safety Information (MSI) e-learning material in English and French and the implementation of the online training material for Marine Spatial Data Infrastructures (MSDI), developed by Denmark.

The meeting reviewed the status of development of the Capacity Building Management System (CBMS) jointly addressed by KHOA and the IHO Secretariat. The meeting concluded that the CBMS was mature enough to be used operationally for receiving submissions to the CBSC in 2019. The PMB agreed to investigate the possibility of organizing a KHOA Alumni Seminar in 2021, together with the PMB11 meeting.

Liaison Visit to the 11th Course of the IHO- Nippon Foundation CHART Project

Director Mustafa Iptes and Mr Naohiko Nagasaka (Project Officer seconded to the IHO Secretariat from Japan) visited the United Kingdom Hydrographic Office (UKHO) on 11 September to meet and brief the trainees attending the 11th course of the IHO - Nippon Foundation CHART (Cartography, Hydrography and Related Training) Project. The project, funded by the Nippon Foundation of Japan, provides training in marine cartography and data assessment, which is recognized at the Category B level by the FIG-IHO-ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers. The course was hosted by the UKHO and was composed of five modules, each module varying from two to five weeks in length. The 11th course started on 2 September 2019 and ended on 13 December. It was attended by students from Bangladesh, Ecuador, Estonia, Nigeria, South Africa, Thailand and Trinidad and Tobago.

The Team of the IHO Secretariat discussed various topics with the students. In response, the students described their experiences and thanked the Nippon Foundation, UKHO and IHO for the opportunity to develop their knowledge and expertise in the field of nautical cartography. Director Iptes delivered a presentation highlighting the areas of influence and the value of hydrography and the responsibilities of Governments in relation to the provision of hydrographic data, information, products and services. The impact of the CHART project was also described and presented in detail by Mr. Nagasaka. The students were encouraged to keep in touch with each other and to maintain an alumni relationship after they return to their home countries.

The trainers and trainees of the 11th CHART Course with the IHO Visiting Team.

Follow-up of CB activities and initiatives

The IHO Secretariat, on behalf of the CBSC, continuously monitored CB activities and initiatives. One Director and one Assistant Director were engaged in this work. Additionally, the Secretary-General, both Directors and the Assistant Directors continuously monitored CB activities undertaken in the RHC areas for which they provide an overview and advisory function.

Capacity Building Assessment

Technical and Advisory Visits

Execution of the technical and advisory visits planned in 2018 are summarized in the following table:

Nº	Activity	RHC/Org.	Implementation
1	Technical Implementation Visit to Niue	SWPHC	Led by New Zealand, 17-21 June 2019
2	Technical Assessment and Advice visit to Palau	SWPHC	Led by IHO, 12-16 August 2019
3	Technical Assessment and Advice visit to Marshall Is.	SWPHC	Led by IHO, 19-23 August 2019
4	Technical Visit to Gambia	EAtHC	Led by UK, 20-26 July 2019
5	Regional Training Centre Site Study	EAtHC	Led by France, 23-28 March 2019
6	Technical Visit to Cambodia	EAHC	Led by Japan, 20-22 August 2019
7	Technical Visit to Lebanon	MBSHC	Led by Italy and Turkey, 15-19 April 2019
8	Training Center Visits	EAtHC	Led by France, 10-17 February 2019
9	Technical Visit to Guatemala	MACHC	Led by USA, 11-15 March 2019
10	Technical Visit to Cameroon	EAtHC	Led by France, 10-17 February 2019

Capacity Building Provision

Raise awareness on the importance of hydrography

The IHO Secretariat continued to work on a schedule of visits to improve global awareness of hydrography, engage external stakeholders such as the United Nations, UN-GGIM, IMO, IALA, the European Commission, funding agencies, academia and industry in general. This included visits to high level authorities in several countries, participation in RHC meetings, participation in various seminars and conferences, and the active promotion of IHO activities in specialized magazines and journals.

- **Revise M-2 – The Need for National Hydrographic Services**

The IHO Publication M-2 was updated in 2018 as Edition 3.0.7, and is in the process of updating with the accession of Guyana, Solomon Islands, Ghana and Samoa.

Technical workshops, seminars, short courses

Execution of the seminars, workshops and short courses planned in 2018 are summarized in the following table:

Nº	Events	RHC	Implementation
1	Hydrography survey programme (Category "A", USM, USA)	Secretariat	Led by USM, Hattiesburg, USA 1 August 2019-1 August 2020
2	Nautical cartography programme (Category "B", KHOA, ROK)	Secretariat	Led by KHOA, Busan, ROK 29 July - 13 December 2019
3	Nippon Chart Project (Category "B", UKHO, UK)	Secretariat	Led by UKHO, Tauton, UK 2 September - 13 December 2019
4	Training for Trainers (TFT, KHOA, ROK)	EAHC	Led by KHOA, Busan, ROK 8-19 July 2019
5	Seminar on Raising Awareness of Hydrography	SAIHC	Led by UKHO, Cape Town, South Africa 2 September 2019
6	Risk Assessment for hydrographic surveys and charting management for the safety of navigation	EAHC	Led by KHOA, Brunei Darussalem 09-13 December 2019
7	Seminar on Raising Awareness of Hydrography	NIOHC	Led by UKHO, Muscat, OMAN 25 March 2019
8	MSI Course	MACHC	Led by UKHO, Santo Domingo, Dom.Rep. 9-11 December 2019
9	MSI / Hydrographic Risk Assessment / Survey Specifications Workshop	EAtHC	Led by SHOM with IALA, Rabat, Morocco 21-24 October 2019
10	Technical Workshop on Disaster Response Planning and Data Discovery	SWPHC	Led by LINZ, Niue 13-15 February 2019
11	Management of MSI DB Workshop	EAHC	Led by KHOA, Indonesia 9-13 September 2019
12	Seminar on Raising Awareness of Hydrography	MACHC	Led by UKHO, Santo Domingo, Dom.Rep. 2-6 December 2019
13	Chart Adequacy Workshop	USA	Led by NOAA/OCS, Silver Spring, MD, USA July 2019
14	Nippon Foundation/IHO-IOC GEBCO Training Course	UNH	Led by UNH, Durham, USA August 2018-August 2019
15	MSI Training Course (former 2018 CBWP P-20)	EAHC	Led by KHOA, Indonesia 9-13 September 2019
16	Nippon Alumni Seminar	IHO	Led by IHO, Singapore 29-31 October 2019

Coordination of Global Surveying and Charting

Publication C-55: Status of Hydrographic Surveying and Nautical Charting Worldwide

During the report period the Secretariat received more updates and confirmations to the entries in C-55.

The following table lists the countries for which updates to existing C-55 entries were received in 2019:

IHO Member States	**IHO Member States**
Argentina	Solomon Islands
Australia	South Africa
Bangladesh	Spain
Brazil	Sri Lanka
Cameroon	Suriname
Canada	Sweden
Chile	Thailand
Colombia	United Kingdom
Cook Islands	Viet Nam
Croatia	**Non-IHO Member States**
Cyprus	Benin
Democratic People's Republic of Korea	Bolivia
Egypt	Comoros
Fiji	Congo
Finland	Côte d'Ivoire
France	Djibouti
Greece	Equatorial Guinea
Guatemala	Eritrea
India	Gabon
Indonesia	Gambia
Iran	Guinea
Italy	Kenya
Kuwait	Kiribati
Malta	Lebanon
Mauritius	Lithuania
Monaco	Madagascar
Myanmar	Malawi
New Zealand	Maldives
Norway	Mauritania
Oman	Nauru
Pakistan	Niue
Philippines	Palau

Portugal	Senegal
Qatar	Somalia
Republic of Korea	Sudan
Romania	Togo
Saudi Arabia	Tuvalu
Seychelles	United Republic of Tanzania
Slovenia	Yemen

Updates for the Antarctic region were provided in 2019.

The IHO Secretariat continued to update publication C-55 - *Status of Hydrographic Surveying and Nautical Charting Worldwide* based on the submissions received from Member States. The current edition of C-55 was generated from a database that is continuously updated as an online service accessed from the download section of the IHO website. The adoption of the IHO Online Form System took place in 2019 and it is the primary entry avenue for updating C-55. The IHO Secretariat continued to investigate ways to display the current database in a GIS environment and to seek new ways to use geo-information to represent the status of surveys and charting around the world. The CBSC established a C-55 Review Project Team to investigate the means to generate the figures to C-55 using CATZOCs.

RHC to coordinate ENC schemes, consistency and quality

In 2019, there was no significant change on the activities of RHCswith regards to coordination of ENC schemes, consistency and quality. In 2018, Ed. 3.1.0 of the IHO Publication S-11 Part A - Guidance for the Preparation and Maintenance of International (INT) Chart and ENC Schemes – was approved by the IHO Member States and issued. In addition to the guidance relating to the preparation and maintenance of ENC schemes that was approved in 2017, this new Edition incorporates a basic check-list for reviewing INT charts, developed by the Nautical Cartography Working Group (NCWG) and Regional INT Charts Coordinators, as well as a new procedure for reviewing INT charts, as a consequence of the revocation of the IHO Resolution 1/1992 - Monitoring of INT Charts. RHCs are expected to coordinate the development and maintenance of small/medium scale ENC schemes and to ensure that uniform parameters are used to ensure consistency and quality. RHCs are also invited to monitor and report on gaps and overlaps in ENC coverage on a regularly basis. With the support provided by the RENCs (IC ENC and PRIMAR), these topics are considered at every meeting of the WENDWG.

Maritime Safety Information

Conduct Meetings of the World-Wide Navigational Warning Service Sub-Committtee (WWNWS)

The Document Review Working Group (DRWG) of the IHO Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC), which is continuing its review of the WWNWS documentation, met at the Headquarters of the International Maritime Organization (IMO) in London, UK from 29-31 January under the chairmanship of Mr Peter Doherty (USA). The meeting was held in the week following the sixth session of the IMO Sub-Committee on Navigation, Communications and Search and Rescue (NCSR 6), to take advantage of the presence of WG Members who had previously attended NCSR 6 (Canada, New Zealand, Norway, USA, IMO, World Meteorological

Organization (WMO), International Mobile Satellite Organization (IMSO), Inmarsat, Iridium and IHO). The IHO Secretariat was represented by Assistant Director David Wyatt.

The outcomes of the 6th session of the IMO Sub-Committee on Navigation, Communications, and Search and Rescue (NCSR 6) relevant to the WWNWS-SC were reviewed. These included the work of a number of Correspondence Groups and groups developing equipment guidelines in which WWNWS-SC members should be involved.

DRWG17 participants at IMO Headquarters

As a consequence of the decisions made at the 99th session of the Maritime Safety Committee (MSC 99) and NCSR 6, in particular the recognition of Inmarsat Fleet Safety and the Iridium satellite service as recognised mobile satellite services of the Global Maritime Distress and Safety System (GMDSS), the DRWG completed a comprehensive revision of the International SafetyNET Manual to include details of the Fleet Safety services and the results of the migration from the I3 to the I4 satellite constellations. The draft revisions were considered by the 11th meeting of the WWNWS-SC (WWNWS11), which was held from 26 to 30 August 2019 in Halifax, Canada, and subsequently be submitted to the 7th session of the NCSR scheduled 15 to 24 January 2020. The DRWG also generated the draft preliminary interim version of the Iridium satellite services manual, which will support the work undertaken by Iridium during the initial operational assessment phase of their service. The draft manual was submitted to MSC 101 for approval. Subsequent to gaining initial operational experience, it was planned to undertake a further revision of the Iridium manual at DRWG18, in preparation for submission to the 12th meeting of the WWNWS-SC (WWNWS12) in 2020.

WWNWS Document Review Working Group, Maintain and extend the following IHO standards, specifications and publications: S-53 and relevant IHO Resolutions in M-3

The WWNWS relies on various IMO/IHO documents to provide guidance for the promulgation of internationally coordinated NAVAREA and Coastal warnings, including the SafetyNET and NAVTEX systems, which each have their own guidance document.

The Document Review Working Group (DRWG) met in the week after the sixth session of NCSR and completed a comprehensive review of the International SafetyNET Manual in preparation for submission to the 11th session of the WWNWS-C. The proposed future editorial amendment cycle to the MSI documentation was discussed, noting the need to take into account the proposed amendments to the SOLAS Convention, the outcomes of the Modernization of the GMDSS and the ongoing operational and technical changes to the WWNWS.

It was decided at WWNWS11 that the 18th meeting of the Document Review WG ((DRWG18) will undertake the review of the Iridium SafetyCast Manual, and prepare proposed text for consideration at WWNWS12 in 2020 and subsequent submission to NCSR 8 in 2021.

Liaise with IMO and WMO on the delivery of MSI within the GMDSS

The WWNWS-SC, with support from the IHO CB Programme, continued to deliver its comprehensive training course that provides practical guidance to relevant authorities in countries that are drafting navigational warnings or broadcasting MSI. The Sub-Committee received updated information on the delivery of MSI training. The meeting was informed that a MSI course had been held in Wellington, New Zealand, for South West Pacific Hydrographic Commission (SWPHC) states.

The lack of qualified experienced trainers was highlighted and the proposed actions to generate regional trainers (Americas, Europe/Africa and Asia/Pacific) to assist the main trainers in the delivery of the course. The WWNWSC noted that the course can only be delivered in English at present, until the lack of qualified French and Spanish trainers is resolved.

The WWNWS-SC reviewed the relevant matters considered and decisions taken during the 100th session of the IMO Maritime Safety Committee (MSC 100) and the sixth session of IMO NCSR. The contents of the relevant Annexes of the Master Plan on the modernization of GMDSS were reviewed.

Improve the delivery and exploitation of MSI to global shipping by taking full advantage of technological developments

The 11th meeting of the World-Wide Navigational Warning Service (WWNWS) Sub-Committee (WWNWS11) was hosted by the Canadian Coast Guard and held in Halifax, Nova Scotia, Canada, from 26 to 30 August under the chairmanship of Mr Peter Doherty of the United States of America. Ms Julie Gascon, Director General Canadian Coast Guard Operations, welcomed the meeting which was attended by 46 delegates from 19 IHO Member States, the Secretariat of the International Maritime Organization (IMO), the Secretariat of the World Meteorological Organization (WMO), the Secretariat of the International Mobile Satellite Organization (IMSO), the Chairs of IMO NAVTEX and International SafetyNET Coordinating Panels, Inmarsat, Iridium, Security of Navigation, Stabilisation, Advice and Training (inc AWNIS) (SONSAT) and the IHO Secretariat. The delegates included representatives of 18 NAVAREA Coordinators, one Sub-area Coordinator and three National Coordinators. The IHO Secretariat was represented by Assistant Director David Wyatt. It was noted that 2019 was the 45th anniversary of the establishment of the Committee for the Provision of Radio Navigational Warnings (CPRNW), the former name for the WWNWS, and the 20th anniversary of the operational establishment of the Global Maritime Distress and Safety System (GMDSS).

The delegates received briefings on the outcomes of recent International Maritime Organization (IMO) meetings, including the 100th and 101st sessions of the Maritime Safety Committee, the 6th session of the Sub-Committee on Navigation, Communications and Search and Rescue and the 15th session of the IMO-International Telecommunication Union (ITU) Expert Group. Up-dates on the activities of the IMO NAVTEX Coordinating and the International SafetyNET panels were provided by their respective chairs as well as developments in the provision of mobile satellite GMDSS services from Inmarsat and Iridium. The meeting also received a progress report on the development of the S-124 Product Specification on Navigational Warnings from the Chair of the S-124 Correspondence Group. He also provided an update brief on the outcomes of the two day workshop, which had been conducted 27-29 August, in parallel to the WWNWS11. Significant progress had been achieved, which would be reported to the S-100WG, and it was agreed to change the S-124CG into a S-124 Project Team, to facilitate opportunities to hold more regular face-to-face meetings.

The sessions considered progress reports on the delivery of MSI training courses, and discussed the processes for reporting the status of MSI provision at Regional Hydrographic Commission meetings and methods for identifying to the Capacity Building Sub-Committee the regions and coastal States most in need of training and assistance.

Participants at the 11th meeting of the IHO World-Wide Navigational Warning Service Sub-Committee in Halifax, Canada

Ocean Mapping Programme

A series of meetings related to the IHO-IOC GEBCO (General Bathymetric Chart of the Oceans) project were hosted by the Center for Coastal and Ocean Mapping-Joint Hydrographic Center/University of New Hampshire (CCOM-JHC/UNH) in Portsmouth, NH, USA, from 4 to 8 November 2019:

- **4 and 5 November:Joint meetings of the Technical Sub-Committee on Ocean Mapping (TSCOM), the Sub-Committee on Regional Undersea Mapping (SCRUM) and the Sub-Committee on Communications, Outreach and Public Engagement (SCOPE);**
- **6 November:GEBCO Symposium; and**
- **7 and 8 November:36th Meeting of the GEBCO Guiding Committee (GGC).**

The IHO Secretariat was represented at the joint TSCOM, SCRUM and SCOPE meeting by Assistant Director David Wyatt who was joined by Director Mustafa Iptes for the GEBCO Symposium and the meeting of the GGC.

- **TSCOM, SCRUM and OWG**

The joint meeting of TSCOM-SCRUM-SCOPE was co-chaired by Ms Caitlyn Raines (USA), Vice-Chair of TSCOM, Dr Vicki Ferrini (USA), Chair of SCRUM, and Professor Hyo Hyun Sung (ROK), Chair of SCOPE.

The initial sessions covered a number of topics relevant to TSCOM and SCRUM, including an update brief by the Director of the IHO Data Centre for Digital Bathymetry (DCDB) and the Chair Crowdsourced Bathymetry Working Group (CSBWG), which highlighted recent developments, current projects and future considerations. A comprehensive brief on the Seabed 2030 structure

and the activities of the Regional Data Centers were received. A number of new applications were demonstrated, including the Arctic App and the Meso-American and Caribbean Sea Hydrographic Commission (MACHC) Discovery App, both of which greatly assist in gaining a better knowledge of data availability within the applicable region.

TSCOM, SCRUM and OWG in plenary session

A detailed brief on the B-11 - *GEBCO Cookbook* - was provided and a number of new chapter titles were identified as well as those existing chapters which needed to be updated. Details of the generation of the GEBCO 2019 Grid were given, in which the new data was highlighted, and the current development state for the 2020 Grid was provided.

Professor Hyo Hyun Sung, Chair SCOPE, presented a detailed update on activities, the proposed GEBCO communications, outreach and capacity building strategies and suggested activities to increase the public engagement with GEBCO and the subordinate Seabed 2030 project. The updating and improvements to the GEBCO and Seabed 2030 websites were noted and the proposal to generate a new world map version from the 2020 Grid was considered.

The Vice-Chair of SCRUM, Pauline Weatherall, advised the Chair of her desire to step down, and as a result Aileen Bohan (Ireland) was elected as Vice-Chair of SCRUM for the period 2019 to 2022.

- **GEBCO Symposium**

For the thirteenth consecutive year, the GEBCO project organized a symposium on the theme of 'Map the Gaps'. The symposium was opened by Kevin Hope, Deputy Director, Source Operations at the National Geospatial Agency (NGA) of the USA. The symposium, which included digital poster sessions and contributions from a broad spectrum of institutions involved in all aspects of ocean mapping, featured 16 presentations and two panel sessions on a diverse range of topics.

Kevin Hope, Deputy Director Source Operations, NGA, opening the GEBCO Symposium

- **GEBCO Guiding Committee**

All of the IHO appointed representatives on the GEBCO Guiding Committee were present. Representatives of Australia, Bangladesh, Brazil, Canada, Ecuador, France, Germany, Guam, India, Indonesia, Ireland, Israel, Italy, Japan, Mexico, New Zealand, Nigeria, Peru, Philippines, South Africa, Republic of Korea, Saudi Arabia, United Kingdom, USA, IOC, IHO and representatives from various government departments and academic institutions attended the meeting as observers with a number of industry stakeholders attending as expert contributors.

GEBCO Guiding Committee members at GGC35

The Chair, Mr Shin Tani (IHO - Japan), introduced the agenda and programme. The GGC received brief reports from its Sub-Committees and endorsed the work which they had undertaken. The GGC also received reports from key personnel performing functions on behalf of GEBCO as well as reports from its parent bodies, IHO and IOC, on activities since the previous meeting.

The Chair of the Sub-Committee on Undersea Feature Names (SCUFN) reported on an automatic discovery process for undersea features. He noted that 2019 was the first year that supporting data had been provided to the DCDB by states proposing feature names. He requested guidance on how the SCUFN should consider feature name proposals that were not visible on a ≥ 1:1 000 000 scale map. After detailed consideration, the GGC agreed that the use of the variable depth resolution approach with a provision for Polar Regions should be employed, which would align with the future GEBCO grid product.

The revised harmonized Terms of Reference (ToRs) of all the sub-committees were reviewed and approved along with the ToRs of the Sub-Committee on Communications, Outreach and Public Engagement (SCOPE).

The GGC considered outreach and ways to raise the profile of the GEBCO project among the different stakeholder and user communities, including the IHO and the IOC Member States, the maritime and scientific community and the general public. The GGC reviewed the draft communications strategy and approved SCOPE to commence work in line with the proposed strategy. The GGC devoted considerable time on discussions on the Seabed 2030 Project. The acting Seabed 2030 Project Director, Dr Graham Allen, provided a comprehensive presentation on the activities of the Seabed 2030 Project Team and the Regional Centers. The GGC reviewed a proposed Seabed 2030 Funding Strategy, as well as reviewing the Year 2 Seabed 2030 Project report and the proposed Year 3 Project Work Plan and both were endorsed after inclusion of some amendments and recommendations. He highlighted the new appointment of the Seabed 2030 Director, Mr Jamie McMichael-Philips, who took up his post on 1 December.

The GGC also reviewed its current financial situation in relation to proposed planned projects. The Committee addressed the budget submissions from its subordinate bodies and approved revised allocations to ensure a suitable contingency balance was maintained for 2020 to cover emergent items. The draft consolidated GEBCO Work Plan and budget will be reported to the 12th meeting of the IHO Inter-Regional Coordination Committee (IRCC) in June 2020 and the 53rd meeting of the IOC Executive Council in July 2020, for consideration and endorsement of the parent organizations.

The GGC reviewed the state of membership and it was noted that one IOC appointed member had not attended for a second meeting. It was agreed that the Chair would investigate the membership statues in collaboration with the IOC Secretariat.

- **Sub-Committee on Undersea Feature Names (SCUFN)**

The 32nd meeting of the IHO-IOC GEBCO Sub-Committee on Undersea Feature Names (SCUFN) was hosted by the Royal Malaysian Navy and Petronas in Kuala Lumpur, Malaysia, from 5 to 9 August 2019.

The meeting, chaired by Dr Hyun-Chul Han (IOC representative) from the Korean Institute of Geoscience and Mineral Resources (KIGAM – ROK), was attended by 28 registered participants, which consisted of eleven of the 12 SCUFN members (six IOC and five IHO representatives) and 17 observers, including Mr Shin Tani, Chair of the GEBCO Guiding Committee (GGC), Mr Tetsushi Komatsu (IOC Secretariat), Marine Regions and representatives of China, India, Japan, Malaysia, Philippines, ROK and Russian Federation. Representatives of NOAA (USA) and KHOA (ROK) in charge of the integration of SCUFN operational web services and GEBCO Gazetteer were also present. Assistant Director Yves Guillam (SCUFN Secretary) represented the IHO Secretariat.

The meeting was opened by Senator Liew Chin Tong, Deputy Minister of Defence (Malaysia). Senator Tong was joined by Vice Admiral Datuk Khairul Anuar bin Yahya, Deputy Chief of Royal Malaysian Navy, Rear Admiral Hanafiah bin Hassan, Chief Hydrographer of Malaysia and Ms Zuhaidah Binti Zulkifli, Senior General Manager, Governance and Strategic Relationships, Malaysia Petroleum Management (MPM), PETRONAS. Senator Tong stressed the importance of the work of SCUFN and called for multilateralism in order to achieve progress amidst a setting of disputes and escalating interest in maritime issues, especially in Southeast Asia region. A specially-prepared montage video was shown as part of the event and mementos were presented to the SCUFN Members.

The Sub-Committee considered proposals for 187 undersea feature names, submitted by various bodies and supporting organizations from Argentina (2), Ascension - St Helena (1), Brazil (15), China (35), Germany (1), Japan (52), Japan together with USA (9), Malaysia (2), Philippines (37), Republic of Korea (3), Republic of Palau (11), New Zealand (18) and USA (1).

Participants of the 32th meeting of the SCUFN

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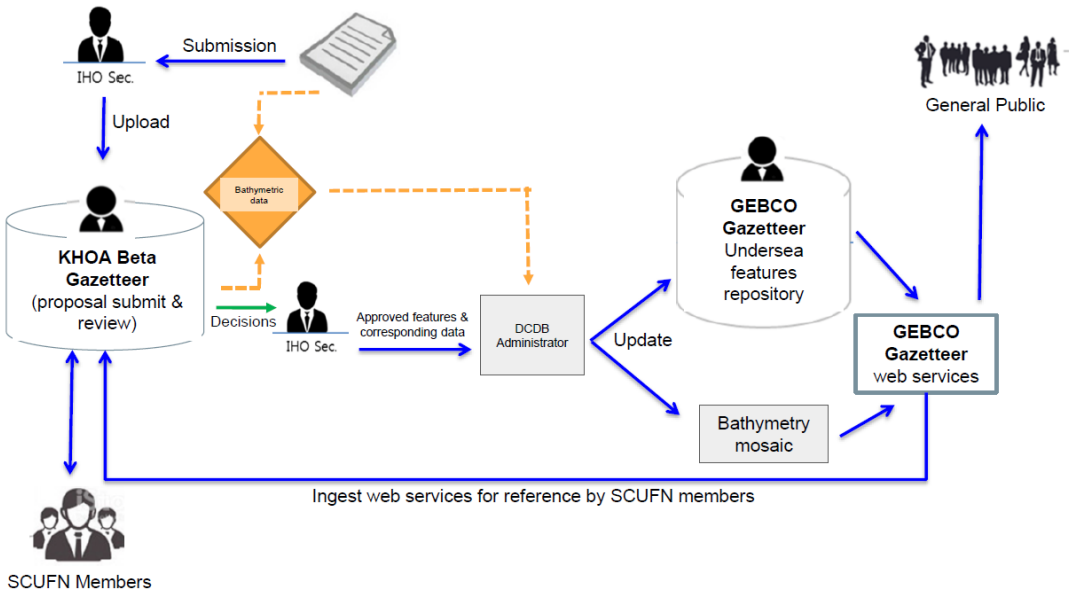
Because of increasing quality of submissions, a large number of the names proposed to the Sub-Committee were accepted in a very efficient and speedy manner, under the Chairmanship of Dr Han who made the best of the outcome of the pre-review made by SCUFN members through the scufn.ops-webservices.kr assessment interface. SCUFN thanked the NOAA representative for the major enhancements made recently in the GEBCO Gazetteer as well as KHOA representatives for the development of the integration of different SCUFN web services. The general principles of this integration, depicted in the diagram below, were agreed and the full integration aiming to avoid duplication and make the whole process much more efficient, is expected within two years.



In addition to the analysis of naming proposals, the Sub-Committee considered several “corporate” issues, including:

- The first comments received through the voting procedure by the IHO Member States for the adoption of the new edition 4.2.0 of B-6 that includes pragmatic suggestions on the release of associated bathymetric data to the IHO Data Center for Digital Bathymetry (DCDB);
- The importance of multilateral consultations between proposers prior to SCUFN meetings when the feature may be located in areas of mutual interests, such as the South China Sea, otherwise some coastal States will never be in a position to make naming proposals if these cases are systematically categorized as being “politically sensitive” in accordance with SCUFN Rules of Procedures 2.10.

SCUFN noted the statements made by some coastal States by which they wish to be kept informed of the proposals located in their areas of jurisdiction.

SCUFN also agreed on the need to pursue the development of a general strategy and possible guidelines defining the optimal horizontal resolution between undersea features that are eligible for naming. Several objectives need to be considered for this task:

- the consequences of the development of GIS tools (by Canada for instance) able to discover features automatically, as long as the generic term definitions become more geometrically robust, a task which is in the scope of the Undersea Feature Names Project Team and the Generic Term Sub-Group;
- clutter reduction;
- the categorization minor features that can be now unveiled by new sensors technologies.

- **Encourage the contribution of bathymetric data to the IHO DCDB**

The GEBCO Ocean mapping programme is dependent upon the availability of bathymetric data and undersea feature information. In order to achieve its goals, 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 also appointed representatives to participate in selected RHC meetings.

Traditionally GEBCO has focused on areas deeper than 200 m, however, it is now actively collecting data in shallow water areas to support activities such as coastal zone management and the mitigation of seaborne disasters such as storm surges 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 and to complete the GEBCO grid coverage.

Conduct meetings of the Crowdsourced Bathymetry Working Group (CSBWG)

- **Crowdsourced Bathymetry**

The Crowdsourced Bathymetry Working Group (CSBWG) has been tasked by the Inter-Regional Coordination Committee (IRCC) to develop the IHO publication B-12 that provides guidance on the collection and use of Crowdsourced Bathymetry (CSB) and to investigate ways to increase participation in data gathering activities. IHO Publication B-12, Edition 2.0.2 - *Guidance on Crowdsourced Bathymetry*, provides guidelines and advice on various considerations that should be taken into account when collecting CSB data for inclusion in the global bathymetric data set which is maintained in the IHO Data Centre for Digital Bathymetry (DCDB).

The working group held its 7th meeting in Québec City, Canada from 12 to 14 February 2019. The Chair of the CSBWG, Ms Jennifer Jencks (USA, Director of the DCDB), chaired the meeting which was attended by representatives from eight Member States (Canada, Denmark, India, Italy, New Zealand, Norway, UK and USA), and observers and expert contributors from the ONE Data Technology Co, Dongseo University, Farsounder INC, Da Gama Maritime Ltd, GMATEK Inc, and Fugro. Assistant Director David Wyatt (Secretary) represented the IHO Secretariat.

The participants of the CSBWG Industry Workshop between sessions

Prior to the meeting, an Industry Workshop was conducted with representatives from CIDCO, Da Gama Maritime, EGS Survey (representing ICPC), ECC, ESRI, FarSounder, Fugro, GMATEK, Hypack, Leeway Marine, Olex, ONE Data Technology, Secunda, SevenCs/ChartWorld and Teledyne CARIS. The representatives were given an overview of the IHO CSB initiative, which was followed by short presentations on current industry partner projects, examples of CSB data usage by hydrographic offices and habit mapping projects and technology perspectives. AORA/ASMIWG, Sea-ID, NF-GEBCO Seabed 2030 and James Cook University gave presentations by remote link. The Workshop participants then considered how to expand the initiative into the various maritime sectors, what methodologies were appropriate to incentivise data gathering activities, how the data could be made available and what recognition strategies were desirable.

The CSBWG briefly reviewed the final draft version of the B-12 Guidelines which was presented to Member States for adoption via IHO Circular Letter 11/2019. A full explanation was provided on the background to the generation of Edition 2.0.0 within such a short timeframe. The WG decided to start considering ways of obtaining user community feedback and comments at its next meeting, which will allow some operational experience to be gained with the current version.

The participants also considered the outreach and recognition strategies, which should be developed. The group focused on the Research vessel, Cruise Liner and recreational leisure sectors, including the Super Yacht community, as being the ones most likely to be able to contribute the most needed data. It was agreed that representation at a number of events and meetings was essential to raise awareness and to progress the five headline topics (need, how, what, incentives and benefits) to increase contributions and participation. It was agreed that leading organizations and companies within each sector could be identified and approached to act as CSB ambassadors. It was proposed that the first three CSB ambassadors should be Carnival on behalf of the cruise industry, Fugro on behalf of the marine survey industry and PGS on behalf of the seismic survey industry. Additionally, it was agreed that closer liaison needed to be established with other IHO bodies as well as the Seabed 2030 project, in particular the Chairs of the Data Quality Working Group (DQWG) and Marine Spatial Data Infrastructure Working Group (MDSIWG) should be invited to future meetings. It was suggested that the Director and Deputy Director of the Seabed 2030 project should be invited to participate and that close harmonization of the outreach activities of both groups should be a priority.

The CSBWG held its 8th meeting at the IHO Secretariat, Monaco from 23 to 25 October 2019. In the absence of the Chair of the CSBWG, Ms Jennifer Jencks (USA, Director of the DCDB), the Vice-Chair, Mr Serge Gosselin (Canada), chaired the meeting which was attended by representatives from eight Member States (Canada, Denmark, Italy, Japan, Netherlands, Norway, UK and USA) and observers and expert contributors from Fugro, Da Gama Maritime Ltd, FLIR Systems AB, SevenCs/ChartWorld, ECC AS, MY Gene Machine and Sea-ID. Assistant Director David Wyatt (Secretary) represented the IHO Secretariat.

Whilst reviewing the actions from its previous meeting, the working group received a brief update on research into manmade noise in the water column and its impacts. In light of the inconclusive information, it was agreed that a coordinated approach should be taken with other IHO bodies which were also investigating the issue. The working group received a number of presentations from participants updating on current CSB related projects as well as a number provided remotely from working group members in Australia and Canada.

The replies to the various IHO Circular Letters on CSB published during 2019 and the States on the positive list published on the IHO website were discussed. It was agreed that more engagement through Regional Hydrographic Commissions was required to articulate the increasing global societal and United Nations (UN) driven need to complete the picture of the seafloor as well as the potential benefits to individual coastal states. Two proposed clarifications to B-12 – *IHO Guidance on Crowdsourced Bathymetry* – were approved.

The participants discussed current use case examples by a number of Hydrographic Offices (HOs), after which the Chair of the Data Quality Working Group (DQWG) provided two comprehensive presentations on ‘Data Quality Combining S-101 and S-102 and Definitions of depth’ and ‘Using data quality for safe navigation’, which highlighted aspects in support of CSB and could overcome a number of HO’s concerns to use the data or encourage its collection.

The participants devoted considerable time to the outreach and recognition strategies, which needed to be developed to increase data contributions and incentives to increase participation. The participants were given a brief on the GEBCO and Seabed 2030 communication activities. The attendance at the OceanObs’19 conference and getting “Seafloor” added to the OceanObs’19 Conference declaration statement were highlighted as significant advances. The participation in the1st UN Decade of Ocean Science for Sustainable Development Global Planning meeting was noted. A number of suggestions and recommendations for consideration by the CSBWG were provided.

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The 8th meeting of the CSBWG in plenary session

During breakout sessions the participants considered three headline topics: actions to increase contributions; key messages; and a review of the mind map developed at CSBWG6. It was agreed that current engagements with commercial companies needed to be nurtured and maintained to ensure data is delivered and continues to be delivered. It was also noted that use of experiences and motivations of current lead contributors should be used to communicate to other potential contributors. It was recognised that the IHO Secretariat report and the national reports to RHCs provided the opportunity to highlight positive coastal states and actions to encourage participation. It was agreed that the Director of the Seabed 2030 project should be invited to participate in future CSBWG meetings and that close harmonization of the outreach activities of both groups should be a priority.

The Vice-Chair, Mr Serge Gosselin, notified the WG of his pending retirement from the Canadian Hydrographic Service and Ms Marta Pratellesi (Italy) was unanimously elected as the new Vice-Chair.

***Seabed 2030* Project**

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 and subsequently under the acting Director, Dr Graham Allen, the project stood up the four regional centers (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 15 arc second grid, based on current technology variable resolution bands, indicates that the current GEBCO grid coverage has increased from 6.8% to 15% with the publication of the GEBCO 2019 grid in March. The Seabed 2030 project has a goal of completing the GEBCO grid by 2030, such that each grid square will contain at least one depth sounding. A new GEBCO grid is expected to be released in late March 2020.

Mr Jamie McMichael-Philips was appointed as the new Seabed 2030 Director who took up his post on 1 December 2019.

Work continues on making additional datasets available and encouraging the IHO Crowdsourced Bathymetry (CSB) initiative to help increase the publically available bathymetric data. The Seabed 2030 regional and global centers continue to work closely with the CSBWG.

Maintain IHO bathymetric publications

- **B-4 - Information concerning recent bathymetric data**

The IHO DCDB is a recognized international repository for all deep ocean bathymetric data (greater than 100 m) collected by hydrographic, oceanographic and other vessels. It has also received significant contributions of crowdsourced bathymetric data. These data can be viewed from: https://maps.ngdc.noaa.gov/viewers/csb/ and http://maps.ngdc.noaa.gov/viewers/bathymetry/.

The DCDB data are publically available and used for the production of improved and more comprehensive bathymetric maps and grids, particularly in support of the GEBCO Ocean Mapping Programme. Significant work has been undertaken to improve the searching, viewing and accessibility of the DCDB data, it is anticipated this work will be completed in 2020.

The DCDB has been working with the private sector to provide a facility for mariners to log bathymetry (position, depth, and time) data using their Electronic Chart Systems, and forward this data to DCDB. Crowdsourced Bathymetry can be provided in GeoJSON format, amongst others.

- **B-6 - Standardization of undersea feature names**

Edition 4.2.0 of Publication B-6 on the Standardization of Undersea Feature Names entered into force in October 2019. This publication provides guidelines for naming features, a naming proposal form and a list of generic terms with definitions with significant clarifications and improvements compared to the previous Edition that was issued in 2013.

- **B-8 - GEBCO Gazetteer of Undersea Feature Names**

The database of the on-line GEBCO Gazetteer of Undersea Feature Names, developed by the IHO DCDB (co-located at one of the US National Centers for Environmental Information (NCEI), NOAA), was maintained by the IHO Secretariat through contract support. Some maintenance issues were fixed in 2019 by the NOAA, USA.

- **B-9 - GEBCO Digital Atlas**

IHO publication B-9 - *GEBCO Digital Atlas* (GDA) is a two-volume DVD and CDROM set which contains: the GEBCO global bathymetric grid at 30 arc-second intervals; the GEBCO One Minute Grid global bathymetric grid, a global set of digital bathymetric contours and coastlines, the GEBCO gazetteer of undersea feature names and a software interface for viewing and accessing the data sets. The GEBCO grids are generated by combining quality-controlled ship depth soundings with depth interpolations between sounding points guided by satellite derived gravity data. The grid is available for download from the GEBCO website. The release of the GEBCO 2019 grid at 15 arc second was released in March 2019 as the GEBCO 2019 grid, which was an enhanced product based on the unpublished 30 arc second GEBCO 2017 grid.

- **B-11 - GEBCO Cook Book**

The *GEBCO Cook Book* (IHO publication B-11) is a technical reference manual that has been developed to assist and encourage participation in the development of bathymetric grids. It is an important GEBCO reference document that is used by academic institutions and hydrographic organizations. The Cook Book covers a wide range of topics such as data gathering, data cleaning, examples of gridding, and provides an overview of different software applications used for producing bathymetric grids.

The Cook Book was first released as IHO Publication B-11 in April 2012 and as an IOC guide document in October 2012. A new additions, Chapter 17 - *Developing a Type Identifier (TID) Grid*,

was added in October 2019; this chapter includes - Developing the TID Grid from Source Data, *List of TID data type codes and definitions* and a new section on *GEBCO Ocean Map Topics*.

Contribute to outreach and education about ocean mapping

GEBCO continues to promote the importance of bathymetric data to the international community.

The GEBCO Sub-Committee on Communications, Outreach and Public Engagement (SCOPE) considered how to improve the GEBCO website in order to make ocean mapping more interesting / enticing for scholars and students. The SCOPE discussed what content could be added to make it a valuable resource for student projects, and considered how this could be harmonized with Seabed 2030 Project developments. It was highlighted that the communications strategy was the overall priority for GEBCO and to this end the GGC focused on the short strategy document developed to provide guidance of how to take forward the identified tasks, the immediate priorities of which were listed as: branding clarity, social media strategy/implementation/engagement and outreach strategy.

In addition, the IHO-IOC GEBCO Cook Book continues to be used as an important educational resource for ocean mapping students.

GEBCO Website kept current and updated regularly

The GEBCO website provides access to information about GEBCO's products, services and activities. The website can be viewed at http://www.gebco.net.

GEBCO bathymetric maps and data sets can be downloaded from the website. These continue to be accessed by a wide user community that includes commercial and academic sectors and the general public.

The GEBCO website also provides access to the world grid via a Web Map Service (WMS). The GEBCO's website has been maintained and updated on behalf of GEBCO by the British Oceanographic Data Centre (BODC) since July 2008. The GEBCO website completed a complete revamp in 2018, the result being a much more modern and refreshed appearance with improved links to the relevant partner websites of the IHO, IOC, DCDB and Seabed 2030.

Marine Spatial Data Infrastructures

This element addresses the developments related to the hydrographic component of Spatial Data Infrastructures (SDI), the maintenance of the relevant IHO publications, and the provision of technical advice as appropriate. Thirty-three representatives from 36 Member States and thirteen Expert Contributors participated in this activity during the period of this report. The IRCC strongly encouraged RHCs to promote MSDI and to explore the potential of the MSDIs.

Conduct meetings of the Marine Spatial Data Infrastructures Working Group (MSDIWG)

The 10th meeting of the Marine Spatial Data Infrastructures Working Group (MSDIWG) took place in Busan, Republic of Korea, hosted by the Korea Hydrographic and Oceanographic Agency (KHOA), on 4 and 5 March, in conjunction with the OGC Marine Domain Working Group (Marine DWG) meeting on 6 March and with the 1st Meeting of the Working Group on Marine Geospatial Information (WGMGI) of the Committee of Experts on Global Geospatial Information Management (UN-GGIM). The meeting was chaired by Mr Jens Peter Weiss Hartmann (Denmark). Nineteen delegates from 12 Member States (Australia, Brazil, Denmark, Germany, Indonesia, Italy, Netherlands, Norway, Republic of Korea, Singapore, United Kingdom and United States of America) and 15 representatives of observer organizations and industry members attended the meeting, a total of 35 participants. Assistant Director Alberto Costa Neves represented the IHO Secretariat.

The meeting was opened by Mr Yong-seok KANG, Director General of KHOA, welcoming the participants and highlighting the importance of the international cooperation and the relevance of Marine Spatial Data Infrastructures (MSDI) for the sustainable development and use of the oceans, seas and inland waters. The willingness of Republic of Korea to contribute to the international efforts to increase the knowledge of the oceans and their sustainable use was emphasized.

Amendments to the Terms of Reference were proposed by the Chair and endorsed by the meeting, in accordance with decisions of the IRCC10. It proposes an expansion of the remit of the WG to include marine spatial planning (MSP) and common operating picture (COP). The Chair reviewed the relevant outcomes from the Council, IRCC, HSSC, WENDWG and DQWG meetings that affected the work of the WG. The Chair provided an overview on the work of the Strategic Plan Review WG and how it will affect the work of the WG.

Online training material on MSDI developed by Denmark was presented by the Chair, following an action from IRCC10. The material was made available from the IHO website to serve the IHO Capacity Building Programme. The meeting also considered ways to promote free online material available from industry members and agreed to create a dedicated page in the IHO website.

The meeting agreed with the Open Geospatial Consortium (OGC) to review the paper previously submitted to HSSC on the interoperable aspects of a Discrete Global Grid System (DGGS), to develop a white paper on data integrity assurance and to create a template policy statement. OGC also is working on the development of a Guide of Standards for the Common People, to promote and facilitate the adoption of standards worldwide in all aspects of a MSDI.

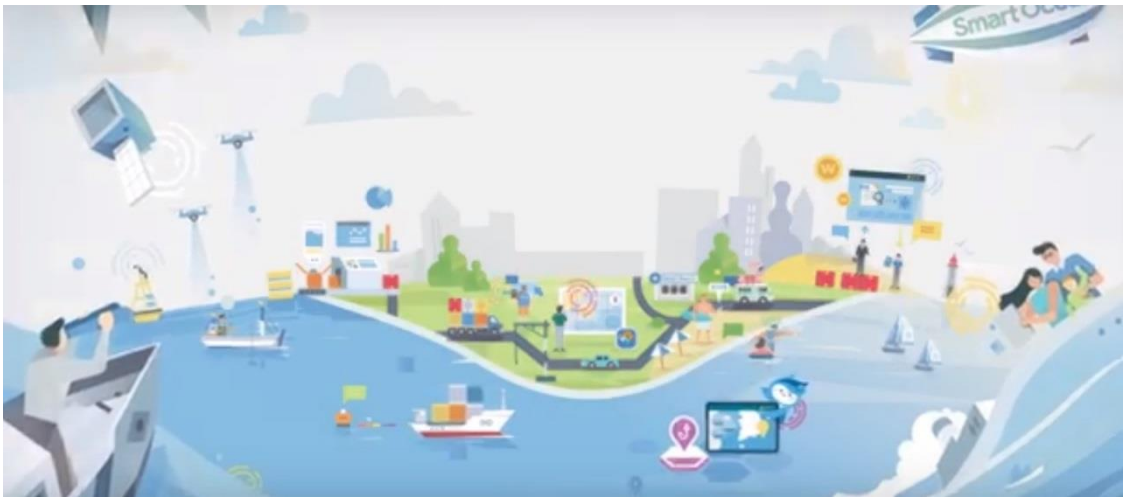
Participants reviewed the current status of the IHO Concept Development Study (CDS) on MSDI that was developed by OGC and funded by the USA/NGA, and presented to IRCC11. The CDS assessed the current state of data management and exchange technologies used in the marine domain. The knowledge gained from the CDS provides interoperability reference architecture for MSDI and foundation for a potential future pilot project that will in turn advance the state of MSDI to support discoverability, accessibility, and interoperability of marine geospatial data across the globe.

Member States and Expert Contributors presented their latest developments and shared lessons learned related to SDI and MSDI. The role of the MSDI Ambassadors was considered and the meeting took note of the Regional Hydrographic Commissions (RHC) that have made progress at national and regional levels. The meeting received feedback on several Use Cases that are being developed and their importance to promote MSDI.

Participants considered how the WG could support the IHO to contribute to the United Nations (UN) Sustainable Development Goals (SDG), in particular those where the impact is more prominent. Attention was also given to the close liaison between the IHO and the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM) and it's WG on Marine Geospatial Information (WGMGI). The meeting considered the work of the IRCC Principles Project Team (PPT) on the UN-GGIM Statement of Shared Guiding Principles for Geospatial Information Management.

The WG considered how to improve communication and to develop an outreach strategy considering the target audience and the means to achieve it. A drafting group was established to develop the first draft of this strategy. The meeting also decided to investigate the possibilities for the development of a new publication on the status of MSDI worldwide from a database within the IHO Regional and Country Information Systems (RIS/CIS). The Chair was tasked to coordinate, with the UN-GGIM/WGMGI Chair, the preparation of a common questionnaire on the status of MSDI worldwide.

The meeting approved with satisfaction the video on MSDI kindly developed by the Republic of Korea (draft available at www.youtube.com/watch?v=5m15KBhd9v0). The video will be made available on the IHO website in English, French and Spanish). Other topics considered by the meeting were the development of a Training for Trainers Course on MSDI, the use of template for MSDI maturity assessment and the way ahead for improving the IHO Publication C-17 *Spatial Data Infrastructures: "The Marine Dimension" - Guidance for Hydrographic Offices*.



The video to promote MSDI developed by Republic of Korea, available at www.youtube.com/watch?v=5m15KBhd9v0

- **OGC Marine DWG Meeting**

MSDIWG10 was succeeded by a meeting of the OGC Marine Domain Working Group (DWG). The meeting was Co-Chaired by Mr Sebastian Carisio (USA and Vice-Chair of the IHO MSDIWG) and Mr Jonathan Pritchard (UK). The meeting reviewed the outcomes of the OGC Marine Summit, held in Singapore on 27 February and the MSDI Concept Development Study (CDS) and the possible follow on Pilot Project.

The meeting also considered the developments of the S-121 Product Specification on Marine Boundaries and Limits, the advances in the GeoPackage Encoding Standard, the updates of the GEBCO Seabed 2030, matters related to interoperability and discoverability, particularly for scientific data, vertical datum harmonization, management and manipulation of temporal data in the marine domain (bathymetry, point clouds), storage and handling for variable resolution data, the progress with the DGGS, governance and policy for data sharing, interoperability and implementation of data catalogues, metadata for bathymetry and data security and provenance and authenticity.

The participants to the OGC Marine DWG meeting.

Work and Meetings of FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC)

- **IBSC Annual Meeting**

The FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) is a joint board of the International Federation of Surveyors (FIG), the International Hydrographic Organization (IHO), and the International Cartographic Association (ICA). The IBSC is responsible to promote, develop and maintain international standards of competence for hydrographic surveyors and nautical cartographers, to maintain publications and documents resulting from the tasks carried out by the Board, to review training and education programmes seeking recognition and to conduct onsite visits to institutions holding recognized programmes.

The 42nd meeting of the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) was held at the Marine Laboratory of the University of Hawaii in Honolulu, USA, from 25 March - 5 April 2019, hosted by the USA (NOAA-UNH). The meeting was attended by nine of the ten Members of the Board. Assistant Director Alberto Costa Neves (IBSC Secretary) represented the IHO Secretariat.

The members of the IBSC at the IBSC42 meeting.

The Board reviewed 16 submitted programmes and recognized eight programmes (two at Category "A" and six at Category "B") and one scheme for hydrographic surveyors and three for nautical cartographers (two at Category "A" and one at Category "B"), with three new programmes being recognized. There are currently 63 recognized programmes and two schemes of individual recognition from 32 countries around the world.

The update of the Guidelines for the Implementation of the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (Ed 2.1.0, May 2019) was completed at the meeting. This companion document of the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (S-5A/B and S-8A/B) was improved with the inclusion of examples of the level of content required in the programme submission documentation and other elements to facilitate the preparation of submissions. The Standards of Competence were considered fit for purpose at the time of the meeting.

The Board developed the Right First Time principle in order to minimize the number of shortcomings in programme submissions the first time they are submitted to the IBSC for review. This prevents

the unnecessary waste of time and resources associated with detecting and correcting issues by the IBSC and submitting institutions. The outcome the IBSC is seeking is that all programmes are recognized at the first review stage. The Board also amended its Rules of Procedure to make the finance information clearer for submitting institutions.

The first Vice-Chair Mr Ron Furness, Australia (ICA), was elected as Chair of the IBSC. Capt Nickolás Roscher, Brazil (IHO) and Mr Sobri Syawie, Indonesia (FIG) were elected as first and second Vice-Chairs, respectively. Chair and Vice-Chair are elected for a period of three years.

- **IBSC ad hoc Meeting**

The FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) held an ad hoc meeting in Singapore from 28 October to 1 November, hosted by the Maritime and Port Authority of Singapore. The meeting was chaired by Mr Adam Greenland (New Zealand) and attended by five of its Members, one Member contributing via videoconference. The IHO Secretariat was partially represented by Assistant Director Alberto Costa Neves (IBSC Secretary), that was also participating in the IHO-Nippon Foundation Alumni Seminar (29 to 30 November).

During the meeting, the Board finalized the intersessional review of programmes that were given conditional recognition at IBSC42. Letters informing the submitting organizations were prepared during the meeting. Participants continued the development of frequently asked questions (FAQ) document as part of the Right First Time principle and the improvement of templates to be used by the submitting institutions.

Provide guidance to training institutions

The IHO Secretariat continuously provided training institutions and other inquirers with guidance regarding the recognition and provision of training and education. This most often occurred as a result of the preparation for the recognition review processes for the IBSC, and during the preparation of CB projects, as well as during seminars and RHC meetings.

Maintain IBSC Publications (C-6, C-47, S-5A/B and S-8A/B)

The IBSC continued the maintenance of the accompanying document Guidelines for the Implementation of the Standards of Competence and issued Edition 2.1.0 in 2019. The revision process continued during the year by correspondence and through one ad hoc meeting in Singapore. The IBSC continued to work in the "Right first time" principle and a lot of effort was devoted to developing templates, frequently asked questions and workflows to support submitting institutions.

New and Revised IHO Publications

The following new IHO publications or revised editions were issued during 2019 and are available from the IHO website.

DATE	ANNOUNCED VIA CL	TITLE
16/01/2019	CL05/2019	Adoption of edition 1.0.0 of IHO Product Specifications; **S-122** Marine Protected Areas and **S-123** Marine Radio Services
13/06/2019	CL28/2019	Adoption of Edition 2.0.0 of IHO Publication **B-12** – IHO Crowdsourced Bathymetry Guidance Document
19/07/2019	CL37/2019	IHO **S-58** Edition 6.1.0 Test Data Set Availability
02/08/2019	CL39/2019	Publication of **P-7** – Annual Report 2018
3/10/2019	CL51/2019	Adoption of Edition 4.2.0 of Publication **B-6** "Standardization of Undersea Feature Names"
22/11/2019	CL57/2019	Adoption of edition 2.0.0 of IHO Publication **S-102** "Bathymetric Surface Product Specification"

NB: The following publications are continuously updated:

-B-8 - Gazetteer of Geographical Names of Undersea Features
-C-55 - Status of Hydrographic Surveying and Nautical Charting Worldwide
-P-5 - IHO Yearbook
-S-32 -Hydrographic Dictionary
-S-62-List of Data Producer Codes

Status Report on Performance Monitoring (2019)

Background

The introduction of IHO performance indicators was firstly decided in 2009 by the 4th Extraordinary International Hydrographic Conference (EIHC-4), together with the adoption of the IHO Strategic Plan. The revised performance indicators was endorsed in 2017 by the 1st IHO Assembly (A-1), together with the adoption of the new IHO Strategic Plan-2017, which are provided at Table 1.

The implementation of performance indicators is described in the IHO Strategic Plan as follows:

The implementation of Performance Indicators is based on a two level approach. *Strategic* level PIs are established by the Assembly as a *top down* process, and *working* level PIs are established by the HSCC and IRCC and their subordinate bodies as a *bottom up* process:

- **Strategic Level PIs (SPIs):** a small number of PIs associated with the objectives of the IHO (1 or 2 SPIs per objective), to be agreed by the Assembly and managed by the Secretary General and the Council;
- **Working Level PIs (WPIs):** PIs associated with the Strategic Directions to be agreed and managed by the HSSC and IRCC and their subsidiary organs.

In this perspective cross-references between the objectives, the Strategic Directions and the PIs are arranged in the following way:

Objectives => Strategic PIs => Strategic Directions => responsible organs => working level PIs

NOTE: The 1st IHO Assembly (A-1) tasked the Council to conduct a comprehensive review of the Strategic Plan and to provide a draft revised Plan, as appropriate, in time for the consideration of the 2nd ordinary session of the Assembly (A-2). The Council was empowered to establish a working group for this discrete purpose. Accordingly, the Council at its first meeting in October 2017 decided to establish the Strategic Plan Review Working Group (SPRWG) which will also review the current Performance Indicators indicated at Table 1, together with Strategic Plan. The Strategic Plan Review Working Group (SPRWG) continued its work throughout the year 2019 and submitted a Revised Strategic Plan to the endorsement of the Council at its 3rd meeting in October 2019. This Revised Strategic Plan will be submitted subsequently to the approval of Member States at the 2nd Session of the Assembly (A-2) in April 2020.

In this respect, **the Performance Indicators are still on pending status for 2019. A new set of SPIs is subject to the outcome of A-2 for their application to the IHO Work Programme 2021 – 2023**. It should be noted that the calculation methods of the new SPIs, as proposed in the Revised Strategic Plan to A-2, are yet to be defined by the SPRWG. This task is planned after A-2 for subsequent submission for approval/endorsement at the 4th meeting of the Council in October 2020 and then implementation.

Table 1

STRATEGIC PERFORMANCE INDICATORS

(Pending status and subject to outcome of the A-2)

Objective	Strategic PIs		Reporting Period	Related Strategic Directions
a. To promote the use of hydrography for the safety of navigation and all other marine purposes and to raise global awareness of the importance of hydrography.	**SPI 1**	Number and percentage of Coastal States providing ENC coverage directly or through an agreement with a third party. (Previous year figures in brackets)	Yearly	1.5; 2.5; 3.1; 3.2; 3.3; and 3.4
b. To improve global coverage, availability and quality of hydrographic data, information, products and services and to facilitate access to such data, information, products and services.	**SPI 2**	Growth in ENC coverage worldwide, as reported in the IHO on-line catalogue, relative to the existing gap in adequate coverage (as defined by IMO/NAV) from the benchmark 01 Aug. 2008.	Quarterly	2.1; and 4.2
	SPI 3	Percentage of Coastal States which provide hydrographic services, directly or through an agreement with a third party, categorized by CB phases, as defined by the IHO Capacity Building Strategy.	Yearly	
c. To improve global hydrographic capability, capacity, training, science and techniques.	**SPI 4**	Percentage of "acceptable" CB requests which are planned. (= *Percentage of submitted CB requests that were approved*)	Yearly	1.3; 2.3; 2.4; 3.4; and 4.4
	SPI 5	Percentage of planned CB requests which are subsequently delivered		

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Objective	Strategic PIs		Reporting Period	Related Strategic Directions
d. To establish and enhance the development of international standards for hydrographic data, information, products, services and techniques and to achieve the greatest possible uniformity in the use of these standards.	**SPI 6**	Number of standards issued (including new editions), per category: - hydrographic standards to enhance safety of navigation at sea, - protection of the marine environment, - maritime security, - economic development.	Yearly	1.3; and 1.4
e. To give authoritative and timely guidance on all hydrographic matters to States and international organizations.	**SPI 7**	Number of potential new IHO MS (indicated by the start of the application process) relative to the number of "non-IHO" IMO MS.	Quarterly	1.1; 1.2; 2.6; and 4.1
f. To facilitate coordination of hydrographic activities among the Member States.	**SPI 8**	Increase in participation / membership in RHCs.	Yearly	2.1; and 4.3
g. To enhance cooperation on hydrographic activities among States on a regional basis.	**SPI 9**	Percentage of available / agreed ENC [production] schemes.	Yearly	2.2; 2.3; and 4.3

List of IHO Secretariat Travel (2019)

DATE	NAME	MEETING	DESTINATION	COUNTRY
JANUARY				
10 11	IPTES	Chart Coordination meeting	Taunton	UNITED KINGDOM
10 11	NAGASAKA	Chart Coordination meeting	Taunton	UNITED KINGDOM
15 18	KAMPFER	NCSR 6	London	UNITED KINGDOM
15 01	WYATT	NCSR 6 & DRWG 17	London	UNITED KINGDOM
28 01	GUILLAM	NIPWG 6	Rostock	GERMANY
FEBRUARY				
05 05	JONAS	GEBCO Seabed 2030	Paris	FRANCE
05 05	WYATT	GEBCO Seabed 2030	Paris	FRANCE
11 15	KAMPFER	SWPHC 16	Alofi	NIUE
11 15	COSTA NEVES	SWPHC 16	Alofi	NIUE
11 15	WYATT	CSBWG 7	Quebec City	CANADA
18 21	IPTES	RSAHC 8	Islamabad	PAKISTAN
18 21	WYATT	RSAHC 8	Islamabad	PAKISTAN
18 21	JONAS	EAHC SC 6	Bali	INDONESIA
25 28	IPTES	WENDWG 9	Brest	FRANCE
25 28	GUILLAM	WENDWG 9	Brest	FRANCE
25 01	KAMPFER	S100WG S102	Aalborg	DENMARK
25 01	PHARAOH	S100WG S102	Aalborg	DENMARK
25 01	WOOTTON	S100WG S102	Aalborg	DENMARK
MARCH				
04 05	COSTA NEVES	MSDIWG 10	Busan	R of KOREA
06 06	COSTA NEVES	OGC Marine DWG	Busan	R of KOREA
07 09	COSTA NEVES	UN-GGIM/WGMGI	Busan	R of KOREA
12 13	COSTA NEVES	PBM 9	Busan	R of KOREA
11 15	IPTES	PBM 9	Busan	R of KOREA
13 22	JONAS	NOAA/UNH/ USCHC/	Boulder/Boston/Biloxi	UNITED STATES
25 05	COSTA NEVES	IBSC 42	Honolulu	UNITED STATES
25 28	IPTES	NIOHC 19	Muscat	OMAN
25 28	WYATT	NIOHC 19	Muscat	OMAN
APRIL				
08 09	JONAS	FAL 43 / ICP	London	UNITED KINGDOM
08 09	GUILLAM	FAL 43 / ICP	London	UNITED KINGDOM
08 12	WYATT	TWCWG 4	Busan	R of KOREA
09 12	KAMPFER	NHC 63	Helsinki	FINLAND
11 12	JONAS	IMLI	Valletta	MALTA
24 25	JONAS	UKHO official opening	Taunton	UNITED KINGDOM
25 26	IPTES	SWAtHC 13	Buenos Aires	ARGENTINA
25 26	COSTA NEVES	SWAtHC 13	Buenos Aires	ARGENTINA
MAY				
06 09	KAMPFER	HSSC 11	Cape Town	SOUTH AFRICA

06 09	GUILLAM	HSSC 11	Cape Town	SOUTH AFRICA
06 09	PHARAOH	HSSC 11	Cape Town	SOUTH AFRICA
13 15	JONAS	IOC 1st global planning meeting (UN Ocean Decade)	Copenhagen	DENMARK
29 31	BRUNEL	CBSC 17	Genoa	ITALY
29 31	COSTA NEVES	CBSC 17	Genoa	ITALY
29 31	IPTES	CBSC 17	Genoa	ITALY
JUNE				
02 04	JONAS	IRCC 11	Genoa	ITALY
03 05	IPTES	IRCC 11	Genoa	ITALY
03 05	COSTA NEVES	IRCC 11	Genoa	ITALY
03 07	PHARAOH	ISO TC 211	Maribor	SLOVENIA
03 07	WOOTTON	ISO TC 211	Maribor	SLOVENIA
05 14	KAMPFER	IMO MSC 101	London	UNITED KINGDOM
05 14	WYATT	IMO MSC 101	London	UNITED KINGDOM
11 13	IPTES	MBSHC 21	Cadiz	SPAIN
11 13	GUILLAM	MBSHC 21	Cadiz	SPAIN
11 13	MURO	MBSHC 21	Cadiz	SPAIN
17	WYATT	IEEE Ocean Conference IFHS Workshop	Marseille	FRANCE
25 27	COSTA NEVES	IMO TC69	London	UNITED KINGDOM
25 28	IPTES	IOC Executive Council & 30th Assembly	Paris	FRANCE
JULY				
01 04	WYATT	IOC 30th Assembly	Paris	FRANCE
03 05	JONAS	HCA 16 & ATCM XLII	Prague	CZECH REPUBLIC
03 05	GUILLAM	HCA 16 & ATCM XLII	Prague	CZECH REPUBLIC
03 05	FONTANILI	HCA 16 & ATCM XLII	Prague	CZECH REPUBLIC
08 10	WYATT	IMO ITU EG 15	London	UNITED KINGDOM
10 11	IPTES	IC ENC SC 21	Cape Town	SOUTH AFRICA
23 26	JONAS	ISA Assembly	Kingston	JAMAICA
AUGUST				
05 09	JONAS	UNGGIM	New York	USA
05 09	GUILLAM	SCUFN 32	Kuala Lumpur	MALAYSIA
12 16	COSTA NEVES	Technical visit	Koror	PALAU
19 23	COSTA NEVES	Technical visit	Majuro	MARSHALL IS
26 30	WYATT	WWNWS 11	Halifax	CANADA
SEPTEMBER				
02 05	KAMPFER	SAIHC 16	Cape Town	SOUTH AFRICA
10	IPTES	12th Joint CB Coordination meeting	London	UNITED KINGDOM
10 11	COSTA NEVES	12th Joint CB Coordination meeting	London	UNITED KINGDOM
11	NAGASAKA	Chart project liaison visit Taunton	London	UNITED KINGDOM
11	IPTES	Chart project liaison visit Taunton	Taunton	UNITED KINGDOM
10 12	JONAS	BSHC 24	Gdansk	POLAND
17 19	JONAS	ARHC 9	Murmansk	RUSSIAN FEDERATION
OCTOBER				
02 03	KAMPFER	PAC 26	Stavanger	NORWAY
14 18	PHARAOH	IALA – ARM / IHO IALA coordination meeting	Paris	FRANCE
21 22	COSTA NEVES	IALA IHO Workshop hydrographic Risk Assessment	Rabat	MOROCCO
22	JONAS	GEBCO Seabed 2030 From Vision to Action	London	UNITED KINGDOM
23 24	JONAS	Our Ocean 2019	Oslo	NORWAY
24 25	KAMPFER	IEC TC80	Shanghai	CHINA

29 31	IPTES	IHO NF Alumni Seminar	Singapore	SINGAPORE
29 30	COSTA NEVES	IHO NF Alumni Seminar	Singapore	SINGAPORE
29 30	NAGASAKA	IHO NF Alumni Seminar	Singapore	SINGAPORE
29 30	PHARAOH	IC ENC Primar TEWG	Stavanger	NORWAY
31 01	COSTA NEVES	IBSC Ad hoc meeting	Singapore	SINGAPORE

NOVEMBER

04 08	KAMPFER	IMO EGDH	London	UNITED KINGDOM
04 08	WYATT	GEBCO XXXVI	Portsmouth	UNITED STATES
05 08	IPTES	GEBCO XXXVI	Portsmouth	UNITED STATES
05 08	GUILLAM	NCWG 5	Stockholm	SWEDEN
25 29	GUILLAM	NIPWG 7	Tallinn	ESTONIA
25 02	JONAS	IMO 31 Assembly	London	UNITED KINGDOM

DECEMBER

02 06	IPTES	MACHC 20	Santo Domingo	DOMINICAN REPUBLIC
02 06	COSTA NEVES	MACHC 20	Santo Domingo	DOMINICAN REPUBLIC
09 13	PHARAOH	ISO /TC 11	Omiya	JAPAN

Responsibilities of the Secretary-General and Directors in 2019

Dr. Mathias JONAS – Secretary-General

- Relations with EU, the United Nations including IMO,ISA and WMO, international bodies concerned with hydrographic matters in polar regions, Non-Member States of the IHO, and other relevant organizations and bodies as appropriate;
- Matters concerning IHO Membership, Host Government Affairs;
- Public Relations;
- Finance and Budget;
- Strategic Plan, Work Plan;
- Programme Performance Reporting;
- IHO Council;
- Administration of the IHO Secretariat, Information Technology;
- Personnel Administration of the IHO Secretariat, Staff Regulations;

and the following Regional Hydrographic Commissions:

- Arctic Regional Hydrographic Commission;
- Baltic Sea Hydrographic Commission;
- East Asia Hydrographic Commission;
- Nordic Hydrographic Commission;
- North Sea Hydrographic Commission;

and the following Commission:

- Hydrographic Commission on Antarctica.

Abri KAMPFER – Director (Technical Programme)

- HSSC and subordinate bodies;
- Relations with ABLOS, IALA, ICA, IEC, ISO, and other relevant organizations, concerning the HSCC programme;
- Technical Support services;
- Stakeholder Liaison;

and the following Regional Hydrographic Commissions:

- Eastern Atlantic Hydrographic Commission;
- Southern African and Islands Hydrographic Commission;
- South-East Pacific Regional Hydrographic Commission;
- South-West Pacific Hydrographic Commission;
- US Canada Hydrographic Commission.

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Mustafa IPTES - Director (Inter-Regional Coordination and Support Programme)

- IRCC, and subordinate bodies, including IBSC and GEBCO;
- Relations with FIG, IOC, the academic sector (education and training), and other relevant organizations, concerning the IRCC programme;
- Capacity Building, Training, Education and Technical Co-operation, including CB Work Programme, CB Fund and budget;
- IHO Publications
- International Hydrographic Review;
- IHO Assembly;
- Annual Report;

and the following Regional Hydrographic Commissions:

- Mediterranean and Black Seas Hydrographic Commission;
- Meso American - Caribbean Sea Hydrographic Commission;
- North Indian Ocean Hydrographic Commission;
- ROPME Sea Area Hydrographic Commission;
- South West Atlantic Hydrographic Commission.

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Responsibilities of the Staff of the IHO Secretariat in 2019

Managerial Staff

Mr A. PEDRASSANI COSTA NEVES	(Brazil)	ADCC	Cooperation and Capacity Building
Mr Y. GUILLAM	(France)	ADCS	Charting and Services
Mr A. PHARAOH	(South Africa)	ADDT	Digital Technology
Mr D. WYATT	(United Kingdom)	ADSO	Surveying and Operations
Ms G. FAUCHOIS	(France)	MFA	Manager, Finance and Administration

Translators

Ms I. ROSSI	HFrTr	Head French Translator
Ms P. BRIEDA SAUVEUR	FrTr	French Translator
Ms M.P. MURO	SpTr	Spanish Translator

Technical, Administrative and Service Staff

Ms I. BELMONTE	WPE	Website and Publications Editor
Ms S. BRUNEL	CBA	Capacity Building Assistant
Ms L. CHAVAGNAS	OA	Office Assistant
Mr D. COSTIN	ITO	Information Technology Officer
Ms C. FONTANILI	PA	Personal Assistant to the Directing Committee
Ms. S. JONES-COUTURE	PRCO	
Mr A. MAACHE	BSA	Bureau Support Assistant
Mr D. MENINI	CGA	Cartography and Graphics Assistant
Ms M. MOLLET	REG	Registrar, Librarian
Mr J. WOOTTON	TSSO	Technical Standards Support Officer

Associate Professional Officers

Dr. H.Y. PARK (from September 2018)	(Republic of Korea)
N. NAGASAKA (from April 2018)	(Japan)
Mr C. RODRIGUEZ (from January 2019)	(Peru)

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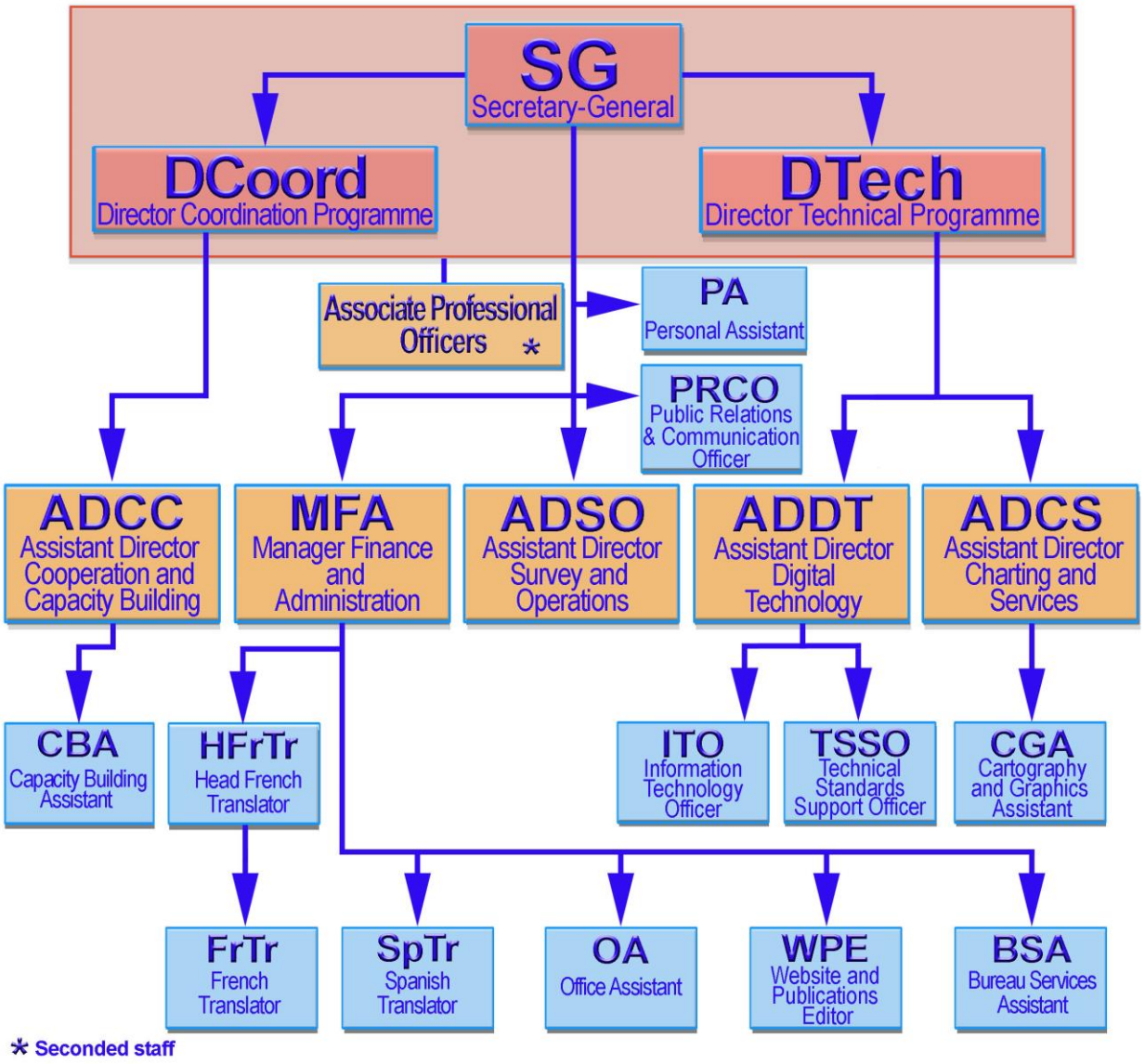
2019
Organizational Diagram of the IHO Secretariat



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LIST OF ACRONYMS

A

ABLOS	Advisory Board on the Law of the Sea
AIS	Automatic Identification System
ARHC	Arctic Regional Hydrographic Commission
ATCM	Antarctic Treaty Consultative Meeting

B

BASWG	Black and Azov Seas Working Group
BSHC	Baltic Sea Hydrographic Commission

C

CB	Capacity Building
CBSC	Capacity Building Sub-Committee
CBWP	Capacity Building Work Programme
CHART	Cartography, Hydrography and Related Training (Project)
CIRM	Comité International Radio-Maritime
CL	Circular Letter
COMNAP	Council of Managers of National Antarctic Programs
CSB	Crowdsourced Bathymetry

D

DCDB	Data Centre for Digital Bathymetry
DG Mare	Directorate-General for Maritime Affairs and Fisheries
DHN	*Diretoria de Hidrografia e Navegação*
DQWG	Data Quality Working Group

E

EAHC	East Asia Hydrographic Commission
EAtHC	Eastern Atlantic Hydrographic Commission
EC	European Commission
ECDIS	Electronic Chart Display and Information System
EIHC	Extraordinary International Hydrographic Conference
EMODnet	European Marine Observation and Data Network
ENC	Electronic Navigational Chart
EU	European Union

F

FIG	International Federation of Surveyors

G

GEBCO	General Bathymetric Chart of the Oceans
GGC	GEBCO Guiding Committee
GIS	Geographic Information System

H

HE	His Excellency
HO	Hydrographic Office

HSH	His Serene Highness
HSSC	Hydrographic Services and Standards Committee

I

IAEA	International Atomic Energy Agency
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAPH	International Association of Ports and Harbours
IBCSO	International Bathymetric Chart of the Southern Ocean
IBSC	International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers
ICA	International Cartographic Association
ICCWG	International Charting Coordination Working Group
IEC	International Electrotechnical Commission
IC-ENC	International Centre for Electronic Navigational Charts
IENWG	IHO-EU Network Working Group
IHB	International Hydrographic Bureau
IHC	International Hydrographic Conference
IHO	International Hydrographic Organization
IMO	International Maritime Organization
IMPA	International Maritime Pilots' Association
IMSO	International Mobile Satellite Organization
INT	International
IOC	Intergovernmental Oceanographic Commission
IRCC	Inter-Regional Coordination Committee
ISA	International Seabed Authority
ISO	International Organization for Standardization
IT	Information Technology

J

JCOMM	Joint Technical Commission for Oceanography and Marine Meteorology
JHOD	Japan Hydrographic and Oceanographic Department

K

KHOA	Korea Hydrographic and Oceanographic Agency

L

M

MACHC	Meso American - Caribbean Sea Hydrographic Commission
MBSHC	Mediterranean and Black Seas Hydrographic Commission
MEIP	Maritime Economic Infrastructure Programme
METAREA	METeorogical Area
MoU	Memorandum of Understanding
MOWCA	Maritime Organization for West and Central Africa
MS	Member State
MSC	Maritime Safety Committee
MSDI	Marine Spatial Data Infrastructure
MSDIWG	Marine Spatial Data Infrastructures Working Group
MSI	Maritime Safety Information
MSP	Maritime Service Portfolio
MSP	Marine Spatial Planning

N

NATO	North Atlantic Treaty Organization
NAVAREA	NAVigational Area
NAVTEX	NAVigational TEXt Messages
NCEI	National Centers for Environmental Information
NCSR	IMO Sub-Committee on Navigation, Communications and Search and Rescue
NCWG	Nautical Cartography Working Group
NGA	National Geospatial-Intelligence Agency
NGIO	Non-Governmental International Organization
NHC	Nordic Hydrographic Commission
NIOHC	North Indian Ocean Hydrographic Commission
NIPWG	Nautical Information Provision Working Group
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NSHC	North Sea Hydrographic Commission

O

OGC	Open Geospatial Consortium

P

PI	Performance Indicator
PMB	Project Management Board

Q

R

RENC	Regional ENC Coordinating Centre
RHC	Regional Hydrographic Commission
ROK	Republic of Korea
RoP	Rules of Procedure
ROPME	Regional Organization for the Protection of the Marine Environment
RSAHC	ROPME Sea Area Hydrographic Commission

S

SAIHC	Southern African and Islands Hydrographic Commission
SCRUM	Sub-Committee on Regional Undersea Mapping
SCUFN	Sub-Committee on Undersea Feature Names
SDI	Spatial Data Infrastructures
SEPRHC	South East Pacific Regional Hydrographic Commission
SHOM	*Service hydrographique et océanographique de la marine*
SOLAS	International Convention for the Safety of Life at Sea
SPI	Strategic Performance Indicator
SWAtHC	South West Atlantic Hydrographic Commission
SWPHC	South West Pacific Hydrographic Commission

T

TALOS	Technical Aspects of the UN Convention on the Law of the Sea
TC	Technical Committee
ToR	Terms of Reference
TSCOM	Technical Sub-Committee on Ocean Mapping

TWCWG	Tides, Water Level and Currents Working Group

U

UAE	United Arab Emirates
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UN	United Nations Organization
UNESCO	United Nations Educational, Scientific and Cultural Organization
UN-GGIM	United Nations Committee of Experts on Global Geospatial Information Management
UNH	University of New Hampshire
USA	United States of America
USCHC	USA-Canada Hydrographic Commission

V

W

WEND	Worldwide ENC Database
WG	Working Group
WMO	World Meteorological Organization
WP	Work Programme
WPI	Working-level Performance Indicator
WWNWS	World Wide Navigational Warning Service
WWNWS-SC	WWNWS Sub-Committee

X

Y

Z