INTERNATIONAL HYDROGRAPHIC ORGANIZATION

ANNUAL REPORT 2016

PART 1 – GENERAL

Published by the International Hydrographic Organization – Monaco

MEMBER STATES OF THE INTERNATIONAL HYDROGRAPHIC ORGANIZATION (IHO) – 31 December 2016

Algeria	Monaco
Argentina	Montenegro
Australia	Morocco
Bahrain	Mozambique
Bangladesh	Myanmar
Belgium	Netherlands
Brazil	New Zealand
Brunei Darussalam	Nigeria
Cameroon	Norway
Canada	Oman
Chile	Pakistan
China	Papua New Guinea
Colombia	Peru
Croatia	Philippines
Cuba	Poland
Cyprus	Portugal
Democratic People's Republic of Korea	Qatar
Democratic Republic of the Congo*	Republic of Korea
Denmark	Romania
Dominican Republic*	Russian Federation
Ecuador	Saudi Arabia
Egypt	Serbia*
Estonia	Singapore
Fiji	Slovenia
Finland	South Africa
France	Spain
Georgia	Sri Lanka
Germany	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	Venezuela (Bolivarian Republic of)
Mauritius	Viet Nam
Mexico	

* *Rights of membership suspended*

IHO SECRETARIAT

Secretary-General	Directors
Robert WARD, Australia	**Mustafa IPTES,** Turkey **Gilles BESSERO,** France

P-7

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	Crowd-Sourced 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	Maritime Spatial Planning

N

NATO	North Atlantic Treaty Organization
NAVAREA	NAVigational Area
NAVTEX	NAVigational TEXt Messages
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
SCWG	Surface Current Working Group
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
TRDC	Training and Research Development Center
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

CONTENTS

P-7

INTRODUCTION

The Secretariat is pleased to present the Annual Report of the activities of the Organization for 2016. 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 2016 together with the report of the external auditor.

Summary and Highlights

Operational Tempo

2016 marked another very busy year for the IHO work programme. The scope of activity and achievement under the work programme remained impressive. This was all the more remarkable because several Member States found it difficult to maintain their previous level of commitment to some of the committees and working groups. This resulted in particular in a number of positions of office-bearers of the working groups remaining vacant and some deadlines being missed. As a consequence this situation placed an increasing strain on the Secretariat to try to achieve the declared targets – particularly in those cases where any delays impacted on the work of other international organizations or stakeholders, and as a consequence the reputation of the IHO. The scope of activity in several areas of the work programme also continued to increase - particularly in the capacity building programme and in the work of the International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC). In both of these cases, the Secretariat did not always have the resources to meet the expectations of the governing bodies - the Capacity Building Sub Committee (CBSC) and the IBSC.

One under-resourced area in the Secretariat was relieved in October when Mr Jeff Wootton, the retiring Chair of the Nautical Cartography Working Group (NCWG), joined the Secretariat as the Technical Standards Support Officer (TSSO) (see IHO CL23/2016). This significantly improved the ability of the Secretariat to support the implementation of S-100 - *Universal Hydrographic Data Model* and the successful implementation and use of IHO technical standards more generally. A principal function of the TSSO position is to undertake the role of S-100 Registry Manager and also to provide a help desk for all those seeking to use IHO technical standards.

Entry into force of the amended Convention on the IHO

A very significant milestone in the history of the IHO was passed when the Government of Monaco informed the Secretariat that the 48th approval of the Protocol of Amendments to the Convention on the IHO was received on 8 August. This meant that the revised Convention, originally approved in 2005, would enter into force on 8 November. The principal changes to the Convention move the Organization from a five-year to a three-year planning cycle from 2018, enable the establishment of a Council that will meet annually from October 2017, and enable States that are already Member States of the United Nations to become Member States of the IHO without the need for a lengthy vote of acceptance procedure. This will see several States acceding to membership of the Organization in 2017.

The revised Convention also changed the organizational arrangements in the Secretariat – previously known as the *International Hydrographic Bureau*. In place of a Directing Committee comprising three elected Directors, one of whom was elected also as the President and, in effect, Chair of the Directing Committee, the IHO Secretariat is now headed by a Secretary-General, assisted by two subordinate Directors. Notwithstanding this significant formal change in responsibility and accountability; for all practical purposes, the Secretary-General continued to pursue the very successful collective and collaborative management and decision-making arrangements that operated under the Directing Committee.

IHO Staff Regulations

2016 also saw the completion of the revision of the IHO Staff Regulations, after a lengthy and faltering process (see IHO CL45/2016) that began in 2007. The new edition of the Staff Regulations, which entered into force on 1 January 2017, now more closely follows the United Nations and the Monaco Civil Service as the benchmark organizations for the remuneration packages and conditions of service for the internationally recruited and the locally recruited members of staff, respectively.

Outreach and engagement

The IHO continued to enjoy the significant contribution of both observer organizations and expert contributors, across all facets of the work programme. Expert contributors, both as individuals and through commercial organizations, played important roles in the continuing development of several IHO standards as well as involvement in several capacity building activities.

As part of continuing to raise awareness of the role of the IHO and to ensure that the IHO's objectives are properly considered by other organizations, the Secretary-General and the Directors took every opportunity to promote the activities and the objectives of the IHO in relevant meetings, conferences and other international gatherings.

Several more intergovernmental and international organizations were recognised as Observer organizations during the year: the International Cable Protection Committee (see IHO CL18/2016) , the Maritime Organisation of West and Central Africa (see IHO CL32/2016), the International Seabed Authority (see IHO CL35/2016), the International Association of Independent Tanker Owners (INTERTANKO) (see IHO CL36/2016), the Open Geospatial Consortium (see IHO CL53/2016) and the World Ocean Council (see IHO CL2016/56). Other applications were considered in 2016 (and subsequently approved in 2017) from, the Arctic Expedition Cruise Operators (see IHO CL60/2016), and the Mediterranean Science Commission (see IHO CL62/2016).

Technical Programme

The main achievements of the technical programme were the preparation by the relevant working groups of draft new or revised editions of several standards:

- draft Edition 3.0.0 of S-11 - Part A - *Guidance for the Preparation and Maintenance of International Chart and ENC Schemes*;
- draft Edition 6.0.0 of S-58 - *ENC validation checks*;
- draft Edition 2.1.0 of S-65 - *ENCs: Production, Maintenance and Distribution Guidance*;
- draft Edition 4.7.0 of S-4 - *Regulations for the International (INT) Charts and Charts Specifications of the IHO*; and
- draft Edition 3.0.0 of S-100 - *Universal Hydrographic Data Model*.

The drafts were endorsed by the Hydrographic Services and Standards Committee (HSSC) at its 8th meeting in November for subsequent consideration by the Member States in view of their approval and publication in 2017.
An upgraded version of the S-100 Registry developed with the generous support of the Republic of Korea was put into service in October. Significant efforts were devoted throughout the year to the on-going development of S-100-based Product Specifications.

Capacity Building Programme

The level of activity in the IHO Capacity Building (CB) Programme continued at a high tempo. Actual expenditure (727,198€) was slightly less than the previous year. 91% of the technical visits, and 100% of the other assignments that were funded in the Capacity Building Work Programme were completed in 2016. The programme continued to benefit from significant financial contributions provided by the Republic of Korea (300k€) and the Nippon Foundation of Japan (195k€).

Financial Situation of the IHO

As indicated in Part 2 of this Report, the financial situation of the Organization at the end of the year remained good. The conservative budgetary approach pursued by the current and previous Directing Committees and approved by the Member States once again resulted in a significant positive outcome by the end of the year. It is proposed that the bulk of the surplus be transferred to the Capacity Building Fund, thereby enabling a number of approved but otherwise unfunded Capacity Building projects to proceed in 2017.

Enduring support by the Government of Monaco

The Secretariat continued to enjoy the significant support of the Principality of Monaco in providing facilities and diplomatic support to the Organization. On behalf of all IHO Member States, the Secretariat would, once again, like to express its gratitude to His Serene Highness Prince Albert II of Monaco and His Government for the enduring generous support and interest in the Organization.

P-7

WORK PROGRAMME 1
Corporate Affairs

Introduction

IHO Work Programme 1 "Corporate Affairs" covers the provision of the 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.

Element 1.1 Cooperation with International Organizations

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

Task 1.1.1 Antarctic Treaty Consultative Meetings

The 39th Antarctic Treaty Consultative Meeting (ATCM) took place in Santiago, Chile from 23 to 27 May. The IHO is an invited expert organization and was represented at the meeting by Captain Hugo Gorziglia, former Hydrographer of Chile and a preceding IHO Director who had specific responsibility for the Antarctic region.

The meeting was opened by the Minister of Foreign Affairs of Chile, Mr Heraldo Muñoz accompanied by senior officers from the Chilean Ministry of Defence. The session was attended by over 400 people representing 53 countries and eight international organizations including the IHO.

Heads of Delegations and Observer Organizations at the Opening Ceremony.

P-7

At the first plenary session, Captain Gorziglia presented the IHO report on the status of hydrographic surveys and nautical cartography in the Antarctic region. He highlighted the role being played by the IHO Hydrographic Commission on Antarctica (HCA) and its members, as well as the contribution being made by different international organizations in order to support activities in Antarctica.

He drew attention to the limited availability of reliable charts of the sea areas and the underlying fact that very little depth data existed for the Antarctic region. He suggested that all vessels entering Antarctic waters should be invited to gather depth data using their existing equipment. This collected data should then be forwarded to the Hydrographic Offices responsible for producing the nautical charts and supporting bathymetric maps of the region.

During the discussions in the Working Group Captain Gorziglia suggested that it would be useful to examine in much more detail the impact of the unacceptable state of hydrographic surveys and nautical charting covering Antarctic waters, particularly in relation to safety, operations and research in the region. He proposed that the IHO could be invited to deliver a seminar on the status of hydrography in the Antarctic, similar to the one organized by the IHO at the 31st meeting of the ATCM held in Ukraine in 2008. This resulted in the Working Group agreeing to include a new priority item in its work programme relating to hydrographic surveying in Antarctica, and to consider the issue in 2018.

The documents of the meeting are available through the ATCM website at: http://www.ats.aq/devAS/ats_meetings.aspx?lang=e.

Task 1.1.2 Comité International Radio Maritime (CIRM)

President Ward represented the IHO at the Annual Meeting of the Comité International Radio-Maritime (CIRM) in Santa Margherita Ligure, Italy from 12 to 14 April.

CIRM is the international organization representing the maritime electronics industry in the development of relevant international regulations and standards and enjoys observer status with the IHO as a Non- Governmental International Organization. CIRM maintains an active role in the IHO Hydrographic Services and Standards Committee (HSSC), with a number of its members also participating as Expert Contributors in various HSSC Working Groups.

The Conference featured three days of presentations, seminars and a workshop on topics including cyber security, developments in navigation and communication, and voyage data recorders and included a dedicated session on ECDIS, and another on the use of non-Type Approved electronic equipment on the bridges of ships.

In the session on ECDIS, Mr Thomas Mellor, Chair of the IHO ENC Standards Maintenance Working Group, provided an update of progress on the relevant IHO standards governing ECDIS and Captain Luigi Sinapi, the Hydrographer of Italy spoke about progress in the provision of ENCs and the underlying issues of limited availability of good hydrographic data and how quality and reliability are depicted on charts and ENCs.

Task 1.1.3 Council of Managers of National Antarctic Programs (COMNAP)

There was no significant contact or activity with the Secretariat of COMNAP during the year.

Task 1.1.4 European Union Initiatives

IHO-EU Network WG

The IHO-EU Network Working Group (IENWG) has been established by the IRCC to monitor and deal with the activities and processes related to hydrography that are being developed under the aegis of the European Union (EU). The IENWG held its fourth meeting in Saint-Mandé, France, on 18 and 19 January.

P-7

The meeting was chaired by Laurent Kerléguer (France) and attended by representatives from the following Regional Hydrographic Commissions:

- Baltic Sea Hydrographic Commission (Sweden),
- Eastern Atlantic Hydrographic Commission (France),
- Nordic Hydrographic Commission (Norway)
- North Indian Ocean Hydrographic Commission (United Kingdom)
- North Sea Hydrographic Commission (Germany),
- South Africa and Islands Hydrographic Commission (France)
- South West Pacific Hydrographic Commission (France).

Director Gilles Bessero represented the Secretariat of the IHO.

France, as the Coastal Mapping Project Coordinator, reported on the progress of this project (see http://coastal-mapping.eu/) which has been funded by the European Commission in support of the development of the European Marine Observation and Data Network (EMODnet). The project is bringing together 11 European Hydrographic Offices. Its objectives are to assess the current availability of digital coastal maps in the EU, to disseminate this information by EMODnet, to share experience of coastal mapping in the EU, to develop standards for best practices and to propose how a future Joint European Coastal Mapping Programme (JECMaP) could operate.

The participants agreed that EMODnet-bathymetry should be promoted as the reference dataset in support of UN-GGIM Europe, EuroGOOS and other related European initiatives. The meeting also considered the support that Hydrographic Offices (HOs) could provide to phase III of the component of EMODnet related to human activities and drafted a report inviting the Marine Spatial Data Infrastructures Working Group (MSDIWG) to analyse further the role of HOs.

The meeting supported a proposal from France to investigate the feasibility of a project aimed at enhancing the archives held by EU HOs, in particular to support climate change studies and to ensure their conservation and accessibility in the long term. The group agreed to start with an inventory of these archives.

The IENWG held its second meeting of the year in Brussels, Belgium on 13 and 14 October, again chaired by Laurent Kerléguer (France). The meeting was attended by representatives from the following Regional Hydrographic Commissions:

- Baltic Sea Hydrographic Commission (Sweden),
- Eastern Atlantic Hydrographic Commission (France),
- Mediterranean and Black Seas Hydrographic Commission (Greece),
- Meso American - Caribbean Sea Hydrographic Commission (France),
- Arctic Regional Hydrographic Commission (Norway, in the absence of Denmark),
- Nordic Hydrographic Commission (Norway),
- North Indian Ocean Hydrographic Commission (United Kingdom),
- South Africa and Islands Hydrographic Commission (France),
- South West Pacific Hydrographic Commission (France).

Assistant Director Yves Guillam represented the Secretariat of the IHO.

At a workshop that preceded the meeting of the IENWG, and in which the IENWG participated, the representative of the EC Directorate-General for Maritime Affairs and Fisheries (DG Mare) reported that Hydrographic Offices had become much more active in EU activities than in the past. He gave a presentation on the maritime geospatial strategy and the associated road map, benchmarking the annual budgets allocated for data collection through the *Copernicus* programme (satellite data, approximately 150 M€), the Data Collection Framework (fisheries data, approximately 60 M€) and EMODnet (up to 5 M€) confirming that the support for collecting hydrographic data "*where it is needed to develop innovation and jobs, where it is not good enough to meet user requirements*" remained insufficient. He also confirmed that

EMODnet operations were funded until 2020 and that DG Mare was preparing for the next phases of activity.

One of the main topics of the workshop concerned the Coastal Mapping Project which sparked discussion on whether Hydrographic Offices were interested in standards other than those existing for bathymetry. This provided the opportunity for the representative of the IHO Secretariat to introduce the S-100 framework (S-102 in particular), refer to the IHO project team on hydrographic surveys scoping (see Element 2.10), and to report on the contacts already established with the Chairs of the Backscatter Working Group of GeoHab (Marine Geological and Biological Habitat Mapping).

The meeting agreed on proposals prepared by the French Hydrographic Office (SHOM), as leader of the Coastal Mapping Project Consortium, to develop a European strategy for Regional Hydrographic Commissions regarding coastal bathymetry. SHOM also reported on the development of the first components for the implementation of the European directive establishing a framework for maritime spatial planning (MSP).

The coordination efforts pursued by the IENWG were rewarded in December with the signature by DG MARE of the new service contract for phase III of EMODnet-bathymetry with a new consortium for further developing the EMODnet Bathymetry portal. The new consortium is composed of 41 leading organizations from 20 countries, including several Hydrographic Offices, and headed by the French Hydrographic Office (SHOM) and Maris BV (Netherlands).

Task 1.1.5 International Federation of Surveyors (FIG)

There was no requirement to communicate formally with the Secretariat of the FIG during the year. The nominated FIG representatives on the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC) continued to work with the other members of the Board (see Task 3.3.7).

Task 1.1.6 International Federation of Hydrographic Societies (IFHS)

The International Federation of Hydrographic Societies (IFHS) is a non-governmental partnership of learned national and regional hydrographic societies dedicated to the promotion of hydrography and related sciences. Liaison between the IFHS and the IHO is governed by a Memorandum of Understanding signed in 2006. The IHO was represented by Secretary-General Ward at the Hydro16 Conference organised by the German Hydrographic Society, a member of the IFHS that took place in Warnemünde, Germany, from 23 to 25 November.

The Secretary-General delivered a welcoming speech, together with Dr Mathias Jonas, Hydrographer of Germany and Chair of the HSSC. Both provided additional presentations on the work and the perspectives of the IHO and, in particular, its relevance to the Conference attendees. The Conference was attended by over 300 people from 20 countries with over 50 companies exhibiting their services, including several participants in the meeting of the IHO Crowd-Sourced Bathymetry Working Group (CSBWG) that held its 3rd meeting immediately before Hydro16 (see report on Task 3.8.2.1).

Task 1.1.7 International Association of Antarctic Tour Operators (IAATO)

IAATO participated actively in the meeting of the Hydrographic Commission on Antarctica in Tromsø in June, where its Executive Director reported on the activities of the organization and its participating tour operators. She reaffirmed the commitment of IAATO and its members to support improvements in hydrography and nautical charting in the region and their continuing willingness to participate in crowdsourcing initiatives.

Task 1.1.8 International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA)

Informal meetings between members of the Secretariats of IHO and IALA took place throughout the year, as part of their participation in various intergovernmental and international events, such as meetings of the IMO and conferences such as the *e-Navigation Underway Conference*, as well as part of combined capacity building activities with the IALA Academy – IALA's equivalent of the IHO Capacity Building Programme.

As part of the preparations for IALA to become an intergovernmental organization in the future, its Secretary-General sought and was provided all the relevant IHO references, together with observations and advice from the IHO Secretary-General.

- **e-Navigation Underway Conference**

Secretary-General of IMO, Mr Kitack Lim addresses the Conference

IALA, in cooperation with the Danish Maritime Authority organised the 6th International e-Navigation Underway Conference on the Baltic Sea ferry *Pearl Seaways* from 2 to 4 February. The primary focus of the Conference was the collaboration and cooperation now taking place to implement the e-Navigation concept.

The Conference was attended by 140 representatives from many parts of the world representing a cross-section of interests from mariners, maritime administrations, significant flag States, navigation equipment manufacturers, academia and international maritime organizations.

Mr Kitack Lim, recently appointed Secretary-General of the IMO, provided the opening address in which he highlighted his wish to see the various stakeholders working together to fulfil the IMO's vision for e-Navigation.

President Robert Ward, representing the IHO, addressed the Conference after the IMO Secretary-General and described the underpinning role that the IHO will play in supporting the IHO S-100 - *Universal Hydrographic Data Model*, that has now been designated as an underpinning e-Navigation data exchange framework standard for e-Navigation.

Secretary-General Lim enjoying a joke with the Conference participants

As a result of the various presentations and discussions that took place over the three days of the Conference, the participants concluded that:

- The stakeholders are cooperating and coordinating and are actively exploring methods to harmonise e-Navigation data and communications.
- IALA may be an appropriate organization to coordinate the IMO unplanned output 6 on Maritime Service Portfolios (MSPs) and harmonise the format, structure and communications channels for the exchange of information electronically.

P-7

- Recognising the value of the Baltic and International Maritime Council (BIMCO) cyber security guidelines, the e-Navigation stakeholders agreed that similar cyber and data security measures must underpin e-Navigation.
- Participants recognised that e-Navigation should improve the human decision making process, not replace it.
- Participants considered that the concept of the Maritime Cloud could support e-Navigation infrastructure and trials are underway.

- **Workshop on Shore-based Maritime Services**

In support of the e-Navigation Strategy Implementation Plan adopted by the International Maritime Organization (IMO), the IALA convened a workshop on shore-based maritime services. The workshop was co-hosted by the Norwegian Coastal Administration and the Portuguese Lighthouse Authority in Lisbon, Portugal, from 24 to 26 May.

The workshop was attended by 61 participants representing a cross-section of stakeholders, including national maritime authorities, lighthouse authorities, pilotage and vessel traffic service operators, industry, academia and five international organizations. The IHO was represented by Director Gilles Bessero and Dr Edward Hosken, from the UK Hydrographic Office, as Vice-Chair of the IHO Nautical Information Provision Working Group (NIPWG). In addition to the IALA Secretariat and the IHO, the following international organizations were represented: the CIRM, the International Maritime Pilots' Association (IMPA) and the World Meteorological Organization (WMO).

Following the welcome addresses delivered by the Secretary General of IALA, Mr Francis Zachariae, and the Director of the Lighthouse Authority of Portugal, Captain Carlos Soares, Director Bessero provided the keynote address in which he described how the concept of Maritime Service Portfolios (MSP) had been introduced during the development of the e-Navigation strategy implementation plan and reviewed the different aspects and issues that may need to be considered to further develop and implement the concept of MSP. Several topical presentations addressed MSP requirements and current developments. In particular, Dr Hosken described the work of the NIPWG in relation to the transition from paper-based nautical publications to S-100 based products while Dr Jürgen Holfort, Head of the German Ice Service and representing the WMO, reviewed the development of S-100 based product specifications related to meteorological and oceanographic information.

The conclusions of the workshop highlighted the underpinning role of the IHO S-100 standard in the development of the format and structure of MSPs and also supported the related proposals discussed in the IMO to use the IMO/IHO Harmonization Group on Data Modelling as a coordinating organ (see Task 1.1.12).

Task 1.1.9 International Association of Ports and Harbours (IAPH)

There was no communication between the Secretariat and the International Association of Ports and Harbours (IAPH) in 2016.

Following the recognition of the International Harbour Masters' Association (IHMA) as an observer organization to the IHO in 2014, the IHMA was represented at the 8th meeting of the HSSC (see Task 2.1.1).

Task 1.1.10 International Cartographic Association (ICA)

There was no requirement to communicate formally with the Secretariat of the ICA during the year. The nominated ICA representatives on the IBSC continued to work with the other members of the Board (see Task 3.3.7).

Task 1.1.11 International Electrotechnical Commission (IEC)

The International Electrotechnical Commission (IEC) is an NGIO that publishes consensus-based international standards and manages conformity assessment systems for electric and electronic products, systems and services. The primary interest in IEC activity is in the work of Technical Committee 80 (TC80) that is responsible for maritime navigation and radio-communication equipment and systems and produces the testing standards required to implement the performance standards adopted by the International Maritime Organization (IMO). TC80 is responsible in particular of the testing standard for ECDIS, IEC 61174.

During the year, the IEC/TC80 liaised with the IHO mainly through representation in the HSSC and several of its working groups. Following the establishment in 2015 of the Working Group 17 dealing with IEC standardization issues related to e-Navigation, a domain was allocated to IEC/TC80 within the Feature Concept Dictionary Register of the IHO S-100 Registry.

Task 1.1.12 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.

- **Maritime Safety Committee**

MSC 96

IMO MSC 96 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. Director Gilles Bessero and Assistant Director David Wyatt represented the IHO at the 96th session of the MSC (MSC 96) that was held at the IMO Headquarters in London, UK, from 11 to 20 May.

e-Navigation. MSC 96 agreed to include in the post-biennial agenda (2018-2019) an output on *Develop guidance on definition and harmonization of the format and structure of Maritime Service Portfolios (MSPs)*. The IHO recommended the activation of the IMO-IHO Harmonization Group on Data Modelling (HGDM) established at MSC 90 to progress this output. The MSC invited the IHO to submit a proposal to MSC or NCSR to activate the HGDM. Such a proposal will be submitted by the IHO in 2017.

Hydrography and Charting. MSC 96 adopted or amended a number of routeing measures, traffic separation schemes and mandatory ship reporting systems. The Committee approved the recognition of Galileo as part of the Worldwide Radio Navigation System and endorsed the view that Iridium could become a mobile satellite service provider of the Global Maritime Distress and Safety System (GMDSS) subject to compliance with outstanding issues reported to NCSR3.

Celebrating European Maritime Day at MSC96 – hosted by Romania

The Committee approved the outcome of a Detailed Review of the GMDSS and the continuation of the project of developing the Modernization Plan.

Maritime Cybersecurity. The Committee developed a draft version of an MSC Circular on *Guidance on maritime cyber risk management*. It was widely agreed that industry was awaiting such guidance to enable it to start implementing appropriate cyber risk management processes. The MSC approved the draft guidance for use as interim MSC Guidelines that would be forwarded to the 41st meeting of the Facilitation Committee for further consideration and finalization with a view to issuing a FAL/MSC Circular.

MSC 97

The 97th session of the MSC (MSC 97) was held at the IMO Headquarters in London, UK, from 21 to 25 November. Assistant Director David Wyatt represented the IHO.

IMO MSC 97 in plenary session

Hydrography and Charting.

MSC 97 adopted amendments to resolution A.572(14), as amended, – *General provisions on ships' routeing* – on establishing multiple structures at sea to be distributed as a MSC circular. The Committee approved MSC.1/Circ.1364/Rev.1 – *Amendments to the International SafetyNET Manual* – and MSC.1/Circ.1403/Rev.1 – *Amendments to the IMO NAVTEX Manual*. The IHO proposed an earlier entry-into-force date and to delete the requirement of providing at least 12 months notification. The MSC decided to refer the IHO proposal to the NCSR Sub-Committee for further consideration. The Committee also authorized the NCSR Sub-Committee to establish an Expert Group on ships' routeing at future sessions.

- **Sub-Committee on Navigation, Communications and Search and Rescue**

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). Its functions are to consider technical and operational matters related to the obligations of Governments and operational measures concerning safety of navigation.

These include: hydrographic and meteorological services, ships' routeing, ship reporting systems, aids to navigation, radio-navigation systems, vessel traffic services, and pilotage; operational requirements and guidelines regarding navigational safety and associated issues, such as regulations for the prevention of collisions and groundings, bridge procedures, voyage planning, avoidance of dangerous situations, places of refuge (including maritime assistance services and relevant aspects of maritime security), carriage requirements, performance standards and operational guidelines for the use of shipborne navigational equipment and other navigational requirements; Governments' obligations and operational measures related to the Global Maritime Distress and Safety System (GMDSS), development and maintenance of the global Search and Rescue (SAR) Plan and the Long Range Identification and Tracking (LRIT) system; operational requirements and guidelines relating to radiocommunications and search and rescue, and, in co-operation with the International Civil Aviation Organization (ICAO), the harmonization of aeronautical and maritime search and rescue procedures; carriage requirements, performance standards and operational guidelines for the use of shipborne radiocommunications and search and rescue equipment; and liaison with the International Telecommunication Union (ITU) on maritime radiocommunication matters.

Director Gilles Bessero and Assistant Director David Wyatt, Mr Peter Doherty, Chair of the IHO World-Wide Navigational Warning Service Sub-Committee (WWNWS-SC), and Mr Christopher Janus, Branch Chief, NGA Maritime Watch - NAVAREA IV/XII represented the IHO at the 3rd Session of the NCSR (NCSR 3) that was held at the IMO Headquarters in London, UK from 29 February to 4 March. Several representatives of Hydrographic Offices also attended the meeting as part of their national delegation.

IMO NCSR 3 in plenary meeting

The Chair of the IHO WWNWS-SC reported on the activities of the Sub-Committee, highlighting the progress on the S-100-based Product Specification for Navigational Warnings - S-124, and the capacity building training provided to the East Asia Hydrographic Commission and Mediterranean and Black Seas Hydrographic Commission. The Sub-Committee endorsed the proposed amendments to the International SafetyNET Manual and the IMO NAVTEX Manual prepared by the WWNWS-SC and instructed the IMO Secretariat to draft the necessary MSC Circulars for consideration and approval by the MSC at its 96th session in the following May.

Director Bessero in the plenary at NSCR 3

In support of the work item on the development of *Guidelines for the harmonized display of navigation information received via communications equipment* and *guidelines and criteria for ship reporting systems,* the IHO submitted a document on the contribution of the S-100 framework to the harmonized display of navigation information. The need for coordination between related activities conducted by the IHO and the IMO was highlighted, including the opportunity of activating the IMO/IHO Harmonization Group on Data Modelling, which had been previously authorized by MSC at its 90th session. Expectations that the output would provide a simplified and more user-friendly display of Marine Safety Information were expressed. The Sub-Committee invited Norway to coordinate a joint proposal from interested Member States and international organizations containing draft Guidelines for the harmonized

P-7

display of navigation information received via communications equipment, for consideration by the NCSR at its fourth session in 2017. Related IMO activities include the development of *Additional modules to the Revised Performance standards for Integrated Navigation Systems (INS)*, for which the Sub-Committee established a Correspondence Group under the coordination of China, the *Interconnection of NAVTEX and Inmarsat SafetyNET receivers and their display on Integrated Navigation Display Systems*, for which the Sub-Committee invited further contribution from the USA and other interested Member States and/or organizations, and the development of *Guidelines on standardized modes of operation (S-mode)*, to be addressed in the post-biennial agenda.

The IHO submitted a document on the monitoring of ECDIS issues and chart coverage. The IHO reported that industry had recently made a request to extend by one year, to 31 August 2017, the transition period for upgrading existing ECDIS systems to meet the revised set of IHO standards which came into force on 31 August 2015 for new ECDIS systems. The Sub-Committee agreed to the one-year extension. Noting the indication in the IHO report of the apparent and inappropriate use of the ECDIS Data Presentation and Performance Check by port State control and vetting inspectors, the Sub-Committee agreed to invite the MSC to note the issue and refer it to the Sub-Committee on Implementation of IMO Instruments (III). The discussion of ECDIS issues was also informed by an out-of-session presentation coordinated by INTERTANKO. The presentation reported the wide variations in the skills of "certified ECDIS users", a prevalent lack of awareness of software maintenance requirements and a lack of appropriate procedures aboard ships. The presentation questioned the relevance of some provisions of the IMO ECDIS Performance Standards related to display options. The presentation highlighted the lack of flexibility in setting the safety depth and the difficulty to optimize the anti-grounding function due to the insufficient density of contour lines in most Electronic Navigational Charts.

Task 1.1.13 International Maritime Pilots' Association (IMPA)

There was no requirement to communicate formally with the Secretariat of IMPA during the year. Informal discussions between members of the IHO Secretariat and the President and Staff of IMPA took place at several events hosted by the IMO and IALA.

Task 1.1.14 Intergovernmental Oceanographic Commission of UNESCO

Cooperation between the IHO and the Intergovernmental Oceanographic Commission (IOC) of UNESCO takes place at several levels. The detailed work of the IHO-IOC GEBCO programme falls under IHO Programme 3 (see Element 3.8). Liaison with the Joint Technical Commission of the World Meteorological Organization (WMO) and the IOC for Oceanography and Marine Meteorology (JCOMM) is reported under task 1.1.19. Representation at the 49th Executive Council of IOC and liaison with the IOC Secretariat are reported here.

The 49th Session of the Executive Council of the IOC met in Paris, France from 7 to 10 June under the Chairmanship of Professor Peter M. Haugan (Norway). 39 of the 40 Member States of the IOC Executive Council were represented (except Côte d'Ivoire), plus 16 other Member States and several international organizations attending as Observers. Among the delegations, the Hydrographers from the following IHO Member States were present: Brazil, Germany, Russian Federation and Turkey. The IHO was represented by Director Mustafa Iptes.

The Sub-Groups and Working Groups of the IOC reported their annual activities to the Executive Council. The Executive Council reviewed the strategic developments of the Commission and its contribution to and role in recent international frameworks in particular the implementation of the UN 2030 Agenda for Sustainable Development.

The Executive Council considered the report - "*IOC Role in Support of the General Bathymetric Chart of the Oceans (GEBCO) Project, State of Progress in the Associated Review*" submitted by the Review Group established by the IOC Assembly in 2015. The Group comprised representatives of IOC Member States and one expert each from the GEBCO Guiding Committee and relevant IOC technical and regional subsidiary bodies. The Review Group was chaired by Dr Alexander Postnov (Russian Federation), Vice-Chair of the IOC.

The Review Group reported that the majority of the IOC technical and regional subsidiary bodies had an interest in the GEBCO products and found them useful for their activities. Taking this into account, the Review Group recommended that IOC should continue its involvement in the GEBCO project and collect and integrate the IOC user requirements for GEBCO products on a regular basis. The Executive Council expressed concern that the level of active involvement by the IOC in the GEBCO project had diminished and noted that the project relies mainly on support from the IHO. Director Iptes intervened during the discussions and stated the IHO position on GEBCO governance.

The Executive Council then decided:

- to enhance IOC involvement in the GEBCO project,
- to establish a regular working group of representatives of IOC technical and regional subsidiary bodies to identify IOC user requirements and potential contributions to GEBCO products tasking it to collect, integrate and assess the user needs and requirements and potential contributions to GEBCO data and products; and to identify potential contributions to GEBCO data and products.

The 49th Session of the Executive Council of the IOC

Task 1.1.15 International Organization for Standardization (ISO)

- **ISO Technical Committee 211**

The Technical Committee (TC) 211 - *Geographic information/Geomatics* of the International Organization for Standardization (ISO/TC211) deals with the development of standards and specifications in the geospatial domain and is currently responsible for maintaining 72 ISO standards. The IHO is a Class A liaison member of ISO/TC211 and participates in its standards development and maintenance activities. The ISO/TC211 19100 series of standards and specifications underpins the IHO S-100 - *Universal Hydrographic Data Model*.

Assistant Director Anthony Pharaoh represented the IHO at the 42nd and 43rd Plenary Meetings and Working Group Meetings of the ISO/TC211 which took place respectively in Tromsø,

Norway from 13 to 17 June and in Redlands, California, USA from 28 November to 2 December.

Participants to the 42nd ISO/TC211 Meeting

The Committee considered the outcome of completed systematic reviews of current standards, decided on standards requiring a revision or new projects and agreed on the standards that should undergo subsequent systematic reviews. None of the items discussed had a direct impact on IHO standards. However it was noted that the on-going development of standards associated to geospatial web services (in liaison with the Open Geospatial Consortium) and the emergence of the "Semantic Web" (or Web 3.0), which implies a shift from a "Web of (human readable) documents" to a "Web of (machine readable) data", may need to be considered in the future.

Task 1.1.16 Joint Board of GIS (JB-GIS)

The JB-GIS comprises the heads of the Secretariats or executive committees of a number of international organizations concerned with geospatial information. The purpose of the JB-GIS is to provide, where possible, a collective and unified voice at the international level regarding geospatial affairs, especially to the United Nations and to other global geospatial information stakeholders. Its second goal is to assist in the coordination of relevant activities between the organizations represented by the members of the JB-GIS.

President Ward attended an informal meeting of the JB-GIS, held in New York in August in the margins of the meeting of the UN-GGIM (see Task 1.1.18).

The Board reviewed the progress that had been made; in particular, the success in raising the profile of the participating organizations in the UN-GGIM.

Task 1.1.17 NATO geospatial bodies

The Defence Geospatial Information Working Group (DGIWG) is the multi-national body responsible for geospatial standardization for the defence organizations of member nations. Some of its standards development activities overlap with those of the IHO.

The NATO Geospatial Maritime Working Group (GMWG) supports NATO's maritime geospatial requirements. It has developed a number of S-57 based product specifications for Additional Military Layers (AML) and is now beginning to develop S-100 based data product specifications.

The United Kingdom acts as liaison with the DGWIG and the NATO GMWG for ensuring the cooperation with the HSSC in the co-ordinated development of interoperable standards.

The UK reported on the relevant activities of both group at the 8th meeting of HSSC (see Task 2.1.1) and requested an allocation of product specification identifiers for use by the GMWG.

P-7

The Committee allocated the numbers S-501 to S-525 as AML Product Specification identifiers.

Task 1.1.18 United Nations

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

President Robert Ward represented the IHO at the sixth Session of the United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM) that took place at the UN Headquarters in New York, USA from 3 to 6 August.

The UN-GGIM reports to the UN Assembly via the UN Economic and Social Council (ECOSOC). 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 in to account the role of geospatial data in monitoring and achieving the Sustainable Development goals agreed under the UN 2030 Agenda for Sustainable Development.

Nearly 300 participants representing more than 80 UN Member States and Observer Organizations, including the IHO, participated in the Session. A representative of the US Hydrographic Office (Office of Coast Survey) was present in the US delegation. The Hydrographic Offices of Cuba, New Zealand, Oman and the Philippines were, in effect, represented since their national delegations were led by their parent organizations.

A number of the items on the agenda of UN-GGIM6 were of direct relevance to IHO Member States, particularly in relation to the contribution of hydrographic data and services to national and regional spatial data infrastructures.

Progress in the development and maintenance of relevant IHO standards was presented to the Committee as part of a combined report of the IHO, the International Organization for Standardization (ISO) and the Open Geospatial Consortium (OGC). The Committee expressed its thanks for the continuing work of the IHO, ISO and OGC with respect to standards, harmonization and implementation, and the usefulness of the two reference documents produced by the three organizations. Several Member States indicated that the reference documents are now being used as a means of highlighting the fundamental importance of the adoption and use of geospatial standards in order to enhance data inter-operability and access in their countries.

The Committee reviewed the progress being made by its working group (WG) on global fundamental geospatial data themes.

The Committee reconfirmed its acknowledgment that open data, data sharing policies, and the use of volunteered geographic information are critical to advancing the use of geospatial information. These are all subjects that are under the purview of the Marine Spatial Data Infrastructure Working Group (MSDIWG) and the Crowd-Sourced Bathymetry Working Group of the IHO.

P-7

The Committee's Expert Group on the Application of Geospatial Information related to Land Administration and Management, provided its report and observations. President Ward drew the Committee's attention to the fact that the subjects under consideration of this expert group applied equally to the coastal areas, seas and oceans. He drew attention to the ongoing work in the IHO in assisting Member States to contribute to national and regional spatial data infrastructures and invited the Committee to consider whether the scope of study should be widened beyond the terrestrial domain to specifically include coastal waters, the seas and the oceans. As a result, the Committee: ... *recognized the need to consider the marine environment – shorelines, coastal waters, seas and oceans – as a key component of the spatial data infrastructure that underpins the administration and management of land, marine spaces, and the national geospatial resources of many littoral Member States*.

Chair of ISO Technical Committee 211 on Geographic information/Geomatics, Mr Olaf Østensen and President Ward

This statement reinforced the role of the MSDIWG and the priority that is placed on MSDI in the IHO Work Programme.

Task 1.1.19 World Meteorological Organization (WMO)

The principal interaction between IHO and WMO remained via the WWNWS-SC (see Element 3.7). Progress on the development of S-100 based Product Specifications S-411 - *Ice Information* and S-412 - *Weather Overlay* led by the Expert Teams of the Joint WMO-IOC Commission for Oceanography and Marine Meteorology (JCOMM) were reported to the S-100WG and the HSSC (see Elements 2.1 and 2.2).

Task 1.1.20 Other Organizations when their agendas have relevance to the programme of the IHO

- **Asian Pacific Heads of Maritime Safety Agencies (APHoMSA)**

The Asia-Pacific Heads of Maritime Safety Agencies (APHoMSA) serves a similar function for the regional coordination and implementation of IMO rules and instruments and for knowledge sharing and capacity building that the Regional Hydrographic Commissions provide for the IHO. The IHO, represented by the Secretariat of the IHO, is a permanent observer organization at the meetings of APHoMSA.

President Robert Ward represented the IHO at the 17th annual Meeting of APHoMSA held in Queenstown, New Zealand from 14 to 16 March. The Maritime Safety Agencies of Australia, Chile, China, Cook Islands, Fiji, Hong Kong - China, Japan, Kiribati, Republic of Korea, Malaysia, New Caledonia, New Zealand, Niue, Philippines, Singapore, Solomon Islands, Tuvalu, United States and Viet Nam were represented. The IHO, IMO, Pacific Community, IALA and the Secretariat of the Pacific Regional Environment Programme were also represented.

P-7

President Ward provided a report on the status of provision of hydrographic and nautical charting services in all countries in the APHoMSA region. He provided a country by country assessment and, in particular, emphasized the currently unsatisfactory provision of Maritime Safety Information (MSI) despite a significant number of the participant organizations having received IHO-sponsored MSI training in recent times. He went on to point out that, in most cases, the trainees were employed in national Maritime Administrations represented in APHoMSA.

President Ward stressed the role that national Maritime Administrations should play in ensuring that appropriate hydrographic and nautical charting services are in place in their jurisdictions in conformance with the obligations placed on States through the relevant articles of the Convention for the Safety of Life at Sea, for which Maritime Administrations are normally answerable in the IMO. He went on to remind the representatives of the Administrations at the meeting that the effective provision of hydrographic services is specifically examined in the IMO mandatory Audit Scheme and that the IHO stood ready to assist those States that may require support.

- **International Mobile Satellite Organization (IMSO)**

The International Mobile Satellite Organization (IMSO) is the inter-governmental organization whose primary purpose is the oversight of certain public satellite safety and security communication services provided by mobile satellite communication systems, including the satellite component of the WWNWS. IMSO comprises 102 Member States. The governing body of the organization is the Assembly of the Parties which meet every two years. The 24th session of the IMSO Assembly was held at the IMO Headquarters in London, UK, from 15 to 17 November under the chairmanship of Mr Dikko Tahir Bala (Nigeria). Assistant Director David Wyatt represented the IHO.

The meeting addressed a number of topics of direct interest to IHO Member States, in particular the GMDSS and potential new GMDSS mobile satellite service providers. The IMSO Directorate gave a presentation providing insight information relating to the activities of the Directorate to oversee GMDSS services. The IHO representative made an intervention, which was to clarify a number of concerns related to the monitoring of broadcasts of Warning Messages by NAVAREA Coordinators, the potential increase in costs to NAVAREA Coordinators as a result of the introduction of a second GMDSS mobile satellite service provider and the need for equipment interoperability.

The Assembly received a presentation from the satellite service provider Iridium, which briefed the Assembly on developments to Iridium's future services and the work being undertaken to address the conditions which need to be fulfilled prior to consideration for recognition by the IMO as a GMDSS mobile satellite service provider.

- **Group on Earth Observations (GEO)**

Director Mustafa Iptes represented the IHO at the 13th GEO Plenary Session (GEO-XIII) that took place in Saint Petersburg, Russian Federation on 9 and 10 November. More than 400 representatives from Members and Participating Organizations and Observers attended the plenary.

GEO, the "Group on Earth Observations", is a voluntary partnership of governments and international organizations. GEO was launched in 2003 in response to calls for action by the 2002 World Summit on Sustainable Development and by the G8 (Group of Eight) leading industrialized countries. GEO is coordinating efforts to build a Global Earth Observation System of Systems (GEOSS) in order to exploit the growing potential of Earth observations to support decision making in an increasingly complex and environmentally stressed world.

P-7

GEO's Members include 103 Governments and the European Commission. In addition, 77 intergovernmental, international, and regional organizations with a mandate in Earth observation or related issues have been recognized as Participating Organizations. The IHO was recognized as a Participating Organization in 2006. GEO meets annually in plenary session. Its strategic guidance is provided by a Ministerial Summit which takes place about every three years. The GEOSS Implementation Plan has been steered by the GEO Co-Chairs (four Members: China, European Commission, South Africa, and USA) and the Executive Committee (sixteen Members selected on a geographical basis).

The meeting considered the potential contributions by GEO and the Earth observations community to the UN's 2030 Agenda for Sustainable Development Goals (SDG). This includes activities to advance the provision, access, discoverability, and applicability of Earth observations and geospatial information for use with the SDGs, and to assess data and information requirements for the SDGs.

All the documents considered at the meeting and the IHO Statement provided to GEO-XIII plenary were posted at:

http://www.earthobservations.org/geo13.php

- **African Union Extraordinary Summit on Maritime Security and Safety and Development in Africa**

Ingénieur général Bruno Frachon, national Hydrographer of France, as Regional Coordinator for Capacity Building of the Eastern Atlantic Hydrographic Commission, and Director Gilles Bessero represented the IHO at an Extraordinary Summit of the African Union (AU) Assembly on Maritime Security, Safety and Development which took place in Lomé, Togo from 10 to 15 October.

The Lomé Summit was composed of three main segments. From 11 to 14 October, the Permanent Representatives Committee and the Executive Council of the AU met in a closed session to discuss and finalize the draft of an "*African Charter on Maritime Security, Safety and Development*". In parallel, a series of side-events addressing the theme of the Summit was held from 10 to 14 October together with an exhibition of posters and demonstrations illustrating activities and tools related to maritime safety and security. Finally, the Heads of State and Governments met on 15 October to review and approve the draft Charter.

The side-events brought together up to 500 participants from 25 different countries, representing the different branches of the maritime sector - including international and regional organizations, national maritime administrations, navies, port authorities, industry, academia - and also the civil society.

About 120 experts invited by the Government of Togo took part in the different panel discussions composing the side-events. Ingénieur général Bruno Frachon and Director Gilles Bessero took part in the panel discussions related to maritime safety and security issues and to governance issues. Director Bessero participated also in the panel discussions on the blue economy. The interventions of the IHO representatives focused on the importance of hydrography as underpinning all marine activities, the poor status of hydrographic surveys in

African waters, the lack of appropriate arrangements for providing hydrographic services in general and maritime safety information in particular in many African countries, the way forward to improve this situation and the role of the IHO in relation to standardization, training and capacity building. Dr Vladimir Ryabinin, Executive Secretary of the IOC, and Mr Chris Trelawny, Special Advisor to the Secretary-General of the IMO were involved in the panel discussions related respectively to governance issues and maritime safety and security issues.

Director Bessero in discussion with Dr Nkosazana Dlamini Zuma, Chair of the AU Commission with Mr Robert Dussey, Minister of Foreign Affairs of Togo in the background

With the kind assistance of Professor Adote Blivi, IOC focal point for Togo, several posters provided by the IHO Secretariat and by the French Hydrographic Office (SHOM) were displayed in the exhibition complementing the side-events. The IHO display was presented by Director Bessero to Her Excellency Dr Nkosazana Dlamini Zuma, Chairperson of the AU Commission, and by Ingénieur général Frachon to European Commissioner Karmenu Vella.

- **International Seabed Authority (ISA)**

President Robert Ward represented the IHO during the first week of the twenty-second annual session of the International Seabed Authority at its headquarters in Kingston, Jamaica from 12 to 22 July.

The Secretary-General of ISA and President of the IHO Secretariat with Mr Tidiani Couma, representative of Monaco to the ISA

Among the items on the Council's agenda was consideration of a proposed Agreement on Cooperation between the IHO and the ISA. This was agreed and resulted in the Agreement being signed on 14 July on behalf of the IHO by President Ward and on behalf of the ISA by its out-going Secretary-General Mr Nii Allotey Odunton of Ghana.

President Ward addressed the Council where he introduced the IHO. He went on to remind the Council that less than 10% of the area under its jurisdiction has been measured directly and that this situation can best be addressed by introducing policies that oblige at least some level of the depth data being collected as part of the exploration and environmental assessment arrangements, to be made more widely available. He reminded

P-7

the Council that this would follow the growing trend in other parts of the world's sea areas – where the policy is to *measure once – and use many* times. He highlighted also that adopting or encouraging such a regime in the ISA of making fundamental depth data more widely available would also directly support the recently adopted 2030 Agenda Sustainable Development number Goal 14 - concerning the sustainability of ocean activities.

The President expanded upon this theme at a side event where he briefed approximately 40 of the delegates.

As a result of the IHO representation at the Assembly and Council meetings of the ISA several groups representing ISA licensees (Contractors) and the Secretariat expressed interest in further developing the ISA protocols to ensure that bathymetric data collected under the ISA regime is made available to the IHO Data Centre for Digital Bathymetry (DCDB) and the IHO-IOC GEBCO project.

- **African Ministerial Conference on Ocean Economies and Climate Change**

At the invitation of the World Bank, President Robert Ward represented the IHO at an African Ministerial Conference on Ocean Economies and Climate Change held on 1 and 2 September in Mauritius. The invitation came as a result of several meetings between Director Mustafa Iptes and the World Bank, where Director Iptes was exploring opportunities for assistance from the Bank for hydrographic capacity building. During the discussions Director Iptes highlighted the fundamental and underpinning role that hydrography, and in particular bathymetric data, plays in all aspects of human activity in, on and under the sea. As a result, the World Bank now better recognizes that hydrography should be considered as part of any wider programmes that it supports to develop the blue economy and invited the IHO to participate in the African Ministerial Conference.

The Conference brought together Ministers from 15 African countries together with leading experts from development partners, the private sector, scientists, and academia. The purpose of the Conference was to prepare to present an 'African Package' to the 22nd session of the Conference of the Parties (COP 22) to the UN Framework Convention on Climate Change (UNFCCC) in Marrakesh, Morocco in the following November and to help attract transformational investment packages for ocean-related development for Africa as part of the broader global ocean action agenda.

The Conference developed a communiqué to be presented to COP22. Among its various calls for action, the communiqué highlighted the need for investments and developments that are sustainable and environmentally sensitive and are backed up by appropriate environmental and scientific studies. In that context, national Hydrographic Offices, as the principal custodians of the authoritative national bathymetric data base and the IHO through its Data Centre for Digital Bathymetry and its co-governance of the IHO - IOC General Bathymetric Chart of the Oceans (GEBCO) project, have important roles that they can play.

The Conference was informed that a growing number of countries, many of them IHO Member States, either have or are planning to implement Marine Spatial Plans. This adds further weight to the need for those Hydrographic Offices that are not already a key part of their national

spatial data infrastructure to consider how they may be recognised and become more involved in supporting activities that go beyond charting and safety of navigation.

During a break in the Conference, key personnel from the Mauritius Hydrographic Unit met the President and discussed hydrographic progress in the country, including the recent establishment of an in-country inshore surveying capability, and the very successful capacity building efforts from both the IHO Capacity Building Programme and the continuing support from the Government of India through the Indian National Hydrographic Office which is deploying its ships regularly to conduct surveys in Mauritius and compiling nautical charts on behalf of the country.

- **Open Geospatial Consortium (OGC)**

The Open Geospatial Consortium (OGC) is a not-for-profit organization founded in 1994 comprising more than 500 industry, government and academic members dedicated to advancing interoperability among information technology systems that process geo-referenced information. The OGC is recognized as an observer organization to the IHO.

Noting the progressive increase in activities of common interest and in support of the aims of developing relations with other organizations whose activities are likely to be of interest the Secretariat identified the benefits of more formalised recognition of the cooperation between the IHO and the OGC. As a result, a Memorandum of Understanding (MoU) between both organizations was developed. Following the approval of IHO Member States the MoU was signed in December (see IHO CLs 37 and 53 of 2016).

The OGC was represented at the 8th meeting of the HSSC (see Task 2.1.1) and reported on the establishment of an OGC Marine Domain Working Group (DWG). The role of the group is to serve as a forum within OGC for marine data issues; to present, refine and focus interoperability-related issues to the OGC Technical Committee; and to serve where appropriate as a liaison to other industry, government, independent, research, and standards organizations active within the marine domain. It was agreed that liaison with the IHO would be primarily through the MSDIWG (see Element 3.9).

Element 1.2 Information Management

This element is particularly important since it underpins the communications, documentation, record keeping and coordination activities of the Secretariat of the IHO.

Task 1.2.1 Compile and publish documents that are not allocated to a specific IHO body

The Secretariat maintained and published various documents 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.*

In the case of P-5, P-7 and S-11 Part B, significant progress was made towards maintaining and deriving these documents from a database rather than by time-consuming manual compilation methods.

Task 1.2.2 Maintain and extend Admin IT infrastructure of the IHO Secretariat

The maintenance and development of the IT infrastructure is achieved through a combination of contract support arrangements, one dedicated member of staff and approximately a third of the time of an Assistant Director. Even so, resources are stretched to meet all the requirements.

The principal components of the IT infrastructure of the IHO Secretariat comprise a standard office desktop computer environment and a Microsoft SharePoint-based document library. In addition, a set of physical and virtual internal servers support the SharePoint-based document library, proxy services, network storage, e-mail services, accounting services, anti-virus services, backups, the Wi-Fi infrastructure, the Secretariat intranet and a Virtual Private

Network (VPN) to enable Directors and Assistant Directors to access the network of the Secretariat while travelling. The Secretariat also maintains external internet servers to host the IHO website, the IHO S-100 Registry Server, Web Mapping Services and various test-bed web servers.

Several improvements to the IT infrastructure were implemented in 2016. These include; upgrades to the e-mail server configuration, improvements to the SharePoint server infrastructure, extensions to the backup facilities, upgrades to workstations, and upgrades to the Windows and Microsoft Office environments. Due to the abrupt closure of the contractor providing external web hosting and contract support services, all relevant applications were transferred to a new service provider as an emergency in December. This caused some disruptions in the operation of the email services and the IHO website.

An on-line registration tool for IHO meetings was developed with the kind support of the Republic of Korea. Because of IT security issues, the initial version of the tool is self-contained, with no connection to the IHO Country Information System that supports the IHO Yearbook. The initial registration of the identity of applicants is validated by the IHO Secretariat. After this initial approval, legitimate applicants are able to register for further IHO meetings without having to re-enter their details. The tool was tested as part of registering participants for the 8th HSSC meeting and fully implemented for registering participants to the 1st Session of the IHO Assembly.

Task 1.2.3 Communication between the IHO Secretariat and Member States through Circular Letters

During the year, the Secretariat published 69 Circular Letters (CLs) in English, French and Spanish and four Finance Committee Circular Letters (FCCLs) were published in English and French. In addition, 24 Conference/Assembly Circular Letters were published in English, French and Spanish in preparation of the 1st Session of the IHO Assembly.

Task 1.2.4 Technical Library of the IHO Secretariat

The technical library of the Secretariat comprises 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.

Element 1.3 Public Relations

This element covers activities concerned with raising the profile of hydrography and of the work of the IHO.

Task 1.3.1 Maintain 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.

- **Diplomatic Missions**

President of the UNGA Thomson and Director Iptes examine an INT chart

HE Ambassador Peter Thomson, permanent representative of Fiji to the United Nations (UN), and current President of the UN General Assembly (UNGA) visited the IHO Secretariat on 21 November as part of his official visit to Monaco.

HE Peter Thomson was welcomed by Director Mustafa Iptes and received a briefing on the role of the IHO and its relationship with several UN bodies including the UN Committee of Experts on Global Geospatial Information Management (UN-GGIM), the IMO, the IOC and the ISA. Ambassador Thomson expressed his pleasure to visit the IHO headquarters and highlighted his particular interest in promoting interest in ocean affairs as the former President of the ISA Council and now the President of the UN General Assembly. He emphasized the importance of the forthcoming high-level United Nations Conference to support the implementation of Sustainable Development Goal 14: *Conserve and sustainably use the oceans, seas and marine resources for sustainable development,* which will be convened in New York, USA from 5 to 9 June 2017, coinciding with World Oceans Day. The IHO will be represented at that conference by Secretary-General Robert Ward.

HE Peter Thomson and Director Mustafa Iptes

- **Monacology 2016**

Hydrography was presented in *Monacology 2016* for the fourth year running, with an interactive display and stand. More than 400 pupils from local schools in Monaco and neighbouring France visited the IHO display and took part in activities guided by the Secretariat staff.

Monacology is an annual event for school children held in Monaco that aims to raise awareness about the environment and sustainable development. *Monacology 2016* took place from 13 to 17 June, directly below the headquarters of the IHO.

The underlying theme of *Monacology 2016* was "*Pollution caused by plastic bags and refuse*". The theme was illustrated on the IHO stand using dynamic presentations illustrating the main ocean gyres in which significant amounts of the world's ocean plastic pollution is now accumulating.

Director Iptes and other participants' representatives at the inauguration of Monacology 2016 honoured by the presence of HSH Prince Albert II of Monaco

One of the active schools wins a GEBCO globe

One of the "Junior Hydrographers"

Task 1.3.2 Compile and publish P-1 – International Hydrographic Review in collaboration with IHR editor

The International Hydrographic Review (IHR), published by the IHO, is the principal peer-reviewed journal that records significant developments in hydrography and associated subjects. Two editions of the Review were published during the year with the assistance of Mr Ian Halls, who carried out the role of editor under an ongoing contract arrangement. The Secretariat worked with the University of New Brunswick (UNB) in a project led by Dr David Wells to develop a digital repository of the complete library of the IHR. As a result, the first phase of the project has provided volumes from 1963 to 2015. They can be found at: https://journals.lib.unb.ca/index.php/ihr

Task 1.3.3 World Hydrography Day

The Secretariat provided briefing material for World Hydrography Day 2016 and published reports on the IHO website that described the celebrations that were conducted by Member States around the world.

World Hydrography Day was celebrated in Monaco in conjunction with the "Forum for Future Ocean Floor Mapping" organized by the IHO-IOC GEBCO Guiding Committee from 15 to 17 June (see Element 3.8).

Task 1.3.4 General public relations support

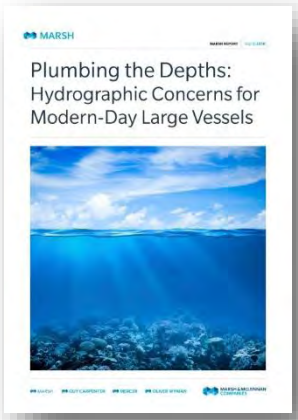
- **Compile and publish International Hydrographic Bulletin**

The Secretariat published the on-line version of the IHO Bulletin monthly. The Bulletin contained short articles on the IHO activities and representational events that involved the staff of the Secretariat of the IHO.

- **Industry Information Report by Marsh**

Marsh, a global leader in marine insurance broking and risk management, issued an industry information report In April, highlighting the inherent risks involved in operating ever larger ships in poorly surveyed waters - *Hydrographic Concerns for Modern-Day Large Vessels*.

The Marsh Report quoted President Robert Ward, and UK National Hydrographer Rear Admiral Tim Lowe, among others.



The Marsh Report noted that many of the world's charts continue to rely on older or inadequate data that may not be appropriate for the operation of ever-larger, modern vessels. The report also notes that the navigation of largest vessels in inadequately surveyed areas introduces potentially serious additional consequences for ship operators because the marine salvage industry may have difficulty in recovering the largest of stranded or grounded vessels. The report also draws attention to the operational risks involved in the polar regions, where the status of surveying is particularly limited.

The report goes on to encourage governments, mariners and ship operators to contribute to improving the world's charting coverage by investing in surveys and submitting reports and data to Hydrographic Offices and the IHO wherever possible.

The Marsh Report is available at: *https://www.marsh.com/uk/insights/research/hydrographic-concerns-plumbing-the-depths.html*.

Element 1.4 Work Programme & Budget, Strategic Plan and Performance Monitoring

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

Task 1.4.1 Implement and administer processes for programme management, performance monitoring and risk assessment, including the acquisition and operation of suitable business software tools

Member States attempted to reinforce Programme management performance monitoring through Decision No. 3 of the 5th Extraordinary International Hydrographic Conference

P-7

(EIHC-5) directing the Secretariat to collect and compile bi-annual reports from all the IHO and associated bodies. After a poor start in 2015, obtaining the necessary input from the various IHO bodies through the Committee structure improved in 2016 but still remained problematic, particularly obtaining reports from the Chairs of Regional Hydrographic Commissions (RHCs). Results for the first half of 2016 were reported to Member States by Circular Letter (see IHO CL 48/ 2016).

In order to avoid unnecessary duplications with the preparation of the reports to the 1st Session of the IHO Assembly by the end of 2016, no separate six-monthly reports were requested for the second semester of 2016.

Annex B reports on the status of performance indicators.

Task 1.4.2 Execute the IHO Work Programme and Budget approved by the 18th IHC, monitoring its progress and adopting the necessary adjustment according to the circumstances

The Work Programme and budget for 2016, based on the approved 5-year Work Programme and budget approved at the 18th International Hydrographic Conference in 2012, were drawn up and approved by Member States in December 2015 (see IHO CL 87/2015 rev1). Progress on the work items contained in the 2016 Work Programme has been reported individually in this report.

The finances of the organization were managed in accordance with the approved budget and work plan for 2016. A positive budget outcome of 280,796.25€ was declared at the end of the year. This included a budget implementation surplus of 241k€. The key reasons for achieving the positive results were the unanticipated payment of arrears and contributions by some Member States, lower than anticipated operational expenses and a better than anticipated return on investments. The full budget statement for 2016, recommendations and auditor's report are contained in Part 2 of this report.

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 2016 is shown in ***Annex C***.

Task 1.4.3 Conduct biennial IHO stakeholders' forums

A Stakeholders' forum was held in conjunction with the 7th meeting of the MSDIWG which took place in Tokyo, Japan in January (see Element 3.9).

Element 1.5 Management of the IHO Secretariat

This element concerns ensuring that the Secretariat is able to provide the range of secretarial and other services required by Member States and the relevant stakeholder organizations.

Task 1.5.1 Administration of the IHO Secretariat

- **Secretariat Staff**

On 31 May, after 37 years' service, Ms Barbara Williams retired from her position as Head of Registry in the IHO Secretariat. During her long career serving the IHO she saw the IHO offices move from their original site on the north side of Port Hercule to their current location. She served under seven Presidents from Rear Admiral G. S Ritchie to Robert Ward and saw 12 Directors serve their terms.

Ms Barbara Williams
with the then Directing Committee
of the International Hydrographic Bureau

Mr Jeff Wootton, the retiring Chair of the NCWG, joined the Secretariat in October as the Technical Standards Support Officer (TSSO). This significantly improved the ability of the Secretariat to support the implementation of S-100 - *Universal Hydrographic Data Model* and the successful implementation and use of IHO technical standards more generally. A principal function of the TSSO position is to undertake the role of S-100 Registry Manager and also to provide a help desk for all those seeking to use IHO technical standards.

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

Three officers were seconded to the Secretariat during 2016 under the terms of IHO Resolution 3/1987 as amended. Mr Yong Baek from the Korea Hydrographic and Oceanographic Agency replaced Mr Woong-Kyo Song in January. Dr Kentaro Kaneda from the Hydrographic and Oceanographic Department of the Japan Coast Guard and Captain Luis Hernandez Rubin from the Hydrographic Office of Peru continued their existing secondments. Captain Hernandez returned to Peru at the end of the year.

Mr Song and then Mr Baek were employed on a number of areas that included improvements to the maintenance of the GEBCO Gazetteer of Undersea Feature Names and the IHO INT chart catalogue through the INToGIS software solution developed by the Republic of Korea (see Task 3.6.4), processing and analysing incoming results from the IHO ECDIS Data Presentation and Performance Checks in ships, liaison for capacity building activities sponsored by the ROK. Mr Baek took a leading role in continuing the development of web-based capabilities, particularly a new S-100 registry and an on-line registration tool for IHO meetings.

Dr Kaneda continued to work on the geo-information databases and web-based functions that assist both the IHO Secretariat and the RHCs in fulfilling their roles and the IHO Country Information System that supports the production and maintenance of IHO Publication P-5 - *IHO Yearbook*.

Captain Hernandez continued his work on bringing the Spanish version of S-32 - *Hydrographic Dictionary* to the same status of revision as the English and French versions (see Task 2.11.2) and in translating a number of IHO publications into the Spanish language.

- **Staff training**

EXCEL training was provided to two administrative members of staff.

Task 1.5.2 Translation Service

The IHB 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 IHB 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.

The volume of this work was similar to previous years and the continued rise in the technical complexity of some of the translations meant there was little opportunity to make any significant progress in the backlog of active IHO publications that await translation into the French and Spanish languages other than the maintenance of those publications that have already been translated. Some translation was done under contract in order to meet deadlines and requirements.

Task 1.5.3 Engage contract support to provide one-off development or maintenance support beyond the resources or competence of the IHO Secretariat

Contract support was engaged to conduct an independent actuarial assessment of the liabilities of the Internal Retirement Fund and for translation of selected IHO texts in French and Spanish which could not be completed in house due to other translation priorities.

Task 1.5.4 Monitor and maintain the Staff Regulations and the Job Descriptions of the Secretariat Staff in step with the evolution of the IHO work programme and IHO requirements.

The revision of the IHO Staff Regulations was completed by the Secretariat in 2016 and endorsed by the Staff Regulations Working Group prior to adoption by the Member States (see IHO CL45/ 2016), after a lengthy and faltering process that began in 2007. The new edition of the Staff Regulations (Edition 8.0.0), which entered into force on 1 January 2017, now more closely follows the United Nations and the Monaco Civil Service as the benchmark organizations for the remuneration packages and conditions of service for the internationally recruited and the locally recruited members of staff, respectively.

Task 1.5.5 Maintain the premises of the IHO Secretariat as required as the occupant.

Renovation of the kitchen was carried out in 2016.

Element 1.6 International Hydrographic Conference / Assembly

Task 1.6.1 Organize IHC-19 / Assembly-1 in 2017

The preparations for the next meeting of the Member States either as a Conference or an Assembly progressed during the year according to the defined timetable (see Conference CL No. 1). The announcement in August of the approval of the revised Convention meant that the next meeting would be as an Assembly. Preparations for an Assembly, rather than a Conference continued thereafter (see Assembly CL No. 8).

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).

Element 2.1 Technical Programme Coordination

This element monitors technical developments and oversees the development of IHO technical standards, specifications and publications through the coordination and interaction of the relevant IHO working groups reporting to the HSSC. In 2016, 47 Member States, one Director and three Assistant Directors played an active role in this activity.

Task 2.1.1 Conduct annual meeting of HSSC

The eighth meeting of the HSSC (HSSC-8) was hosted by the IHO Secretariat in Monaco, from 15 to 18 November.

Opening of HSSC-8 by Robert Ward, Secretary-General of the IHO and Dr Mathias Jonas (Germany), Chair of the HSSC

The meeting was attended by 74 representatives from 22 Member States, nine international organizations accredited as observers and the IHO Secretariat.

The Committee reviewed the activities, proposals, and work plans of its subordinate bodies and the decisions of other organs and organizations affecting its work.

P-7

The minutes of HSSC-8 and all documents considered at the meeting and further information are available on the IHO web site at Home > Committees & WG > HSSC (see IHO CL 08/2017).

HSSC-8 participants

Task 2.1.2 Support the IHO Secretariat to implement the planning mechanism annually and at the end of each 5-year cycle

The entities under the governance of the HSSC provided their biannual reports as requested by the IHO Secretariat in accordance with Decision No. 3 of the EIHC-5 (see IHO CLs 14 and 48 of 2016).

At its 7th meeting in November 2015, the HSSC had agreed to delegate the preparation of the Committee's contribution to the preparation of the 1st Session of the IHO Assembly (A-1) to its Chair Group, composed of the Chairs of the HSSC subordinate bodies, the Chair, Vice-Chair, Secretary and Assistant Secretary of the HSSC.

A dedicated workshop of the Chair Group was hosted by the French Hydrographic Office of France (SHOM) in Paris/Saint-Mandé, France, on 1 and 2 June. It was attended by nine of the 13 members of the Chair Group. The members who were not able to participate had provided written inputs prior to the meeting.

Participants in the HSSC Chair Group Workshop

The workshop reviewed the current version of the IHO Strategic Plan and concluded that a full-scale revision was not required. Several proposed amendments related to the scope of the HSSC were developed. The main items for the subsequent cycle of the Committee's work programme were identified and the associated performance indicators were agreed.

P-7

At the request of the Chairs of the HSSC Working Groups, the adequacy of IHO Resolution 2/2007 - *Principles and procedures for making changes to IHO technical standards and specifications* was also considered. The members of the workshop did not identify any compelling evidence that a revision of the Resolution would improve the efficiency of the existing procedures and agreed to take no further action on this issue.

The development of the draft work programme was progressed subsequently for further consideration at HSSC-8.

HSSC-8 endorsed the input from the Chair Group related to the revision of the IHO Strategic Plan and the preparation of the draft 3-year Work Programme of the IHO for 2018-2020 for the consideration of the IHO Assembly in 2017.

Task 2.1.3 Provide technical advice and guidance on IHO technical standards, specifications and publications

The main activities under this task dealt with the promotion of S-100 - *IHO Universal Hydrographic Data Model* and the implementation of the revised set of standards related to Electronic Navigational Charts (ENC) and ECDIS. They are reported under the relevant tasks. The IHO Secretariat responded also to a number of routine enquiries on other IHO technical publications, in particular S-63 - *IHO Data Protection Scheme*.

Element 2.2 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. In 2016, 33 Member States and 30 Expert Contributors participated in this activity.

Task 2.2.1 Conduct meetings of S-100 and ENC Standards Maintenance Working Groups

The Japan Hydrographic and Oceanographic Department (JHOD) hosted concurrent meetings of the S-100, ENC Standards Maintenance and Data Protection Scheme Working Groups (WG) in Tokyo, Japan from 14 to 18 March. The meeting schedule included joint sessions to discuss items of mutual interest, as well as separate sessions for items pertaining to each group. Sixty participants from 18 Member States, 15 stakeholder organizations, and one academic institution attended the meetings.

Participants in the joint meetings of the S-100WG, ENCWG and DPSWG

Task 2.2.2 Maintain and extend the relevant IHO standards, specifications and publications, using contract support assistance as appropriate

Work continued on the development of S-100 and S-101 - *ENC Product Specification*. The draft new edition 3.0.0 of S-100 was finalized and endorsed by the HSSC. The changes included in the draft new edition are meant to facilitate the development of S-100-based product specifications. The major extensions include:

P-7

- the addition of Hierarchical Data Format (HDF) as an encoding format to support product specifications that use gridded data such as S-102 - *Bathymetric Surface* and S-111 - *Surface Currents*. This improves standardization, by moving the encoding to the S-100 level rather than having the product specifications define the encoding.

- the addition of Scalable Vector Graphics (SVG) as a profile to define symbols that will be registered in the portrayal register and utilized in the portrayal of products.

- the development of the Portrayal Register Model defining how the Portrayal Register should be constructed.

In accordance with IHO Resolution 2/2007 as amended the first version of the draft was circulated for a stakeholder review before submitting the final draft to the HSSC.

The S-100WG recognized the need to develop an S-100 Interoperability Specification to describe how different S-100 based products interoperate within a single system such as an ECDIS. The specification will be incorporated into the S-100 test bed for further refinement in conjunction with the completion of S-101. The initial draft was jointly developed by IIC Technologies and C-Map, under contract to the US-NOAA. It was reviewed at the 4th S-100 Test Strategy Meeting which was hosted by the Hydrographic Office of Germany in Rostock, from 13 to 16 September. The meeting discussed issues relating to S-100 portrayal and the language used for encoding conditional symbolization procedures and reviewed the progress of the S-100 test bed projects under development. The implementation of the S-100/S-101 test strategy and test bed continued with the on-going development of preliminary production tools and simple S-100 viewers.

S-101 progress was slow. Much of this was due to waiting for the S-100 infrastructure to be updated for use (see Task 2.2.4). The major components of S-101 and their status were as follows at the end of the reporting period:

S-101 Component	Current Status	Comment
Main Document	Testing baseline	• Sent out for stakeholder review in September 2014 and final comments incorporated into the testing baseline. • New Items have been registered in the GI Registry. • Changes to the DCEG will undergo a controlled proposal process in order to manage change effectively.
Data Classification and Encoding Guide (DCEG)	Baselined – June 2016	
8211 Annex	Testing baseline	
Feature Catalogue	Testing baseline	• Awaiting the Feature Catalogue Builder connection to the GI Registry to create a new version that contains the new DCEG items.

P-7

S-101 Component	Current Status	Comment
Portrayal Catalogue	Partial baseline	• Caris has created a partial portrayal catalogue using the elements from S-52 in the S-100 format. • There is still more work to be done once the S-100 Register is operational. • NOAA has funded work on baselining the S-52 conditional symbology procedures (CSPs) into XSLT 1.0 that will be part of the Portrayal Catalogue.
Implementation Guidance	In progress	Will continue to be refined during the S-101 test bed process.
Validation Checks	In progress	

Work continued on revising S-102 - *Bathymetric Surface Product Specification*. It was agreed to limit the scope to navigation applications but product portrayal has been taking longer than expected, delaying the submission of the draft new edition to HSSC until 2017.

The S-121 Project Team (PT) tasked with the development of an S-100 conformant product specification for maritime limits and boundaries held its first meeting at the offices of the United Nations Division for Ocean Affairs and the Law of the Sea (UN DOALOS), in New York, USA from 5 to 9 December. The meeting considered the specific implementation requirements of the Member States and the UN Secretariat to help frame the content of the standard. The meeting reviewed the feature, attributes and code-list requirements and data formats and discussed the additional work required.

A sub-group of the ENCWG comprising representatives from several Expert Contributors met at the Secretariat from 8 to 10 February in order to review implementation issues identified with Edition 4.0.1 of IHO Publication S-52 Annex A - *IHO Presentation Library for ECDIS* and inconsistencies that had been identified in Edition 3.0.1 of IHO Publication S-64 - *IHO Test Data Sets for ECDIS*. All the required amendments were assessed as *clarifications* and the drafting of the relevant text was undertaken for further consideration in view of their approval at the next ENCWG meeting in 2017.

Draft revised editions of S-58 - *ENC validation checks*, S-65 - *ENCs: Production, Maintenance and Distribution Guidance* and S-66 - *Facts about Electronic Charts and Carriage Requirements* were prepared by the ENCWG. The HSSC endorsed the principles of the revised editions and tasked the working group to finalize the drafts and forward them to the IHO Secretariat for subsequent consideration by IHO Member States in 2017. The Committee also endorsed the ENCWG proposal to use ECDIS Chart 1 to assist mariners in checking ECDIS operating with Edition 4.0 of the IHO S-52 *Presentation Library*. The IHO Secretariat included the procedure in a new edition of the page of the IHO web site on "*ECDIS Data Presentation and Performance Check in Ships*". At the request of the HSSC, the Secretariat invited HOs to liaise with their national maritime administration and provide feedback on port State Control (PSC) issues related to the carriage and operation of ECDIS, for further consideration by the ENCWG if and as appropriate (see IHO CL 67/2016).

The HSSC tasked the ENCWG to explore existing and possible options that could meet user requirements related to the provision of high resolution bathymetry in ENCs.

Task 2.2.3 Develop and maintain as-yet undefined S-100-based Product Specifications

The Under Keel Clearance Management Information Project Team (UKCM PT) held its first meeting in September in Singapore to scope out the primary requirements of the S-100-based product specification for the display of UKCM information. The project team determined that the product specification should focus on the primary outputs produced by shore based UKCM service providers. These outputs are:

- a time-based layer indicating calculated go/no-go areas, and
- critical UKCM waypoints and their associated tidal windows.

The project team agreed that discovery information about the location and operation of UKCM services should be included in appropriate nautical publications and within relevant ENCs. This would enable information about UKCM services to be brought to mariners' attention when preparing berth to berth passage plans. Work to prepare a draft product specification continued by correspondence.

HSSC-8 assigned the identifier S-129 to the product specification.

Task 2.2.4 Maintain and extend S-100 Registry

The S-100 Registry underpins the entire S-100 infrastructure and continues to be the highest priority item for the S-100WG as it has a direct effect on the functionality of the S-100 Feature Catalogue Builder and the S-100 Portrayal Catalogue Builder. The work undertaken in 2015 to upgrade the interfaces and functionality of the Registry continued mainly through the support provided by the Republic of Korea. The efforts focused on the Feature Concept Dictionaries so that the wider S-100 user community can begin to propose new items in support of their product specifications. Work on the major interfaces was completed in September after two live trials (Feb to Mar, Aug to Sep). The new version of the Registry has been operational since October. In late 2016, the Feature Catalogue Builder was connected to the Registry, thus enabling the testing process of the S-100 Portrayal Catalogue Builder and conformant S-100 portrayal catalogues to be built for testing.

Mr Jeff Wootton from Australia, previously the Chair of the Nautical Cartography Working Group (NCWG), was selected by the Directing Committee for the new position of Technical Standards Support Officer in the Secretariat. He joined the Staff of the Secretariat on 1 October and took over the function of S-100 Registry Manager (see IHO CL 23/2016).

Task 2.2.5 Provide outreach and technical assistance regarding transfer standards

The role of the IHO S-100 infrastructure as an underpinning e-Navigation data exchange framework standard for e-Navigation was presented at the 6th E-navigation Underway International Conference which was organized in the Baltic Sea ferry *Pearl Seaways* from 2 to 4 February by the Danish Maritime Authority and IALA (see Task 1.1.8).

The contribution of S-100 based product specifications to the implementation of the concept of Maritime Service Portfolios in support of e-Navigation was also highlighted through

presentations at an IALA workshop on shore-based maritime services which was co-hosted by the Norwegian Coastal Administration and the Portuguese Lighthouse Authority in Lisbon, Portugal from 24 to 26 May (see Task 1.1.8).

Element 2.3 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. In 2016, 29 Member States and three Expert Contributors participated in this activity.

Task 2.3.1 Conduct meetings of Nautical Cartography Working Group

The second meeting of the IHO Nautical Cartography Working Group (NCWG) took place at the IHO Secretariat in Monaco from 26 to 29 April. 23 delegates from 19 Member States and two Expert Contributors attended the meeting. The plenary meeting was followed by a meeting of the correspondence group on the future of the paper chart that had been identified by HSSC-7 as a high priority work item.

NCWG-2 gather on the rooftop of the IHO Headquarters

The NCWG is now well established and working under its Terms of Reference that were approved at HSSC-7 in November 2015. The Working Group, which combines elements of disbanded working groups that separately covered data portrayal on paper charts and electronic charts, is much more focused on the chart content itself and the portrayal requirements than on the sole maintenance of IHO Publication S-4 - *Regulations for the International (INT) Charts and Charts Specifications of the IHO* – even though the consideration of clarifications or revisions to S-4 remains relevant for assisting cartographers in their day-to-day work.

Following the retirement in March 2016 of Mr Nick Webb (United Kingdom), Mr Mikko Hovi (Finland) was elected as Vice-Chair. Following the retirement in September 2016 of the Chair, Mr Jeff Wootton (Australia), Mr Hovi assumed the position of Chair of the Working Group. The position of Vice-Chair was still vacant at the end of the reporting period.

Task 2.3.2 Maintain and extend the relevant IHO standards, specifications and publications, using contract support assistance as appropriate

The NCWG continued to maintain IHO Publication S-4, as directed by its programme of work and in accordance with section B-160 of S-4. HSSC-8 endorsed the changes to Edition 4.6.0 of S-4 proposed by the NCWG and tasked the Working Group to finalize the draft revision 4.7.0 and forward it to the IHO Secretariat for circulation to IHO Member States in 2017.

Edition 6 of the French version of INT 1 - *Symbols, Abbreviations and Terms used on Charts* was published by the Hydrographic Office of France.

The NCWG considered the first tranche of portrayal requirements for S-100-based product specifications (weather overlays, S-101 ENC, marine protected areas, quality of bathymetric data / category of zones of confidence [CATZOC] …) received from other working groups, following a proposal agreed at the HSSC-7 to trial an all-encompassing process that involves all relevant IHO working groups and other stakeholders (industry, academia). In that context, it was agreed to set up a small portrayal sub-working group to establish a protocol to assist developers of S-100-based product specifications in drafting portrayal submissions. The establishment of an integrated project team drawing on the different working groups to address portrayal issues in the development of S-101 was also discussed.

The NCWG continued work on the preparation of a draft new edition 3.0.0 of IHO Publication S-11 - Part A - *Guidance for the Preparation and Maintenance of International Chart and ENC Schemes* in accordance with the instructions given by HSSC-7. A revised text was submitted to HSSC-8. The Committee agreed to move the Annexes A (printer nations) and B (format) to S-11 - Part B - *INTernational Chart Web Catalogue* and to publish separate English and French versions of S-11 Part A rather than a bilingual document. The NCWG was tasked to finalize the proposed new Edition 3.0.0 and forward it to the IHO Secretariat for circulation to IHO Member States in 2017.

The web-based IHO Publication S-11 - Part B was kept up-to-date through the regional INT coordinators (see Task 3.6.4).

Element 2.4 Digital Data Protection and Authentication

This element addresses the developments related to data protection and data authentication, the maintenance of the relevant IHO standards, specifications and publications, and the provision of technical advice as appropriate. In 2016, six Member States and 12 Expert Contributors participated in this activity.

Task 2.4.1 Conduct meetings of Data Protection Scheme Working Group

The 11th meeting of the Data Protection Scheme Working Group (DPSWG) took place in Tokyo, Japan on 15 March, in conjunction with the meetings of the S-100WG and ENCWG (see Task 2.2.1).

Task 2.4.2 Maintain and extend the relevant IHO standards, specifications and publications

The DPSWG further developed the draft new edition of IHO Publication S-63 - *IHO Data Protection Scheme* for use with S-100 based product specifications. In this process, it appeared that it would be more efficient to incorporate a large proportion of the content of S-63 into a new part of the S-100 standard. The proposal was endorsed by the S-100WG and agreed at HSSC-8.

As a consequence, HSSC-8 decided to disband the DPSWG and to continue the development of the protection scheme of S-100 based-products as well as the monitoring of cyber security

requirements through a project team under the S-100WG. The expertise required to support the Secretariat as Scheme Administrator for the existing S-63 was transferred to the ENCWG.

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. 13 new OEMs were accepted in 2016. At the end of the year there were 49 Data Servers and 294 OEMs licensed to use the S-63 scheme.

Element 2.5 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. In 2016, 11 Member States and two Expert Contributors participated in this activity.

Task 2.5.1 Conduct meetings of Data Quality Working Group

The 11th meeting of the Data Quality Working Group (DQWG) was hosted from 10 to 12 May 2016 in Arlington, Virginia, USA, by the National Oceanic and Atmospheric Administration (NOAA) at a venue made available by the Radio Technical Commission for Maritime Services (RTCM). Nine delegates from seven Member States and one Expert Contributor attended the meeting.

Participants in the DQWG-11 meeting, Arlington, USA

The meeting conducted a comprehensive review of the work items and priorities of the DQWG work programme, focusing on the milestones and the ways and means to deliver expected outputs in a relatively short timeframe. This review was intended to assist in reconsidering the role of the DQWG and the continuation of its activities. It was agreed that the DQWG should focus on delivering the data quality elements of S-101 and once this had been achieved, an evaluation of its remaining tasks could be completed at its next session, prior to the HSSC-9 meeting in 2017.

Task 2.5.2 Maintain and extend the relevant IHO standards, specifications and publications

The DQWG completed the data quality model and the decision tree for designating the quality of bathymetric data in S-101. Considering the effort that would be required of Hydrographic

Offices to implement a new scheme, the group decided to recommend retaining the current CATZOC threshold values for data quality. As a consequence, the transition from S-57 to S-101, as far as the quality of bathymetric data is concerned, should be more easily implemented and automated.

In addition, the DQWG developed guidance on assessing respectively temporal variations of the seafloor and overlapping depth-related features, such as for areas of mobile seafloor above which a safe clearance depth may exist. The working group provided input to the development of guidance on crowd-sourced bathymetry. Feedback was also provided to the NIPWG on data modelling and portrayal related to uncertain ("fuzzy") areas.

As instructed by the HSSC, the DQWG considered the concept of data supply chain certification. The group endorsed the overall importance of end-to-end data integrity, from the data source to the end-user, but did not reach a consensus on the role of the IHO.

Another work item of the DQWG was to investigate ways to improve mariners' understanding about data quality. The task has not been completed yet due to lack of resources and is on-going. At HSSC-8, the representatives of the stakeholders highlighted the pressing requirement for all IHO Member States that produce ENCs to populate them with assessed CATZOC values (1 to 5) to assist mariners in their decision-making process for safe navigation.

Element 2.6 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. In 2016, 20 Member States and 13 Expert Contributors participated in this activity.

Task 2.6.1 Conduct meetings of Nautical Information Provision Working Group

The Nautical Information Provision Working Group (NIPWG) met twice in 2016. The 2nd NIPWG meeting took place at the IHO Secretariat in Monaco, from 21 to 24 March with 27 delegates from 14 Member States and eight stakeholder organizations in attendance. The 3rd Meeting was hosted by the Hydrographic Office of the Republic of Korea from 5 to 9 December and attracted 31 delegates from 13 Member States and four stakeholder organizations.

Task 2.6.2 Develop, maintain and extend S-10n - Nautical Information Product Specifications

The NIPWG continued the development of S-100 based product specifications assigned to the Working Group. It was agreed to put on hold and benchmark S-126 (*Physical Environment*) with existing features of physical characteristics of other product specifications such as S-111 (*Surface Currents*), S-411 (*Ice Information*) and S-412 (*Weather Overlay*) which are developing at a faster pace. It was also decided to speed up the finalization of S-122 (*Marine Protected Areas*) and S-123 (*Radio Services*) product specifications through out-sourcing, due to the lack of resources and expertise available in the group since some expert contributors from industry had been obliged to step down.

As a contribution to the test strategy for S-100 based products, the NIPWG decided to develop and maintain a matrix of interoperability issues based on the results of test beds and experimentations such as the sea trial of S-101, S-124 (*Navigational Warnings*), S-111 and S-412 conducted by the Republic of Korea in October 2016.

Task 2.6.3 Maintain and extend the relevant IHO standards, specifications and publications

The NIPWG also started to review the IHO Resolutions promulgated in IHO Publication M-3 that are under its remit. Noting the vital importance of submarine cables, a proposal to amend

IHO Resolution 4/1967 (*Submarine Cables*) was developed through the effective relationship established by NIPWG with the representative of the International Cable Protection Committee (ICPC) and was submitted by Germany, as Chair of both the NIPWG and the HSSC, for the consideration of the 1st Session of the IHO Assembly (see ACL 10 bis-3).

Element 2.7 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. In 2016, 34 Member States and four Expert Contributors participated in this activity.

Task 2.7.1 Conduct meetings of the Tides, Water Level and Currents Working Group

TWCWG1 participants visit the tide station located in Ilha Fiscal, Rio de Janeiro, Brazil

The Tides, Water Level and Currents Working Group (TWCWG) formed in 2015 had inherited the work previously undertaken by the Tides and Water Levels Working Group and the Surface Current Working Group. The Working Group held its 1st meeting in its new format at the Directorate of the *Centro de Hidrografia da Marinha - Marinha do Brasil* (CHM), Niterói, Brazil from 25 to 29 April. The meeting was attended by 25 delegates from 13 Member States and three stakeholder organizations.

Task 2.7.2 Maintain and extend the relevant IHO standards, specifications and publications

The proposed revision of IHO Resolution 3/1919 as amended - *Datums and Bench Marks* recommended by the IHO Tides, Water Level and Currents Working Group (TWCWG) and endorsed by HSSC-7 was circulated for the consideration of IHO Member States (see IHO CL 27/2016). The comments received required a comprehensive review by the Chair and the Vice-Chair of the Working Group in liaison with the Secretariat. As agreed at HSSC-8, the final revised text will be issued in early 2017.

The inventory of tide gauges and current meters operated by Member States was updated in May. Due to the increased use of Vertical Reference Frame datums based on the Global Navigation Satellite System (GNSS) for the reduction of soundings, the TWCWG agreed to create a repository in the TWCWG section of the IHO website where details of these datums will be posted when available.

Task 2.7.3 Develop, maintain and extend a Product Specification for digital tide tables

Further progress was made on a standard for digital tide tables with the refinement of the list of fundamental attributes generated by the USA.

Task 2.7.4 Develop, maintain and extend a Product Specification for the transmission of real-time tidal data

Work continued to refine the first draft of S-112. Following further consideration of the scope of the product specification, HSSC-8 approved the proposal of the Working Group to revise the name of S-112 from “Dynamic Water Level Data” to “Dynamic Water Level Data Transfer”.

Task 2.7.5 Develop, maintain and extend a Product Specification for dynamic tides in ECDIS

The continuing development of S-104 focused on the need to review attributes against the revised edition of ISO 19115 - *Geographic information - Metadata* and on portrayal issues. HSSC-8 approved the proposal of the Working Group to revise the name of S-104 from "Tidal Information for Surface Navigation" to "Water Level Information for Surface Navigation".

Element 2.8 Digital Data Updating

This element addresses developments in standardized processes for the updating of digital hydrographic data products, the maintenance of the relevant IHO standards, specifications and publications, and the provision of technical advice as appropriate.

Task 2.8.1 Maintain and extend the relevant IHO standards, specifications and publications

At HSSC-8, a submission from the International Association of Independent Tanker Owners (INTERTANKO) reported that its members were facing great difficulties in recognising what information issued through Temporary (T) and Preliminary (P) Notices to Mariners was or was not included in ENC updates. The Committee tasked the ENCWG to consider further improvement of the relevant guidance (Clause 2.6.2 of S-57, Appendix B.1, Annex A - *Use of the Object Catalogue for ENC*) and to draft, in liaison with the NCWG, a consolidated, authoritative IHO document addressing the issue of "equivalent" T&Ps for ENCs, with the intention of distributing the completed document to Hydrographic Offices, port State Control authorities and mariners. The document will also take into account the comments received from Member States.

Element 2.10 Hydrographic Data Acquisition and Processing

This element addresses the developments related to hydrographic data acquisition and processing, the maintenance of the relevant IHO publications, and the provision of technical advice as appropriate.

The Hydrographic Surveys Scoping Project Team (H2SPT) that was established by HSSC-7 conducted its work by correspondence and reported to HSSC-8. 18 Member States and six Expert Contributors participated in this activity. The Committee decided to establish a Project Team on Standards for Hydrographic Surveys (HS PT), primarily tasked to review IHO Publication S-44 - *IHO Standards for Hydrographic Surveys*, draft a new edition, if appropriate, and identify additional tasks, if any, that might require the establishment of a standing Hydrographic Surveys Working Group (see IHO CL 68/2016).

Element 2.11 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. In 2016, seven Member States, and one Expert Contributor were registered as participants in this activity. However, the active participation of the declared representatives of the Member States, with the exception of the Chair of the Hydrographic Dictionary Working Group (HDWG) and the Project Officer seconded to the Secretariat by Peru, remained minimal.

Task 2.11.1 Maintain and extend the IHO Hydrographic Dictionary in English, French and Spanish.

This task did not progress in 2016.

Task 2.11.2 Develop the Spanish language Wiki version of S-32 with commercial contract support

The investigation of existing options for on-line multilingual glossaries undertaken in 2015 led to the development of a draft policy for the maintenance of the Hydrographic Dictionary and to the proposal to develop an experimental multi-lingual wiki-based demonstrator to support a subsequent upgrade of S-32. HSSC-8 endorsed the development of the demonstrator through contractor support and invited the Chair of the HDWG to develop further the draft policy and complement it with an implementation roadmap, compatible with the resources available and taking into account the S-100 framework with regard to the location of authoritative definitions.

Element 2.12 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. The Advisory Board on the Law of the Sea (ABLOS) is a joint body of the IHO and the International Association of Geodesy (IAG). It comprises four representatives from IHO Member States and four representatives from the IAG. Four observers from IHO Member States and two Expert Contributors were also involved in the activities of the Board during the year.

Task 2.12.1 Organize and prepare ABLOS annual business meeting

The 23rd Business Meeting of ABLOS was held in Seoul, Republic of Korea on 26 and 27 October. All ABLOS members and eight observers attended the meeting.

The meeting discussed notable topics from the various conferences, seminars and workshops that the participants had attended since the previous Business Meeting. The meeting also discussed the material for the ABLOS capacity building training course and reviewed ways to develop it further.

The meeting reviewed the Terms of Reference and Rules of Procedure of the Board, as a catalyst for in-depth discussions on the future of ABLOS and its role.

The ABLOS meeting was followed by a seminar titled “Roles of the Law of the Sea and the Hydrography in Asian Region” on 28 October.

The seminar was attended by approximately 45 delegates from across the region, including China and Japan as well as representatives from France and Qatar and a wide selection of government ministries, technical authorities and universities from the Republic of Korea.

P-7

Task 2.12.2 Organize and prepare the biennial ABLOS Conference

The ABLOS meeting began preparations for the 9th ABLOS Conference, which was planned to be held in Monaco on 10 and 11 October 2017 under the title "*UNCLOS: Pushing the Limits of UNCLOS*".

Task 2.12.3 Contribute to the revision of IHO Publication C-51- TALOS Manual

The ABLOS progressed the revisions of Chapter 3 of Edition 5.0.0 of IHO Publication C-51 - *A Manual on Technical Aspects of the United Nations Convention on the Law of the Sea* (TALOS Manual).

Element 2.13 Surface Currents

This element addresses the development of standards for the delivery and presentation of navigationally significant surface current information. This element has been taken up by the TWCWG in conjunction with element 2.7.

Task 2.13.2 Maintain and extend the relevant IHO standards, specifications and publications

The refinement of the draft S-111 - *Surface Current Product Specification* was continued. Test datasets were produced to assist the development of the feature catalogue and portrayal catalogue.

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), capacity building (CB), and education and training. IHO Work Programme 3 is implemented under the principal responsibility of the Inter-Regional Coordination Committee (IRCC).

Element 3.0 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 amongst States on a regional basis, and between regions; establish cooperation to enhance the delivery of capacity building programmes; monitor the work of specified 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.

Task 3.0.1 Conduct annual meeting of IRCC

The eighth meeting of the Inter-Regional Coordination Committee (IRCC8) was held in Abu Dhabi, United Arab Emirates (UAE), from 29 to 31 May, hosted by the General Headquarters (GHQ) Armed Forces, Military Survey Department of the UAE. The meeting was attended by the Chairs, or their representatives, of the 15 Regional Hydrographic Commissions (RHCs) and the IRCC subordinate bodies (except the FIG-IHO-ICA International Board on Standards of Competence (IBSC)) and 20 observers. A total of 41 participants were present. The meeting was chaired by Dr Parry Oei (Singapore). The IHO Secretariat was represented by President Robert Ward, who also attended as Chair of the IHO Hydrographic Commission on Antarctica, Director Mustafa Iptes (IRCC Secretary) and Assistant Director Alberto Costa Neves.

The IRCC reviewed the reports and activities of the RHCs and its subordinate bodies, proposed amended Terms of Reference for Member States' consideration and approval, and considered the need to have a better communication strategy in order to promote the success stories of the IHO. The meeting was informed of the developments in Electronic Navigational Charts (ENC) for the leisure market and the requirement for authoritative and standardised chart products for Electronic Chart Systems (ECS) on ships that are not subject to the ECDIS carriage requirements of SOLAS (International Convention for the Safety of Life at Sea) so as to support national maritime administrations. The meeting noted the increasing level of capacity building activities in West Africa under the effective leadership of Morocco and with a key contribution from France. The Committee also noted the high level of engagement and capacity building in the South-West Pacific; a good example being the support provided to Fiji by South West Pacific Hydrographic Commission (SWPHC) Members and regional bodies following Tropical Cyclone *Winston*.

Participants to the IRCC8 meeting

With respect to the Arctic Regional Hydrographic Commission, the meeting noted the development of the Arctic Voyage Planning Guides, the efforts to resolve ENC overlaps and the project to develop an Arctic Marine Spatial Data Infrastructure (MSDI) in coordination with other organizations, and the engagement with stakeholders in relation to crowd-sourced bathymetry, satellite-derived bathymetry and hydrographic risk assessment.

The Committee was informed about the approval of the SafetyNET and NAVTEX Manuals by the International Maritime Organization following the new review process endorsed at IRCC7 and subsequently approved by the IHO Member States. Noting the increased cooperation between NAVAREA and METAREA Coordinators, the Committee acknowledged the need for more engagement of Member States, National MSI Coordinators and Observers in matters related to the World-Wide Navigational Warning Service.

The meeting welcomed the development of new CB Procedures, including one to assess and monitor the CB phases in coastal States, and the continued support from the Republic of Korea and from the Nippon Foundation of Japan to the CB Fund.

The meeting noted with concern several issues related to ENC coverage. Little progress has been made to resolve existing ENC overlaps, some of the top 2,000 ports still lack adequate ENC coverage and some ENCs are not available through nor distributed through the RENC distribution system. Difficulties in providing ENC updates at the same frequency as the equivalent paper chart updates were also discussed. The meeting observed that progress in improving coverage is now largely dependent upon new surveys being conducted in those areas where the existing data is insufficient to support the production of ENCs. The Committee agreed guidance on the conditions under which Marine Information Overlays (MIO) could be issued to assist in drawing attention to any differences between a published paper chart and a corresponding ENC or to assist in displaying Temporary &Preliminary Notices to Mariners on ECDIS.

The Committee was informed about progress in updating IHO Publication C-17 *Spatial Data Infrastructures: "The Marine Dimension" - Guidance for Hydrographic Offices*. The Committee also noted the progress of the work of the Crowd-Sourced Bathymetry Working Group and its preparation of a guidance document on Crowd-Sourced Bathymetry.

The Committee endorsed the draft new edition 1.0.0 of IHO Publication S-5A *Standards of Competence for Category "A" Hydrographic Surveyors* to be circulated to Member States for consideration and approval, and approved the work plan for the development and adoption of the draft new editions 1.0.0 of the IHO Publications S-8B *Standards of Competence for Category "B" Nautical Cartographers* and S-8A *Standards of Competence for Category "A" Nautical Cartographers*. The meeting commended the work done by the IBSC with respect to the review of an increasing number of course submissions and the revision of the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers.

The meeting noted the work done by the GEBCO Guiding Committee and its subordinate bodies, especially the evolution of the GEBCO grids, the incorporation of shallow water bathymetry in the GEBCO dataset, the current status of the digitization of all the GEBCO chart series since its inception with the support of Italy and Japan, and the organization of the Forum for the Future of Ocean Floor Mapping (F-FOFM).

The meeting discussed the revision of the IHO Strategic Plan and agreed on the need to implement a more pragmatic performance monitoring system. The meeting acknowledged also the need to raise awareness of the role of hydrography and the importance of improving knowledge of the seas and oceans in support of the relevant Goals in the UN 2030 Sustainable Development Agenda and disaster risk reduction.

The next meeting of the IRCC was set to take place in Paramaribo, Suriname from 12 to 14 June 2017.

Element 3.1 Co-operation with Member States and attendance at relevant meetings

The objective of this element 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 of the Work Programme 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.

Task 3.1.1 Arctic Regional Hydrographic Commission

The 6th Conference of the Arctic Regional Hydrographic Commission (ARHC) was held in Iqaluit, Nunavut, Canada on 3 and 6 October, on either side of the *Ocean Innovation 2016* Conference that took place on 4 and 5 October. The *Ocean Innovation* Conference is the premier Canadian oceans conference.

22 participants representing four of the five ARHC Members (Canada, Denmark, Norway, and the USA), two Observer States (Finland and Iceland) and one Observer from the Department of Indigenous and Northern Affairs Canada. The Russian Federation was unable to be represented at the Conference but provided written inputs that were taken into account or noted. The Conference was chaired by Mr Denis Hains, Director General of the Canadian Hydrographic Service and Hydrographer-General of Canada. Assistant Director Yves Guillam represented the IHO Secretariat

The Statutes of the ARHC were amended to align with the terminology and conditions set out in the new IHO basic documents that were due to enter in to force in November, and the Russian Federation was designated to be the first to occupy the seat allocated to the ARHC when the IHO Council is established at the IHO Assembly in April 2017.

All participants reported on their activities in the Arctic region and the challenges that they faced. In particular, the delegation from Denmark reported on the additional challenges in Greenlandic waters resulting from the reorganization of the Danish Geodata Agency. It was agreed by Canada and Norway to discuss further the scope and management of the Arctic International Charting Coordination Working Group so that ENC and INT chart coverage and maintenance issues can be considered together. The Conference agreed to establish the Arctic Regional Marine Spatial Data Infrastructure Working Group (ARMSDIWG), the Terms of Reference of which were approved.

Denmark was elevated from the position of Vice-Chair to take over the Chair at the end of the meeting.

Task 3.1.2 Baltic Sea Hydrographic Commission

The 21st Conference of the Baltic Sea Hydrographic Commission (BSHC21) was held in Klaipeda, Lithuania, from 27 to 29 September, under the Chairmanship of Mr Leonid Shalnov (Russian Federation). All full members of the Commission (Denmark, Estonia, Finland, Germany, Latvia, Poland, Sweden and the Russian Federation) and associate member Lithuania were represented at the Conference. The United Kingdom and the United States of America were also represented at the Conference as Observers. The IHO Secretariat was represented by Director Mustafa IPTES.

BSHC21 covered a wide range of regional topics including reports on 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 MSI activities since the 20th meeting. They also reported on new developments with regard to surveying, chart production and maritime traffic management. Director Iptes reported on the IHO Work Programme and the Organization's activities during the previous year. He also provided the Commission with general information on the next IHO Assembly and the revised structure of the IHO.

Participants to the BSHC21 meeting

The Commission reviewed on-going regional initiatives in particular the activities of the Monitoring Re-survey Working Group (MWG), Baltic Sea Bathymetric Database Working Group (BSBDWG), Baltic Sea Marine Spatial Data Information Working Group (BSMSDIWG) and the Chart Datum Working Group (CDWG). The Commission considered the outcome of the 8th meeting of the IRCC and the 6th meeting of the World Wide ENC Database Working Group (WENDWG).

The Member States reviewed the Statutes of the BSHC and agreed on amendments proposed by Sweden in relation to the preparation of BSHC conferences. Considering that the IHO Council will be established at the 1st Assembly of the IHO in 2017, the members of the BSHC discussed the possible options for designating the Member(s) that will occupy the seat(s) on the IHO Council allocated to the Commission and agreed on the procedures that they would follow.

At the end of the meeting, Mr Mindaugas Cesnauskis, (Lithuania) was elected as the new Chair of the BSHC. Considering that Lithuania is not a member of the IHO, it was agreed by the Commission that Dr Mathias Jones (Germany), as Vice Chair, will deal with IHO related issues on behalf of the Chair. It was also agreed that the next meeting of the BSHC will be hosted in Rostock by Germany in September 2017.

P-7

Task 3.1.3 East Asia Hydrographic Commission

The 3rd meeting of the Steering Committee of the East Asia Hydrographic Commission (EAHC) was held in Surakarta, Indonesia from 24 to 26 February, hosted by Dinas Hidro-Oseanografi TNI AL (DISHIDROS), the Navy Hydro-Oceanographic Office of Indonesia, and chaired by Rear Admiral Zaaim Bin Hasan, Director-General of the National Hydrographic Centre, Malaysia and Chair of the EAHC. The EAHC Steering Committee meets annually between the triennial meetings of the EAHC to monitor progress in the region and provide an annual forum for the region's Hydrographers to meet.

Representatives from all but one EAHC Member State attended the meeting: China, Indonesia, Japan, Republic of Korea (ROK), Malaysia, Philippines, Singapore and Thailand. The Democratic People's Republic of Korea was not represented. Associate Members Brunei Darussalam and Viet Nam attended the meeting together with the Chair of the GEBCO Guiding Committee (GC). President Ward attended as an invited observer from the Secretariat of the IHO.

On the basis of their recent acceptance as Member States of the IHO, Brunei Darussalam and Viet Nam sought full membership of the EAHC. The applications received the verbal support of all the existing Members present, but a final decision must await notification of the approval of the DPRK before full membership can be confirmed.

The meeting received progress reports on the Training and Research Development Center (TRDC), based at the Korean Hydrographic and Oceanographic Agency, in Busan, ROK, established by the Commission to deliver its regional Capacity Building Programme (see: http://trdc.eahc.asia/). The increasingly successful implementation of a sustainable and replicating regional capacity building capability was illustrated by the growing number of regional instructors becoming available to conduct training. The TRDC provided a strategic analysis of the current status of the EAHC Capacity Building Programme. This will be used to guide further development of the programme. The Committee endorsed the 2017 work programme and the funding bids to be forwarded to the IHO Capacity Building Sub-Committee. President Ward provided a report of IHO activities of relevance to the Commission and the Chair of the GEBCO GC provided a briefing on the IHO-IOC GEBCO project and its involvement with crowd-sourcing for data.

Details of regional ENC coverage were discussed.

During the meeting, the participants developed a procedure for selecting representatives to serve on the IHO Council when it is formed under the revised Convention on the IHO which was anticipated to enter into force in the near future.

It was agreed that the next meeting of the EAHC Steering Committee will be held in Japan in February 2017.

Prior to the 3rd meeting of the EAHC Steering Committee, President Robert Ward took the opportunity to visit DISHIDROS in Jakarta at the invitation of the Hydrographer of Indonesia, Commodore Daryanto. President Ward delivered a presentation to the staff and invited guests where he discussed current topics being considered in the IHO. He also called on the Chief of Navy, Admiral Ade Supandi, and was able to provide him with a brief on the organizational impacts for national Hydrographic Offices of the global transition from government mapping agencies moving from the sole production of maps and charts to the provision of geodata services.

Task 3.1.4 Eastern Atlantic Hydrographic Commission

The 14th Conference of the Eastern Atlantic Hydrographic Commission (EAtHC-14) was held from 18 to 20 October, in San Fernando, Cádiz, Spain and hosted by the Hydrographic Office of Spain (*Instituto Hidrográfico de la Marina* - IHM). Due to the non-availability of the Director of the Department of Surveying, Oceanography and Charting of the Royal Navy of Morocco (DHOC), the Conference was chaired by Commander Hassan Ouahid, Head of the Hydrographic Section of DHOC. Simultaneous translation from French to English and vice versa was provided.

The Conference was attended by 28 delegates. Five IHO Member States of the Region (out of six), three Associate Member States (out of nine) and two Observer States (out of eleven) were represented. Representatives from the IHO-IOC GEBCO Project, from the UNESCO IOC Intergovernmental Coordination Group for the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and connected seas (ICG/NEAMTWS), the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), two expert contributors from industry (Kongsberg Maritime, Teledyne-Caris), two Regional ENC Coordinating Centres (IC-ENC, PRIMAR) participated as observers. Director Gilles Bessero and Assistant Director Yves Guillam represented the IHO Secretariat.

Participants to the EAtHC-14 meeting

Due to the unplanned absence of the representative of the Maritime Organisation for West and Central Africa (MOWCA), it was not possible to consider how the Memorandum of Understanding on cooperation between the IHO and MOWCA that had been signed in July would affect the activities of the Commission and the relations with MOWCA's specialized organs.

All the coastal States participating in the Conference reported on their activities, progress and difficulties. Most of the Western Africa coastal States continue to express concerns about lack of expertise and training opportunities, despite several training sessions sponsored by the IHO in accordance with the recommendations of the IHO Western Africa Action Team in the 2000's. The Conference took note that very few initiatives aimed at setting up national hydrographic committees or national hydrographic services, or joining the IHO were reported by those States. The Conference agreed that there was a need to re-consider the relationship between those coastal States and the EAtHC and the IHO and considered that this could be achieved through the "HydroMAOC" project led

by France (as regional Capacity Building Coordinator), noting that the objectives of the project are to define, conduct and implement a consistent set of actions to develop hydrography in Western and Central Africa. France delivered the report of the definition study supporting this project addressing education, equipment, and empowerment issues as well as associated funding strategies.

All participants were invited to take advantage of the methodologies available for conducting risk-assessment studies, particularly in relation to ENC coverage, not only for international shipping in the approaches to the main harbours, but also in support of the cruise industry, submarine cable, and oil and gas industry activities.

Task 3.1.5 Meso American - Caribbean Sea Hydrographic Commission

The 17th Meeting of the Meso American - Caribbean Sea Hydrographic Commission (MACHC) was held in Belem, Brazil from 14 to 17 December with 61 participants representing 11 Member States, 11 Associate Members, one observer country, seven observer organizations, and five commercial companies. Secretary-General Robert Ward and Assistant Director Alberto Costa Neves represented the IHO Secretariat.

The meeting was hosted by the Directorate of Hydrography and Navigation (DHN) of Brazil at hotel *Princesa Louçã* and chaired by Captain Marc van der Donck, national Hydrographer of the Netherlands and Chair of the Commission. The meeting was opened on behalf of the Brazilian Navy Commander by Vice-Admiral Alipio Jorge Rodrigues da Silva, Commander of the 4th Brazilian Naval District and by Vice-Admiral Marcos Olsen Sampaio, national Hydrographer of Brazil.

As a lead-up to the meeting, IHO capacity building seminars on hydrographic governance and on satellite derived bathymetry were held. Speakers from IHO Member States, the IHO Secretariat and the IALA took part. Secretary-General Ward also delivered a presentation at a parallel event organized by the Brazilian Maritime Authority where he highlighted the importance of hydrography for the safety of navigation, for the protection of the marine environment and for national economic development.

The seminars were followed by meetings of the MACHC Integrated Chart Coordination Committee (MICC), the Capacity Building Committee (CBC), the Marine Economic Infrastructure Program (MEIP) Working Group and the Risk Assessment Working Group (RAWG). Ms Dawn Seepersad from the University of the West Indies (UWI) described her research topic on Risk Assessment in Maritime Navigation for the Greater Caribbean Region. The Commission subsequently decided to create a correspondence group to support the UWI risk assessment research and participants were invited to contribute.

The Brazilian Oceanographic Vessel *Antares* made a port call during the period of the meeting and the MACHC attendees were invited to a reception onboard the vessel. Participants also had the opportunity to visit the Centre for Hydrographic Surveys and Aids to Navigation (AtoNs) for the Eastern Amazonia, operated by the Brazilian Navy.

The agenda of the Commission meeting was arranged according to themes: reports from countries and organizations, surveying and risk assessment, spatial data infrastructures, nautical charts and publications, and capacity building. In additional to the delivery of national reports from each of the countries represented at the meeting, presentations were provided by the observing organizations and by industry stakeholders invited to the meeting to complement the various agenda topics.

The meeting was told of the level of technical engagement in the work of the MICC and of the significant progress in ENC coverage in the region with 37 new ENCs. The meeting was also informed of the outcomes of the cruise port gap analysis and the actions countries are taking to fill the gaps, with two new ENCs produced based on this analysis.

As a direct consequence of the report from the Chair of the World-Wide Navigational Warning Service Sub-Committee and the assessment of MSI in the region, Barbados immediately began supporting the issuing of Notices to Mariners and navigational warnings informing the mariners on the inconsistencies between AtoNs and the nautical charts of its waters.

In the context of the passage of Hurricane *Matthew* and the impact it had in Haiti the meeting reviewed IHO Resolution 1/2005 – *Response to Disasters* and agreed on several proposed adjustments to the Resolution. The meeting was informed of the substantial improvements in determining the accuracy uncertainty of satellite derived bathymetry and on its assimilation with various other measures leading to new strategies for its use.

Briefings were delivered on the status of the work of the Regional ENC Coordinating Centres, on the importance of Inland ENCs in the region, on developments for chart on demand, on the outcomes of the 3rd Mexican Hydrographic Conference, and the potential benefits of the recognized Hydrographic Certification Scheme granted to Canada by the FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers, contributing to the standards of competence and labour mobility on a global basis for Hydrographic Offices, Ports and other organizations requiring professional competencies amongst their contractors.

Participants to the MAHC17 meeting

A number of changes to the Statutes of the MACHC were made as a consequence of the entry into force of the amendments to the Convention on the IHO. A process was included to determine the selection of Members to occupy the seats on the IHO Council allocated to the Commission. Brazil and the Netherlands were selected to occupy the two seats allocated to the MACHC once the IHO Council is established during the first Session of the IHO Assembly.

Rear-Admiral Fernando Alfonso Angli Rodríguez (Mexico) and Ms Kathryn Ries (USA) were elected respectively as the Chair and Vice-Chair for the next two years.

It was agreed that the next meeting would be held in Varadero, Cuba from 29 November to 2 December 2017, preceded by a two-day Awareness Seminar on 27-28 November.

Task 3.1.6 Mediterranean and Black Seas Hydrographic Commission

No meeting of the Mediterranean and Black Seas Hydrographic Commission (MBSHC) was conducted during the year.

P-7

- **Black and Azov Seas Working Group**

The 13th meeting of the Black and Azov Seas Working Group (BASWG13), which is a Working Group of the MBSHC, was held in İstanbul, Turkey, on 3 and 4 May under the chairmanship of Captain (PhD) Erhan Gezgin, Hydrographer of Turkey. Fifteen delegates attended the meeting. Five Black Sea States were represented: Bulgaria, Georgia, Romania, Turkey and Ukraine. The Coordinator of the Regional International Charting Coordination Working Group (ICCWG - Region F) (France) attended the meeting also. The IHO Secretariat was represented by Director Mustafa Iptes. Director Iptes provided a briefing on current IHO issues and the work of the Secretariat.

The Member States reported on their national activities since the last meeting of the MBSHC. The Working Group reviewed the CB activities in the region, presented by Turkey, as the CB Coordinator for MBSHC, and the status of the INT chart and ENC schemes of the Black Sea and Azov Sea, presented by the ICCWG Coordinator. The status of MSI coverage in the Black Sea was also discussed at the meeting. Georgia announced the establishment of a new NAVTEX station promulgating coastal warnings in the Georgian language.

The preparations for the XIXth International Hydrographic Conference / 1st Session of the IHO Assembly were also discussed at the meeting and Director Iptes provided the Working Group with detailed information.

It was agreed that the activities and the new developments of the BASWG would be reported to the next meeting of the MBSHC in Montenegro, in July 2017.

Captain Gezgin was re-elected as Chair of the BASWG. The next BASWG meeting was scheduled to be held in 2017 in Constanţa, Romania.

Task 3.1.7 Nordic Hydrographic Commission

The 60th meeting of the Nordic Hydrographic Commission (NHC) was hosted by Norway from 11 to 13 April in Stavanger. Sixteen delegates attended the meeting, chaired by Mr Evert Flier, Director of the Norwegian Hydrographic Service (NHS). The five Nordic States (Denmark, Finland, Iceland, Norway and Sweden) were represented. The IHO Secretariat was represented by Director Gilles Bessero.

Following the opening of the meeting by the Chair and the review of the status of the list of actions from the previous meetings, Director Bessero briefed the Commission on current IHO issues and the activities of the Secretariat. The meeting considered reports on national activities since the 59th meeting and reviewed on-going initiatives and projects of common interest related to surveys, nautical charting, nautical publications, the provision of official services to the leisure market, the development of MSDI and the provision of capacity building. Iceland reported that the Government of Iceland had concluded that the current rate of progress of surveying Icelandic waters was unacceptable and therefore decided to launch a programme aimed at a complete survey of the Exclusive Economic Zone within ten to fifteen years. Norway reported that a socio-economic study had been initiated to justify the budgetary requirements of NHS. The results were expected by September and would be shared within the Commission. Norway reported also on the progress of a bilateral cooperation project with Albania aimed at developing an ENC production capability: the first ENC was expected to be released for distribution later in April.

The work of the IRCC, MSDIWG, WENDWG and IHO-European Union Network Working Group (IENWG) was considered. The two Regional ENC Coordinating Centres, PRIMAR and IC-ENC, reported on their activities. The Commission expressed its expectation that the outstanding issues related to the Admiralty Information Overlay (AIO) service provided by the UKHO would be resolved by the 8th IRCC meeting in May.

Noting that the number of members of the NHC would result in only one seat being allocated to the Commission in the future IHO Council and that all five NHC members were members of more than one Regional Hydrographic Commission (RHC), the meeting considered a procedure to allocate the NHC seat. The Commission agreed that under these circumstances, only one Member State would declare its preference to be counted in the NHC and occupy the seat allocated to the NHC, thereby

leaving the other Members of the NHC to be counted in other Commissions. It was agreed that Sweden would declare its interest in being counted in the NHC and occupy the Council seat allocated to the NHC for the first term.

In accordance with the order defined by the statutes, Denmark took over the chair at the end of the meeting. It was agreed later that the next meeting will be hosted in Elsinore, Denmark from 6 to 8 March 2017.

Task 3.1.8 North Indian Ocean Hydrographic Commission

The 16th meeting of the North Indian Ocean Hydrographic Commission (NIOHC) was held in Chittagong, Bangladesh, from 14 to 16 March, under the chairmanship of Rear Admiral Makbul Hossain, Chairman of the National Hydrographic Committee of Bangladesh. Participants were welcomed at the opening ceremony by Vice Admiral Mohammad Nizamuddin Ahmed, Chief of Naval Staff of the Bangladesh Navy.

NIOHC Member State representatives from Bangladesh, Egypt, India, Myanmar, Pakistan, Saudi Arabia, Sri Lanka, Thailand and the United Kingdom attended the meeting together with representatives of Associate Members from Australia, France, Oman, the Seychelles and the United States. The Russian Federation and Sudan were represented as Observer States. Representatives of the IHO-IOC GEBCO Project and several commercial companies also attended as invited observers. Director Iptes and Assistant Director Wyatt represented the IHO Secretariat.

Participants to the NIOHC16

The NIOHC received national reports from Member States and Associate Member States, a report from the IHO Secretariat as well as summary reports on the 7th meetings of the IHO Hydrographic Services and Standards Committee and the Inter Regional Coordination Committee held during the previous year and presentations about progress of the IHO-IOC GEBCO Project. The meeting also received reports on progress and issues related to the IHO Worldwide ENC Database concept and the associated Regional ENC Coordinating Centres, the report on the INT chart scheme of Region J, an update on the work of the IHO Marine Spatial Data Infrastructures Working Group, relevant activities that had taken place in the International Maritime Organization, an update from the NAVAREA VIII Coordinator and the outcomes of the 7th meeting of the World-Wide Navigational Warning Service Sub-Committee.

Director Iptes reported on the IHO Work Programme and the Organization's activities during the previous year. As at previous meetings, time was devoted to discussing regional requirements for capacity building (CB). A comprehensive CB plan was developed for submission to the 14th meeting of the IHO Capacity Building Sub-Committee (CBSC14) later in the year. Assistant Director Wyatt provided a progress report on the IHO crowd-sourced bathymetry programme, which generated numerous comments and questions.

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

The Member States reviewed the Statutes of the NIOHC and, in preparation for the approval of the amendments to the IHO Convention, spent time drafting a new annex detailing the processes and procedures for selecting the Member State(s) that would occupy the seat(s) on the Council allocated to the NIOHC. Director Iptes also provided the Commission with general information on the next International Hydrographic Conference / Assembly and the revised structure of the IHO, in particular, in relation to the formation and role of the IHO Council.

Egypt assumed the Chair of the NIOHC four months after the NIOHC16 meeting in accordance with the Statutes of the Commission. The NIOHC elected India to assume the Vice-Chair position for the next period. Egypt volunteered to host the 17th meeting of the Commission in Alexandria, Egypt, tentatively scheduled during the week of 13 to 17 February 2017; it was agreed to hold an INT Chart Coordination Working Group meeting prior to NIOHC17.

Task 3.1.9 North Sea Hydrographic Commission

The 32nd Conference of the North Sea Hydrographic Commission (NSHC) was hosted by the Irish Maritime Administration, in Dublin, from 21 to 23 June. This was the first NSHC Conference hosted by Ireland. The Conference took place in Dublin Castle and was chaired by Captain Marc van der Donck, the Hydrographer of the Netherlands. 26 delegates, the Manager of the GEBCO Digital Atlas and seven Observers from industry attended the Conference. The ten IHO Member States of the Region (Belgium, Denmark, France, Germany, Iceland, Ireland, Netherlands, Norway, Sweden and United Kingdom) were represented together with the USA. The IHO Secretariat was represented by Director Gilles Bessero.

Participants to the NSHC-32 meeting

The first half-day was devoted to a closed session attended only by the Members of the Commission and the representative of the IHO Secretariat. In his opening remarks, the Chair noted the relevance of the theme of World Hydrography Day to the activities of the Commission. The closed session considered governance issues related to the establishment of the IHO Council and to the management of the Commission. The Conference agreed on the procedures to select the Member State(s) which will occupy the Council seat(s) allocated to the Commission and how to prepare any input from the Commission to the Council. Director Bessero briefed the delegates on current IHO issues and the activities of the Secretariat. The Commission considered the activities of IHO bodies affecting its work, including the IRCC, the WENDWG and the IENWG.

The final item of the closed session was devoted to the consideration of the preliminary results obtained by the NSHC Tidal Working Group in relation with the realization of North Sea wide vertical reference surfaces. The Commission provided guidance to the Working Group for the continuation of this work item.

The subsequent open sessions addressed a broad scope of issues related to survey policies and technologies, including satellite derived bathymetry, charting and MSDI. Both the Member States and the industry representatives reported on relevant developments and on-going national and regional programmes. The Commission agreed to suspend further development of the North Sea Bathymetric Database pending the outcome of the EU Call for Tenders on high resolution seabed mapping and the results of the EU Coastal Mapping Project.

The activities and work plans of the North Sea International Charting Coordination Working Group (NICCWG), Resurvey Working Group and Baltic Sea-North Sea MSDI Working Group were considered and endorsed. Noting that the North Sea ENC Harmonization Group had no further issue to consider at the regional level, the Conference agreed to disband the group and tasked the NICCWG to monitor and address any future ENC scheme issues.

Germany informed the Commission of a ruling of the Court of Justice of the European Union[1] which concluded that "*geographical information extracted from a topographic map (…) retains, following its extraction, sufficient informative value to be classified as 'independent materials' of a 'database' (…)*". Through this ruling, the Court indicates that the concept of "database" must be interpreted widely, as collections of works and/or other data, in any form, without technical or material restrictions - therefore applying also to analogue databases - and stresses the functional nature of database protection[2].

At the end of the Conference, Captain Declan Black, Ireland, took over the chair and Ms Virginie Debuck, Belgium, became Vice-Chair. The next Conference should take place toward the end of March 2018 in Belgium, the exact date and venue yet to be decided.

Task 3.1.10 ROPME Sea Area Hydrographic Commission

No meeting of the ROPME Sea Area Hydrographic Commission (RSAHC) was conducted during the year.

Task 3.1.11 Southern Africa and Islands Hydrographic Commission

The 13th Conference of the Southern Africa and Islands Hydrographic Commission (SAIHC) was held from 30 to 31 August in Cape Town, South Africa. Six Member States: France, Mauritius, Mozambique, Norway, South Africa and the United Kingdom were represented at the meeting. India also participated by invitation. Comoros, Malawi, Namibia and Portugal, attended as Associate Members and delegates from the International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA), the South African Maritime Safety Authority (SAMSA) and the two Regional Electronic Nautical Chart (RENC) organizations: IC-ENC and PRIMAR also participated in the meeting. Industry participants from C-MAP Norway, Fugro Survey Africa, Kongsberg Maritime, Oceaneering South Africa, Teledyne CARIS and Underwater Surveys also attended the meeting. President Robert Ward and Assistant Director Anthony Pharaoh represented the IHO Secretariat. The meeting was chaired by Captain Abri Kampfer (national Hydrographer of South Africa).

The 13th Conference was preceded by a meeting of the regional International Charting Coordination Working Group (ICCWG) during which the status of INT chart production in the region was discussed. A presentation on the INToGIS online catalogue application was provided, followed by an "*IALA Safety of Navigation Conference"*. These events took place on 29 August.

---

[1] See http://curia.europa.eu/juris/document/document.jsf?text=&docid=170741&pageIndex=0&doclang=EN&mode=req&dir=&occ=first&part=1

[2] Directive 96/9/EC of the European Parliament and of the Council of 11 March 1996 on the legal protection of databases.

Each of the participating Member and Associate Member States and India presented at the Conference a briefing on the status of hydrography and charting priorities in their areas of responsibility. There were reports, presentations and discussions on Satellite Derived Bathymetry, GEBCO activities, the IHO capacity building programme for the region, the status of IHO publication C-55, procedures for marine disasters, MSI for NAVAREA VII and the Norwegian Mareano Project (http://www.mareano.no/). The two RENC organizations provided feedback on the status of ENC distribution in the region. Presentations were also delivered by each of the industry participants.

The report provided by Mauritius highlighted the significant progress that has been made with the development of the Mauritian hydrographic infrastructure and capabilities. This has been achieved through the very successful capacity building efforts from both the IHO Capacity Building Programme and the continuing support from the Government of India through the Indian National Hydrographic Office which has deployed its ships regularly to conduct surveys in Mauritius, provided training and compiled nautical charts on behalf of the country. Associate Members Angola, Kenya, Madagascar, Seychelles and Tanzania were not able to attend the meeting and did not submit national reports.

South Africa (Captain Abri Kampfer) was re-elected as Chair for the next term and the United Kingdom was elected to hold the position of Vice Chair. The next conference was proposed to take place in late September 2017 in Mauritius, subject to confirmation.

Task 3.1.12 South East Pacific Regional Hydrographic Commission

No meeting of the South East Pacific Regional Hydrographic Commission (SEPRHC) was conducted during the year.

Task 3.1.13 South-West Atlantic Hydrographic Commission

The 10th Conference of the South-West Atlantic Hydrographic Commission (SWAtHC) was hosted by the Hydrographic Office of Argentina (*Servicio de Hidrografía Naval - SHN*) in Buenos Aires on 7 and 8 April. Fifteen delegates attended the meeting, chaired by Captain Rubén Alberto Frattini, acting Director of the SHN. All three IHO Member States of the Commission, Argentina, Brazil and Uruguay, were represented together with the Associate Member, Paraguay. Two industry stakeholders (Caris and Kongsberg Maritime) participated in the meeting as Observers. The IHO Secretariat was represented by Director Gilles Bessero. Dr Antonio Marcelo Serangeli, Undersecretary of State for Defence Research, Development and Production delivered the opening address on behalf of the Minister of Defence of Argentina, highlighting the importance of hydrography through its underpinning role in the submission of Argentina for the extension of its continental shelf which had been recently approved by the United Nations Commission on the Limits of the Continental Shelf. The approval of the report of the 9th Conference was confirmed and the status of the list of actions was reviewed.

Argentina, Brazil and Uruguay reported on their national activities since the 9th Conference. The Commission noted the progress reported by Brazil in developing an IC-ENC branch covering South America. The first validations of ENC were expected during the first quarter of the year. Brazil, as Chair of the SWAtHC Planning Committee (*Comité de Planeamiento*), then reported on the intersessional work conducted through the Committee, addressing notably the maintenance and implementation of the regional INT and ENC schemes and the establishment of a pluriannual capacity building programme. The Commission noted the progress in the co-production by Argentina and Uruguay of INT Chart 2010 (De Arroyo del Chuy a Mar de Plata). The Commission considered the work plan of the Committee for the next intersessional period and agreed to add an item on the analysis of the use of risk assessment methodologies to prioritize survey requirements. The chairmanship of the Committee was handed over to Uruguay for the next three-year period.

In addition to providing a briefing on current IHO issues and the work of the Secretariat, Director Bessero provided advice on the regional selection of the members of the future IHO Council. The Commission agreed that the seat on the Council allocated to the SWAtHC would be taken by the Chair and decided to revise the Statutes of the Commission accordingly.

Noting the lack of progress in implementing the recommendations of the IHO Technical Visit conducted in Paraguay in 2014, the Commission reiterated its request that a representative

participates in the Planning Committee and invited Paraguay to submit a national report at the next SWAtHC meeting and to identify any further requirements for assistance.

Argentina, as Chair of the Commission, reported on the work of the IRCC, WENDWG and HSSC. The Commission agreed consequential actions. Brazil reported on the activities of the Inland ENC Harmonization Group. Argentina and Brazil reported on the successful testing of contingency arrangements between the Coordinators of NAVAREAs V and VI and the signing of an agreement formalizing their joint contingency plan.

The industry representatives briefed the Commission on their latest developments related to data acquisition and processing.

It was proposed that the next Conference take place in March 2017 in Brazil, the exact date and venue to be decided before 1 September 2016. In accordance with the statutes of the Commission, the chair role transferred to Brazil after 45 days from the closure of the Conference.

Task 3.1.14 South West Pacific Hydrographic Commission

The Government of New Caledonia, the French Hydrographic Office (*Service hydrographique et océanographique de la marine - SHOM)* and the Pacific Community (SPC) jointly hosted the 14th Conference of the South West Pacific Hydrographic Commission (SWPHC) from 30 November to 2 December in Nouméa, New Caledonia. Representatives from all eight Member States of the Commission (Australia, Fiji, France, New Zealand, Papua New Guinea, Tonga, UK, USA), and six of the seven Associate Members (Cook Islands, Kiribati, Niue, Samoa, Solomon Islands, Vanuatu) attended the meeting. Two Observers (New Caledonia, Tuvalu), five international organisations and nine representatives from industry also participated; a total of 46 participants. The IHO Secretariat was represented by Secretary-General Robert Ward and Assistant Director Alberto Costa Neves.

The meeting was opened by Captain Éric Mevelec, Director of the Department of Maritime Affairs in New Caledonia, on behalf of the President of the Government of New Caledonia, Mr Philippe Germain, and chaired by Commodore Brett Brace (Australia).

Participants to the SWPHC14 meeting

Each of the coastal States present provided an update on their activities since the last meeting that took place in the Cook Islands 19 months previously. The Commission acknowledged the achievements and developments in Fiji, where the profile of hydrography has been raised and appropriate legislation and foreign agreements were established. Papua New Guinea reported that it had signed a cooperative agreement with Australia to ensure that it is able to properly meet its international obligations under the International Convention for the Safety of Life at Sea (SOLAS). It reported also the establishment of a network of tide gauges, and informed on the funding for hydrographic surveys provided by the Asian Development Bank. Tonga reported that it had established a National Hydrographic Coordinating Committee and that the Navy is now tasked with the collection of hydrographic data for which it will shortly acquire a new vessel that will be capable of conducting hydrographic surveys.

The Cook Islands reported the establishment of its National Hydrographic Coordinating Committee and a bilateral agreement with New Zealand. Kiribati has passed a new Maritime Act and acceded to the SOLAS Convention. Solomon Islands has provided hydrographic surveying and charting

awareness to tertiary institutions and government agencies, established chart sales services to the local shipping industry and foreign vessels entering its waters and started conducting hydrographic surveys. Vanuatu reported significant progress towards becoming a Member State of the IHO.

The meeting was informed of recent technical visits to Kiribati, Niue, Samoa, Tuvalu and Vanuatu conducted under the auspices of the IHO capacity building work programme with support from New Zealand and the United Kingdom. Member States in the region also reported on the developments and progress in chart production systems and new chart releases and the support being provided to Pacific Island Countries and Territories (PICTs) through the New Zealand Pacific Region Navigation Initiative (PRNI), from the United Kingdom Commonwealth Marine Economies (CME) Programme and from the SPC Geoscience Division.

SPC briefed the Commission on the development of its proposed Safety of Navigation Strategy and the progress being made in developing its hydrographic capacity. New Zealand reported on the recent outcomes from its evidence-based hydrographic risk assessment initiative to identify priorities and areas where chart remediation should be a priority. The Commission members reviewed their requirements for further capacity building support and agreed on priorities to be submitted to the next meeting of the IHO Capacity Building Sub-Committee that will take place in June 2017.

The Commission was informed about the impact of significant natural disasters that have taken place in the region since the last meeting, in particular the severe tropical cyclone *Pam* in March 2015 affecting Vanuatu mainly and the severe tropical cyclone *Winston* which struck Fiji in February 2016 and the very recent earthquake that struck southern New Zealand in November. The Chair of the SWPHC in close coordination with the IHO Secretariat monitored the impact of these disasters and undertook a coordinating role, as guided by IHO Resolution 1/2005 as amended.

Subject to final confirmation, the next meeting will take place in South Tarawa, Kiribati, in February or March 2018. The Commission re-elected Commodore Brett Brace (Australia) to continue as its Chair and elected Lieutenant-Commander Gerard Rokoua (Fiji) as its Vice-Chair.

Task 3.1.15 USA-Canada Hydrographic Commission

The 39th meeting of the United States of America – Canada Hydrographic Commission (USCHC) was held on 16 May in Halifax, Nova Scotia, Canada. USCHC39 took place in conjunction with the Canadian Hydrographic Conference 2016. The meeting was co-chaired by Mr Denis Hains, the Hydrographer-General of Canada, and the Director, Office of Coast Survey of the USA, Rear Admiral Gerd Glang. Twenty eight participants attended the meeting including representatives from the Canadian Hydrographic Service (CHS) and the Departments of National Defence (DND) and Fisheries and Oceans (DFO), from the National Oceanographic and Atmospheric Administration (NOAA), National Geospatial-Intelligence Agency (NGA), US Navy and US Army Corps of Engineers (USACE), and also from the United Kingdom Hydrographic Office (UKHO). Director Mustafa Iptes represented the IHO Secretariat.

The USCHC39 agenda covered a wide range of topics of mutual interest to the Member States' with additional briefs on the activities of the HO, WENDWG, MSDIWG, Crowd-Sourced Bathymetry Working Group, IHO/IOC GEBCO Project and FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC). Director Iptes reported on the IHO Work Programme and the Organization's activities during the previous year. He also provided the Commission with general information on the preparation of the XIXth International Hydrographic Conference / 1st Session of the IHO Assembly and the revised structure of the IHO.

Some of the topics that provoked in-depth discussions included:

- The INT Chart Programme review (from the USCHC perspective);
- Marine Spatial Data Infrastructures (MSDI);
- Crowd-sourced bathymetry; and,
- The future of the paper chart.

Several technical presentations were also made that were complementary to the discussions, including: "*Building a decision tree to obtain a complete and coherent coastal chart coverage for ENCs*" (USA); "*Sensor-Derived [Bathymetry] Policy and Localized Chart Updates*" (USA); "*A Data Access Centre of Expertise" (Canada)*"; and, "*A Satellite-Derived Bathymetry Pilot Study*" (USA).

It was decided that the 40th USCHC meeting will be held in conjunction with the US Hydrographic Conference-2017 which will take place in Galveston, Texas, USA, from 20 to 23 March 2017.

Task 3.1.16 IHO Hydrographic Commission on Antarctica

The 14th Conference of the IHO Hydrographic Commission on Antarctica (HCA) could not be held in Ecuador as planned because of the earthquake that struck that country in April. Instead the Conference was held at the Fram Centre in Tromsø, Norway from 28 to 30 June, hosted by the Norwegian Hydrographic Service (NHS).

The Conference was chaired by President Robert Ward, supported by Assistant Director Yves Guillam, (HCA Secretary) from the IHO Secretariat. 21 delegates from 14 Member States (Argentina, Australia, Brazil, Chile, China, Colombia, France, India, Italy, Korea (Rep. of), Norway, United Kingdom, USA, Venezuela), four stakeholder organizations (COMNAP[3], GEBCO/IBCSO[4], IAATO[5], IALA[6]), three expert contributors (Kongsberg Marine, Norwegian Polar Institute, Teledyne-Caris), attended the meeting. Apologies were received from the representatives of Japan, New Zealand, Peru, the Russian Federation, South Africa and Spain, who were unable to attend the meeting.

Following the signature of the statutes of the HCA by the representative of Colombia at the opening of the Conference, the HCA now comprises 24 Member States.

The Conference agreed to amend the Statutes of the HCA in order to provide greater flexibility in the timing of its meetings and to conform with the new planning cycle of the IHO. It was also decided to include the list of ATCM[7] Resolutions that are relevant to the HCA as an annex to the Statutes.

In addition to national reports from the IHO Member States, presentations were also given by the expert contributors. Two presentations delivered by the representative of the Norwegian Polar Institute were well received and provided the opportunity to identify ways to strengthen links between the HCA and SCAR[8] and other scientific institutes who collect bathymetric data in Antarctica. Participants agreed that the Secretariat of the IHO should investigate the possibility of engaging with SCAR's Standing Committee on Data Management (SC-ADM).

Discussions at the meeting centred not only on the need to obtain bathymetric data from all sources and observers in the region, but also on the need to improve and develop a coordinated approach across the HCA membership and its stakeholders by establishing a recognized and interoperable GIS-based repository that will enable existing data coverage to be identified.

[3] COMNAP: The Council of Managers of National Antarctic Programs.

[4] GEBCO/IBCSO: The General Bathymetric Chart of the Oceans / The International Bathymetric Chart of the Southern Ocean.

[5] IAATO: The International Association of Antarctic Tour Operators.

[6] IALA: The International Association of Marine Aids to Navigation and Lighthouse Authorities.

[7] ATCM: Antarctic Treaty Consultative Meeting.

[8] SCAR: The Scientific Committee on Antarctic Research.

The Chair of the HCA Hydrographic Priorities Working Group (HPWG) provided a comprehensive analysis of the charting coverage (INT paper charts and ENCs) in the region. Statistics and illustrations of recent vessel traffic patterns, provided by IAATO, and through access to AIS data were very useful in verifying the existing maritime shipping routes (MSR) used to set survey and charting priorities in the HCA and resulted in the identification of two new MSRs.

The delegate of Chile reported on Chile's representation of the IHO-HCA at the 39th session of the ATCM and indicated the possibility for the IHO to present a seminar on the status of hydrography in Antarctica back-to-back with the 41st session of the Antarctic Treaty Consultative Meeting (ATCM) due to take place in Ecuador in 2018.

Subject to confirmation by the host country, it was agreed that the 15th Conference of the HCA would take place in New Zealand in June 2017. Subsequently, it was decided to postpone the 15th Conference in favour of an extraordinary meeting during the IHO Assembly in 2017. A Conference of the HCA was tentatively planned to take place in conjunction with the 41st session of the ATCM in Ecuador in 2018, thereby maximizing attendance and participation of HCA Members at both its own Conference and the proposed seminar on the status of hydrography in Antarctica.

Task 3.1.17 WEND Working Group

The sixth meeting of the Worldwide ENC Database Working Group (WENDWG) was held from 8 to 10 March in Stavanger, Norway, hosted by the Norwegian Hydrographic Service (NHS). The meeting was chaired by Mr Jamie McMichael-Phillips (UK). Twenty-four delegates from 16 Member States (Argentina, Brazil, Canada, Finland, France, Germany, Italy, Japan, Norway, Oman, Poland, South Africa, Sweden, Turkey, United Kingdom, USA), representing 11 Regional Hydrographic Commissions (ARHC, BSHC, EAtHC, MACHC, MBSHC, NHC, NSHC, RSAHC, SAIHC, SWAtHC, USCHC), two Regional ENC Coordinating Centres (IC-ENC and PRIMAR), and the IHO Secretariat attended the meeting. Additionally, four expert contributors from industry and academia had been invited by the WENDG Chair to participate as observers. Director Mustafa Iptes and Assistant Director Yves Guillam (WENDWG Secretary) represented the IHO Secretariat.

One of the main objectives of the WENDWG is to monitor the application of the WEND Principles by Hydrographic Offices and the Regional Hydrographic Commissions (RHCs). As reported to the IMO, global ENC coverage had reached the point where further progress was now primarily dependent upon new surveys or re-surveys being carried out in the areas not yet covered by ENCs. Yet, for various reasons, there remained numerous cases of overlapping ENCs, which is contrary to the ENC production principles established by the IHO. It was agreed that the situation is not improving: one of the reasons identified was that most of the RHCs do not set up "Approved" ENC Schemes as they do for INT paper charts. IC-ENC provided a comprehensive report on the unpredictable behaviour of ECDIS in situations where overlapping data occurs.

It was agreed by the Working Group and supported by the industry stakeholder participants that CIRM be invited to distribute the IC-ENC Report on overlapping ENC data to ECDIS manufacturers in order to provide a better understanding of the consequences in ECDIS operating software when uploading or displaying ENCs. A set of associated actions to improve the situation was also decided. In particular, it was decided that the IHO ENC Catalogue should display Approved ENC Schemes as additional layers, and that the IRCC and the WENDWG should prepare a proposal for a new IHO Resolution, that focused on overlapping ENC coverage that was navigationally-significant.

The RENCs reported on their harmonization activities and provided an up to date ENC data flow diagram to illustrate the few remaining distribution issues yet to be resolved. Discussions on ENCs that are currently only available through "exclusive" distributor arrangements, rather than via the WEND system, led to some actions agreed by Jeppesen Marine and the UKHO in order to improve the *accessibility* of those ENCs in the future.

A final proposal on Temporary & Preliminary Notices to Mariners (T&P NtMs) and the Admiralty Information Overlay service, delivered by the UKHO as part of its AVCS service, was agreed. This was to be included in the WENDWG Chair's report to the IRCC; its main recommendation relating to safety of navigation being that "*AIO must be withdrawn where the primary charting authority produces T&P NtMs for its ENC*".

Following the retirement of Mr Sean Hinds (Canada), Mr John Nyberg was elected as Vice-Chair of the WENDWG. It was agreed that the next meeting of the WENDWG would take place consecutively when the Joint RENC meeting takes place in early February 2017 in the USA.

Task 3.1.18 Industry participation in RHC meetings

In addition to being represented at IHO meetings through various Non-Governmental International Organizations (NGIO), representatives from industry participated as invited Expert Contributors in most RHC meetings, where they provided valuable contributions to regional capacity building initiatives.

Task 3.1.19 Contribute to improving the framework of IHO response to marine disasters

During the period of this report, the South West Pacific region, in particular in Fiji, was impacted by a significant natural disaster - "Tropical Cyclone *Winston*" in February. Commodore Brett Brace (Australia), Chair of the SWPHC, in close coordination with the IHO Secretariat, successfully monitored the impact of the disaster and stood ready to implement IHO Resolution 1/2005 as amended, in order to activate the IHO disaster reaction organization to coordinate immediate requests for hydrographic and cartographic assistance. Australia, New Zealand, USA, UK and France also provided direct and indirect support to the region for recovering from this disaster.

Element 3.2 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 and 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. Director Bessero led a high-level technical visit to Liberia in February and Director Iptes paid a high level visit to Azerbaijan in October to invite Azerbaijan to become a member of the IHO.

Element 3.3 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 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 in 2016 was nearly the same as in 2015. Expenditure in the 2016 CB Work Programme (763,605 Euros) was slightly more than the budget for the previous year. Three activities were postponed to 2017 at the request of the RHC Chairs, which resulted in 93% of the budgeted work program being executed.

One Director, one Assistant Director and some other members of the staff were directly engaged in supporting the CB programme. The limited human resources available in the Secretariat constrain the performance of the CB Programme.

Task 3.3.1 Capacity Building Sub-Committee

The 14th meeting of the Capacity Building Sub-Committee (CBSC14) was held in Abu Dhabi, United Arab Emirates (UAE) from 24 to 26 May, hosted by the General Headquarters (GHQ) Armed Forces, Military Survey Department of the UAE. The meeting was chaired by Mr Thomas Dehling (Germany) and attended by 26 participants representing the 15 Regional Hydrographic Commissions (RHC), ten Member States and two observer organizations. The IHO Secretariat was represented by Director Mustafa Iptes and Assistant Director Alberto Costa Neves (CBSC Secretary).

The Sub-Committee considered the revision of the IHO Strategic Plan (2009) and the need to better reflect the strategic aspects of the IHO CB Strategy, assessed the status of capacity building in the RHCs, including those that do not need support but rather provide it to other regions in need, and received information on regional projects for hydrographic risk assessment, survey priorities and requirements, e-learning, and developments related to the revision of the syllabuses for Category A and Category B hydrographic and nautical cartography training.

Methods to better evaluate success were considered by the participants in terms of subjective aspects of improving hydrographic awareness, provision of MSI, coverage of adequate hydrographic surveys and ENC and protection of the marine environment. The Sub-Committee also discussed objective aspects of successful capacity building such as attracting funding for the Capacity Building Work Programme (CBWP) and the number of courses and training provided, visits executed and students trained. The evolution of the status of each coastal State in relation to the three phases of the CB Strategy was considered by the meeting as a strategic performance indicator to assess progress.

Participants to the CBSC14 meeting

The meeting made progress on further improvements to the administration of the CBWP by adopting amendments to two CB Procedures and three new draft CB Procedures that will be tested until the next meeting. One of these new CB Procedures aimed to improve the assessment of the phases of Capacity Building as the basis for monitoring performance at the strategic level. Strong support from the World-Wide Navigational Warning Service Sub-Committee (WWNWS-SC) and the NAVAREA Coordinators is expected in order to implement phase 1 (Collection and circulation of nautical information, necessary to maintain existing charts and publications up to date).

RHC CB Coordinators were briefed on the preparation of the three-year work plan that will be submitted to the 1st Session of the IHO Assembly for the period 2018-2020. The 2017 CB Management Plan (CBMP) was reviewed and approved by the meeting as the basis for the 2017 CBWP. The meeting endorsed the completed 2015 CBWP and updated the 2016 CBWP. The CBSC expressed continued concern on the limited financial resources available to execute the full 2017 CBWP.

The next meeting of the CBSC was planned to be held in Paramaribo, Suriname, from 7 to 9 June 2017.

Task 3.3.2 Capacity Building Fund Management

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 such things as 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.

Task 3.3.2.1 Develop and maintain a Capacity Building Management System

The Secretariat 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 indicated in the introduction of Element 3.3.

Task 3.3.3 Meeting with other organizations, funding agencies, private sector and academia

Task 3.3.3.1 Joint IHO/IMO/WMO/IOC/IALA/IAEA/FIG Capacity Building (CB) Coordination Meeting

The annual Joint IHO/IMO/WMO/IOC/IALA/IAEA/FIG Capacity Building (CB) Coordination Meeting was to be hosted by the International Maritime Organization, however, the details were never confirmed by the IMO Secretariat despite several requests from the participants. As a result, the meeting was cancelled at late notice.

Task 3.3.3.2 Capacity Building Stakeholders Forum

No Capacity Building Stakeholders Forum was held in 2016.

Other meetings

The 6th meeting of the IHO/ROK Programme Management Board (PMB6)

The 6th meeting of the IHO/Republic of Korea (ROK) Programme Management Board (PMB) was held at the IHO Headquarters in Monaco from 3 to 4 March. The ROK delegation comprised Mr An-ho Lee, Director of the Marine Territory Division of the Ministry of Oceans and Fisheries and Mr Woongkyo Song from the International Cooperation Team at the Korea Hydrographic and Oceanographic Agency (KHOA). The IHO was represented by Mr Thomas Dehling (Chair of the IHO Capacity Building (CB) Sub-Committee), Director Mustafa Iptes and Assistant Director Alberto Costa Neves (Secretary). Mr Maxim Van Norden, Programme Manager at the University of Southern Mississippi (USA) and relevant IHO Staff also attended the meeting as invited contributors. The meeting was chaired by Mr Dehling.

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 the clauses.

The meeting reviewed the achievements and the various training and education activities sponsored by the ROK. The annual financial contribution from ROK forms a significant part of the CB Fund used to support the annual IHO CBWP. Since its inception the ROK contribution has supported education programmes in hydrography and cartography, training-for-trainers' 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 to the PMB6 meeting

The PMB considered the management aspects of supporting trainees on the Category "A" Hydrography Programme at the University of Southern Mississippi (USM) and the Category "B" Nautical Cartography Programme conducted at the KHOA headquarters in order to effectively deliver high level education to participants from developing countries. During the meeting the selection board for the 2016-2017 edition of the Category "A" Programme was established and selected two candidates from Malaysia and Philippines respectively, subject to final acceptance by the USM.

The meeting acknowledged the limited number of qualified candidates that were nominated for the Category "A" Programme for the year and agreed on a number of actions to facilitate and guide prospective candidates for future opportunities, including a dedicated page of the IHO website and improved communication with the Member States and Regional Hydrographic Commissions.

During the meeting the ROK confirmed that the support for the CB activities in 2016 would be at the same level as the 2015 contribution. ROK also expressed its interest in supporting the further development of the Capacity Building Management System (CBMS) by working with the IHO Secretariat. The meeting was also briefed on CB activities being conducted by the East Asia Hydrographic Commission Technical, Research and Development Center (TRDC) and its developments on e-learning to better assist the international hydrographic community.

The seventh meeting of the PMB was planned to take place in Busan, Republic of Korea in February 2017.

Liaison Visit to the UKHO for the CHART Project

Director Mustafa Iptes and Mr Kentaro Kaneda (Project Officer seconded to the IHO Secretariat from Japan) visited the United Kingdom Hydrographic Office (UKHO) on 24 October to meet and brief the trainees attending the eighth 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 is delivered by the UKHO and comprises five modules, each module varying from two to five weeks in length. The 8th course took place from 5 September to 16 December. It was attended by students from Bangladesh, Colombia, Cuba, Georgia, Latvia, Philippines and Viet Nam.

Director Iptes 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 important coordination and standardization role of the IHO and its Capacity Building programme were also described. The students were encouraged to keep in touch with each other and to maintain an alumni relationship after they return to their home countries.

IHO-Nippon Foundation Alumni Workshop

The IHO- Nippon Foundation (NF) Alumni Workshop was held from 2 to 4 November in Bangkok, Thailand organized by the IHO and supported by the Nippon Foundation of Japan. The Nippon Foundation has funded selected international trainees to attend courses in nautical cartography at the UKHO for the last eight years. Since 2014 the training has been conducted under the auspices of an MoU signed between the IHO and NF on the IHO-NF CHART Project.

The objectives of the Alumni Workshop were to strengthen the IHO-NF Alumni network, to encourage cooperation between the fellows, to further develop global linkages and to obtain feedback from the alumni. Of the total of 51 fellows, 18 alumni from 16 countries (Algeria, Bulgaria, Egypt, Estonia, Indonesia, Malaysia, Mexico, Myanmar, Solomon Islands, Spain, Suriname, Trinidad and Tobago, Uruguay, Vietnam, Japan and Thailand), were available to participate in this event. Mr Mitsuyuki Unno (Executive Director of the Nippon Foundation), Mr Yu Nakahiro (representative of the Nippon Foundation), Mr Jeff Bryant (International Capacity Building Manager of the UKHO), Mr Derek Aldridge (cartography trainer from the UKHO), Mr Shinichi Toyama (representative of the Japan Hydrographic and Oceanographic Department) also participated in the workshop. The IHO Secretariat was represented by Director Mustafa Iptes, Assistant Director Alberto Costa Neves and Dr Kentaro Kaneda (Project Officer seconded to the IHO Secretariat by Japan).

The Workshop was opened by Director Iptes. This was followed by keynote speeches delivered by Mr Mitsuyuki Unno and Vice Admiral Charin Boonmoh (Director General of the Thailand Hydrographic Office). Following the presentations given by the representatives of the IHO, UKHO and NF which informed the participants about the background of the IHO-NF cooperation and development of the CHART Project, the alumni described their experiences and the lessons learned during and after the training programme, their professional progress since their training, and their expectations for future developments in their hydrographic services.

The presentations from the alumni showed that all alumni have continued to work on nautical cartography or related matters since the completion of their training programme and that about half of the alumni are in a position to teach nautical cartography to their staff or to students in formal education and training programmes. Most of the alumni now hold key positions in the establishment and development of cartographic production and the publication of ENCs. For the majority of the alumni the workshop was their first participation in an international meeting which provided them with additional confidence and experience to further develop their work.

The workshop provided opportunities to discuss the ways and means to continue developing nautical cartography worldwide in line with the objectives of the IHO and of the Nippon Foundation, including the need for a Category "A" cartographic training programme.

The alumni all agreed that hearing about the work and developments in other hydrographic offices can help to establish benchmarks and identify success stories to help promote their work both within their chains of command and with other national, regional and international organizations.

Graduation Recognition Ceremony for Master of Science Degree in Hydrographic Science, University of Southern Mississippi, USA

Four students (from Bahrain, Mauritius, Nigeria and Romania), sponsored by the ROK through the IHO CB Programme, successfully completed a master's degree in hydrographic science at the University of Southern Mississippi, USA, on 4 August. This programme is recognized by the

FIG/IHO/ICA IBSC as meeting its Category "A" level. Director Iptes attended the Graduation Recognition Ceremony representing the IHO and delivered a keynote address.

10th Anniversary of Contributions by the Republic of Korea to the IHO Capacity Building Programme

The 10th anniversary of continuous support by the ROK to the IHO CB Programme was acknowledged by a special meeting held at the IHO Secretariat in Monaco on 7 December. The ROK delegation comprised Director General of KHOA Mr Ryoo Jae-hyung, Mr Kim Baek Soo, Mr Kang Seongmin, Prof. Choi Yunsoo and Ms Yu Aeri. The IHO was represented by Secretary-General Robert Ward, Directors Mustafa Iptes and Gilles Bessero, Assistant Director Alberto Costa Neves, Mr Yong Baek - Project Officer seconded to the IHO Secretariat by the ROK, and Ms Sandrine Brunel – IHO Secretariat Accounting and Administration Assistant.

The ROK's support to the IHO Capacity Building Programme was initiated in 2006 under the terms of a MoU between the IHO and the ROK. A total of two million euros has been provided over the last ten years which has made up a significant part of the CB Fund used to support the annual IHO CB Work Programme (CBWP).

The meeting was opened by Secretary-General Ward and Director General Ryoo who both highlighted the contribution of the ROK and the achievements that it has made possible. Ms Yu reviewed the ROK's contribution to CB Programme during the last 10 years and Director Iptes provided his assessment of the positive impact on the CB Programme and the aims of the IHO. The meeting reviewed the current training and education activities, in particular the Category "A" Hydrography Programme at the University of Southern Mississippi (USM) and the Category "B" Marine Geospatial Information Programme undertaken at the KHOA headquarters, sponsored by the ROK. The meeting was also briefed on Training-for-Trainers (TFT) activities being conducted by the East Asia Hydrographic Commission's Training, Research and Development Center hosted by KHOA and its support to the regional hydrographic community.

Mr Baek presented a review of the Technical Cooperation Projects that have also been supported by the ROK in addition to its contribution to the CB programme. The meeting considered potential ways of developing further cooperation in this area. The meeting also agreed on the need to revise the current MoU in order to update its content and include technical cooperation.

During the meeting Director-General Ryoo indicated that he expected ROK's support for CB activities would continue in the future. At the end of meeting, Secretary-General Ward thanked the Republic of Korea on behalf of the IHO Member States for its continuing and generous support to the IHO Work Programme, not only in the area of capacity building, but increasingly in several important areas of

the IHO technical work programme and for its support to the Secretariat through the secondment of officers.

Task 3.3.4 IHO Capacity Building Strategy

Following the approval of the IHO CB Strategy by the EIHC-5, the CBSC considered at its 14th meeting in Abu Dhabi, UAE, that the Strategy was fit for purpose.

Task 3.3.5 Capacity Building Work Programme

The Capacity Building Work Programme is developed by the CBSC and subsequently endorsed by the IRCC. More details about the activities in the CBWP are described under Elements 3.4 and 3.5.

Task 3.3.6 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.

Task 3.3.7 FIG/IHO/ICA International Board on Standards of Competence for Hydrographic Surveyors and Nautical Cartographers (IBSC)

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 IHO, and the International Cartographic Association (ICA). The IBSC is responsible for promoting, developing and maintaining the international standards of competence for hydrographic surveyors and nautical cartographers, for reviewing training and education programmes seeking recognition, for providing support and guidance to institutions seeking advice, and for conducting onsite visits to institutions holding recognized programmes. The 39th meeting of the IBSC was held in Brest (France) at the *Service hydrographique et océanographique de la marine* (SHOM) from 4 to 15 April under the chairmanship of Nicolas Seube (France, IHO representative). The meeting was attended by the ten Members of the Board. The Board welcomed Commodore Rod Nairn from Australia as a new IBSC Member representing the IHO. Assistant Director Alberto Costa Neves (IBSC Secretary) represented the IHO Secretariat.

The Board reviewed a record number of 18 programmes for hydrographic surveyors and nautical cartographers at its annual meeting: 16 programmes for hydrographic surveyors (eight at Category "A" and eight at Category "B", including three new programmes), one new programme for nautical cartographers at Category "B" level and one new scheme for individual recognition at national level.

The result was significant and the Board was able to grant recognition to 11 programmes for Hydrographic Surveyors (four at Category "A" level and seven at Category "B" level), including one new programme. The Board was also pleased to grant recognition to a new programme for Nautical Cartographers (the ninth of its kind) and to a new scheme for individual recognition (the second to be recognized). Seven of these thirteen submissions were recognized with certain preconditions that the Board required to be met in a short time. Worth noting was the increasing number of institutions successfully using e-learning and blended-learning tools to deliver parts of programme content.

The Board also reviewed progress made during the intersessional period in the revision of the Standards of Competence for Hydrographic Surveyors and Nautical Cartographers. The Board was able to complete the work on the Standards of Competence for Hydrographic Surveyors Category "A" (IHO Publication S-5A), incorporating a significant number of suggestions and recommendations received from the broad hydrographic community. The draft S-5A was submitted to the subsequent meeting of the Inter-Regional Coordination Committee (IRCC8) for endorsement.

Progress was also achieved in the revision of the Standards of Competence for Nautical Cartographers and the Board was able to complete the first draft of IHO publication S-8B that was introduced to IRCC8 for information and feedback, before distribution to the wider community for comment. The Board established ad-hoc working groups to continue the development of S-8B and to issue the first draft of S-8A in order to seek stakeholder feedback. Both S-8B and S-8A will be

submitted to the 9th session of the IRCC in 2017. Subject to endorsement by the IRCC and to the subsequent approval process, the new publications will eventually replace the current S-8 Edition 3.1.0.

The IBSC considered the ever increasing workload brought about by the large number of submissions for recognition, the maintenance of the Standards of Competence, the support and guidance to institutions seeking advice and the onsite visits to institutions holding recognized programmes. This workload is leading to the need for longer meetings and for continuous work during the intersessional period. This heavy workload is also impacting on the demands placed on the IHO Secretariat that supports the work of the Board.

The need to further support the institutions that submit programmes and schemes for recognition also occupied the Board during the meeting. The Board agreed to establish templates and checklists that will facilitate the preparation and improve the quality of the documentation submitted to the IBSC, thereby helping the institutions to ensure that their programmes comply with the Standards of Competence.

The Board elected Mr Adam Greenland (New Zealand, FIG representative) as the Chair for the next three years. Mr Ron Furness (Australia, ICA representative) and Captain Nickolás Roscher (Brazil, IHO representative) were elected as Vice-Chair 1 and Vice-Chair 2, respectively. The new Chair and Vice-Chairs took office on 30 September 2016.

It was agreed that the next meeting of the IBSC will take place from 20 to 31 March 2017 in Wellington, New Zealand. It is expected that more than 20 programmes and schemes will be reviewed during that meeting, together with the continuation of the maintenance of the Standards of Competence.

Task 3.3.8 Provide guidance to training institutions

The IHO Secretariat provided training institutions and other inquirers with guidance regarding the recognition and provision of training and education, when requested. 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.

Task 3.3.9 Maintain IBSC Publications (C-6, C-47, S-5 and S-8)

The IHO Secretariat and the IBSC worked on the revision of the structure and updating of IHO Publication C-47 - *Training Courses in Hydrography and Nautical Cartography* that is expected to be concluded in 2017.

Task 3.3.9.1 IBSC to develop a new Standards framework to separate competency requirements for Category "A" and Category "B" Hydrographic Surveyors and Nautical Cartographers

The IBSC had been working on the development of revisions to the standards, specifically the significant revision of S-5 - *Standards of Competence for Hydrographic Surveyors* and S-8 - *Standards of Competence for Nautical Cartographers* into a new framework of separate Standards (S-5A, S-5B, S-8A and S-8B. The revision process continued during the year by correspondence and through three working group meetings (Bandung, London and Singapore). In 2016 Member States approved the new Edition of S-5A which was scheduled to enter into force on 1 January 2017 (see IHO CL 50/2016). The draft S-8B was distributed to Member States for comments in October (see IHO CL 57/2016).

Element 3.4 Capacity Building Assessment

Task 3.4.1 Technical and Advisory Visits

Execution of the technical and advisory visits planned in 2016 are summarized in the following table:

Nº	Activity	RHC	Implementation
1	Technical Assessment & Advice - Samoa	SWPHC	Led by LINZ 8-12 August
2	High-level Visit to Tanzania	SAIHC	Cancelled
3	Technical Assessment & Advice – Tuvalu	SWPHC	Led by UKHO 2-13 November
4	High-level Visit to Azerbaijan	MBSHC	Led by IHO Secretariat 4-7 October
5	Technical Visit to Timor Leste	EAHC	Led by Malaysia 5-8 December
6	Technical Visit to Montenegro and Albania	MBSHC	Led by Turkey/Greece 28 November-2 December
7	Technical Visit to Cambodia	EAHC	Postponed to 2017
8	Haiti follow up visit	MACHC	Postponed to 2017
9	Technical Visit to Liberia	EAtHC	Led by IHO Secretariat/UKHO 3-5 February
10	High level visit to the Maritime Security Conference of Lomé, Togo	EAtHC	Led by SHOM 15 October
11	Technical visit to Niue (in-kind contribution from LINZ)	SWPHC	Led by LINZ 1-5 February

Task 3.4.2 Enhance publication C-55. IHO Secretariat with the support of the RHCs, CBSC and GGC to develop a new framework for C-55

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 is generated from a database that is continuously updated as an online service accessed from the download section of the IHO website. 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. A prototype is currently available to the Secretariat for trial. See also Task 3.6.1.

Element 3.5 Capacity Building Provision

Task 3.5.1 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, 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.

Task 3.5.1.1 Revise M-2 – The Need for National Hydrographic Services

The IHO Publication M-2 was updated (as Edition 3.0.6) to reflect the accession of new Member States and to reflect the entry into force of the amendments to the Convention on the IHO.

Task 3.5.2 Technical workshops, seminars, short courses

Execution of the seminars, workshops and short courses planned in 2016 are summarized in the following table:

Nº	Events	RHC	Implementation
1	ROK Category "A" Programme	Secretariat	Led by USM, Hattiesburg, USA 1 August 2016-1 August 2017
2	Training for Trainers - Basic Hydrography	EAHC	Led by KHOA, Busan, Korea 24 October - 4 November
3	ROK Category B Programme (second phase)	Secretariat	Led by KHOA, Busan, Korea 4 April-3 June
4	IHO - Nippon Foundation CHART Project	Secretariat	Led by UKHO, Taunton, UK 5 September-16 December
5	Seminar on Raising Awareness of Hydrography	MACHC	Led by UKHO, Belém, Brazil 12-13 December
6	E-learning experimentation (MSI)	EAtHC	Postponed to 2017
7	MBES Processing	NIOHC	Led by UKHO, Yangon, Myanmar, 6-10 June
8	Technical Workshop for PICTs in Formulating and Implementing Strategic Development Plans for Hydrography	SWPHC	Led by LINZ, Nouméa, New Caledonia 28 November-2 December
9	CB Assistant	Secretariat	Cancelled
10	Tide Training Course	SWAtHC	Led by DHN, Niteroi, Brazil 3-7 October
11	MSI Training	MACHC	Led by UKHO, Rodney Bay, St Lucia 16-18 August
12	Workshop on technics, methodology of MBES data processing	SEPRHC	Led by DIMAR, Cartagena, Colombia 22-26 August
13	Chart Scheming	NIOHC	Not funded
14	MSI Regional Workshop	SWPHC	Led by LINZ, Wellington, New Zealand 22-24 August
15	MBES setting to work project for Mozambique	SAIHC	Led by UKHO, Maputo, Mozambique 23 October - 05 November
16	Multi-beam Training Course	SWAtHC	Led by SHN, Buenos Aires, Argentina 12-17 September
17	MSDI Workshop for Spanish speakers	MACHC	Led by SEMAR, Veracruz, Mexico 3-7 October

Nº	Events	RHC	Implementation
18	Introduction to MSDI and Data Management	NIOHC	Led by UKHO, Visakhapatnam, India 20-24 June
19	Satellite Derived Bathymetry Workshop	MACHC	With activity No. 5
20	Advanced ENC Production	NIOHC	Led by UKHO, Colombo, Sri Lanka 25-29 April
21	Workshop on LIDAR technology for shallow waters	SEPRHC	With activity No. 12
22	ENC Production and QA	RSAHC	Led by UKHO, Bangkok, Thailand 30 January-3 February 2017
23	Satellite Derived Bathymetry	EAHC	Not funded
24	Cartographic Production Database System Workshop	EAHC	Not funded
25	Multi-beam Survey and Seabed Classification	EAHC	Not funded
26	ENC QA	NIOHC	With activity No. 22
27	Workshop on Multi-beam Echo Sounder and SSS Systems	MBSHC	Led by ONHO, Istanbul, Turkey 24-28 October
28	Regional Training Course in Basic Hydrography and Hydrographic Governance for Southern Africa	SAIHC	Not funded by the IMO
29	Regional Training Course in Hydrographic Field Operator for Francophone Africa	EAtHC	Not funded by the IMO
30	GEBCO Training Project	UNH	Led by UNH, Durham, USA August 2016-August 2017
31	Phase 1 Skills Training Course	SAIHC	Led by UKHO, Walvis Bay, Namibia 18-22 July

Task 3.5.3 IHO Secretariat, in conjunction with IBSC and CBSC, to encourage the development and delivery of new Hydrographic and Nautical Cartography Programs, including the establishment of new Hydrographic Schools where that regional capacity does not exist. Report to the IHO on the results

Through the work of the IBSC, CBSC and IHO Secretariat, new programmes continued to be developed as indicated by the new submissions to the IBSC (see Task 3.3.7).

Task 3.5.4 On the Job Training (ashore / on board)

No on the job training was reported during the period of this report.

Task 3.5.5 IHO Secretariat, with the support of CBSC and RHCs, to ensure awareness of multilateral or bilateral projects with hydrographic and/or cartographic components, and to provide advice to governments, project managers and funding agencies on the importance of including a hydrographic Capacity Building Component. Report to IHO annually on the results obtained.

The IHO Secretariat worked with France (SHOM) to assist Cabo Verde to prepare for the hydrographic and cartographic components of the IMO Member States Audit Scheme (IMSAS). The Secretariat also participated with IALA in a seminar on safety of navigation services for Lusophone African countries fostering bilateral and multilateral projects. The importance of bilateral and multilateral projects was also raised in all technical and advisory visits, including the high level visit to the Maritime Security Conference of Lomé, Togo (see Tasks 1.1.20 and 3.4.1), and during the

participation of the Secretariat in RHC meetings.

Task 3.5.6 CBSC to foster bilateral agreements in order to help satisfy SOLAS V/9

Technical visits (see Task 3.4.1) continued to be the principal way of identifying areas where bilateral agreements may help to further develop the provision of hydrographic services.

Element 3.6 Coordination of Global Surveying and Charting

Task 3.6.1 Publication C-55: Status of Hydrographic Surveying and Nautical Charting worldwide

During the report period, relatively few countries provided updates or confirmed the current entries shown in C-55. This limits the usefulness of the publication and its underlying data base. The following table lists the countries for which updates to existing C-55 entries were received in 2016:

IHO Member States	Non IHO Member States
Argentina	Angola
Australia	Cabo Verde
Brazil	Cook Is.
Colombia	El Salvador
Cuba	Equatorial Guinea
Denmark	Guinea Bissau
France	Haiti
Germany	Lithuania
Guatemala	Marshall Islands
Iceland	Nicaragua
India	Niue
Iran (I. R.)	Palau
Jamaica	Panama
Mauritius	Samoa
Mozambique	Sao Tome & Principe
New Zealand	Solomon Is.
Oman	Timor Leste
Pakistan	Tuvalu
Papua New Guinea	
Russian Federation	
Saudi Arabia	
South Africa	
Sri Lanka	
Sweden	
Thailand	
United States of America	
Uruguay	

Updates for the Antarctic region were also provided in 2016.

Task 3.6.2 WENDWG to foster the implementation of the WEND principles, monitor progress and report to IRCC

The principal objective of the WENDWG is to monitor and advise IRCC on the achievement of adequate ENC coverage that meets the SOLAS V/19 carriage requirements for ECDIS. The WENDWG submitted a number of proposals that were considered by the IRCC at its 8th meeting, and as reported under Tasks 3.0.1 and 3.1.17.

Task 3.6.3 RHC to coordinate ENC schemes, consistency and quality

In 2016, the Nautical Cartography Working Group (NCWG), in liaison with the INT Chart / ENC Regional Coordinators, finalized a new draft edition of IHO Publication S-11 Part A, the main purpose of which was to incorporate guidance relating to the preparation and maintenance of ENC schemes (see Task 2.3.2). This new edition was endorsed by the HSSC at its 8th meeting in November for submission and the approval of IHO Member States early in 2017. Based on this publication and following decisions made by the IRCC, RHC's 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.

As far as ENC coverage was concerned, the examination of the IHO ENC Catalogue, compiled primarily from data provided by the two established RENC organizations and the UKHO, showed that ENC small/medium scale coverage was generally satisfactory, though there were a number of instances of overlapping or duplicated data in the same usage band. As requested by the Member States, this IHO ENC Catalogue was improved in 2016, with the addition of various layers (the NGA PUB. 150 World Port Index, for example) and the possibility of making queries on ENC data attributes. The IHO ENC Catalogue is kept updated on a monthly basis.

Task 3.6.4 Maintenance of INT chart schemes and improvements of availability of the INT chart series

The purpose of the IHO INT chart series is to define and produce a set of medium and large-scale charts that are specifically designed for planning, landfall and coastal navigation and access to ports used by ships engaged in international trade. The designation of the limits and scale for each INT chart and the designation of which country will be the primary producer of each INT chart are managed by the relevant RHC.

The first workshop for INT Chart / ENC Coordinators took place at the IHO Secretariat in Monaco on 25 April, the day before the 2nd meeting of the Nautical Cartography Working Group (NCWG). Twenty delegates from 11 Member States (Australia, Brazil, Canada, Finland, France, Germany, Korea (Rep. of), Netherlands, Norway, United Kingdom, USA), and the IHO Secretariat attended the workshop. The INT Chart / ENC Coordinators of 14 out of 15 charting regions were present or represented. The workshop was moderated by Assistant Director Yves Guillam, supported by Mr Daniel Menini and Mr Yong Baek (seconded officer from ROK) from the Secretariat.

President Robert Ward highlighted the importance of this information session on the use of the new web-based services for the efficient maintenance of S-11 Part B – Catalogue of INT charts in each region, and for improving the quality of the underlying database.

The principal objective of the workshop was to inform the Regional Coordinators of the tutorials available and the tools that can facilitate their day-to-day tasks in accordance with the Guidelines available in Publication S-11 for the maintenance of INT charts schemes and the production of INT charts. A comprehensive demonstration of the new INToGIS web-based INT chart scheme management tool was provided.

As a result of using the new INToGIS web services, the tempo for updating the S-11 Part B (Catalogue of INT Charts) increased significantly in 2016, as well as the quality of the database. The following

table summarizes the status of the INT chart scheme at the end of 2016, according to the new S-11 Part B INTernational Chart Web Catalogue:

Region	Coordinator	Commission	Scheduled	New publications reported in 2016	Published Total	Regional Database Version
A	USA/NOS	USCHC	15	0	15	3.0.0
B	USA/NOS	MACHC	82	2	49	3.0.0
C1	Brazil	SWAtHC	51	0	34	3.0.1
C2	Chile	SEPRHC	44	0	7	3.0.0
D	UK	NSHC	215	0	215	3.0.3
E	Finland	BSHC	299	3	287	3.0.5
F	France	MBSHC	240	1	167	3.0.1
G	France	EAtHC	172	1	139	3.0.3
H	South Africa	SAIHC	125	5	93	3.0.2
I	Iran (I.R of)	RSAHC	117	1	68	3.0.0
J	India	NIOHC	172	0	132	3.0.0
K	Japan	EAHC	294	0	240	3.0.0
L	Australia	SWPHC	62	1	58	3.0.0
M	UK	HCA	117	1	78	3.0.1
N	Norway	ARHC	12	0	8	3.0.0
1 :10 Million	IHO Sec.		25	0	24	3.0.0

Total of INT charts scheduled: 2042

Total of INT charts produced in 2016: 15 (0.7% of the total scheduled)

Total of INT charts published by end 2016: 1614 (79.0% of the total scheduled)

In August 2015, a two-year trial procedure for the review of new INT charts, to be implemented by the relevant Regional INT Chart Coordinators, was decided (see IHO CL 64/2015). In order to support the work of the Chart Coordinators, a "*basic quality assurance check-list for review of INT charts*" was prepared by the IHO Secretariat in liaison with the NCWG. A report on this new regime is expected from the Chart Coordinators by the end of March 2017, so it can be considered by the NCWG in May 2017, then by the IRCC. Possible proposals to amend existing related IHO Resolutions may be made subsequently.

Element 3.7 Maritime Safety Information

Task 3.7.1 Sub-Committee on the World-Wide Navigational Warning Service

The Sub-Committee on the World-Wide Navigational Warning Service (WWNWS-SC) monitors and guides the IHO/IMO World Wide Navigational Warning Service which includes NAVAREA and coastal warnings. The Sub-Committee is responsible for studying and proposing new methods to enhance the provision of navigational warnings to mariners at sea, facilitating the implementation of the major changes in procedures for dissemination of navigational warnings and providing appropriate guidance to concerned IHO Member State representatives to further the evolution of the WWNWS. The Sub-Committee also maintains a close liaison and cooperation with the World Meteorological Organization (WMO) for its Worldwide Met-Ocean Information and Warning Service (WWMIWS).

The 8th meeting of the WWNWS-SC (WWNWS8) was hosted by the Norwegian Coastal Administration (NCA) and held at the Quality Waterfront Hotel, Ålesund, Norway, from 12 to 16 September under the chairmanship of Mr Peter Doherty (USA). Mr Arve Dimmen, Director of Maritime Safety at the NCA, welcomed the meeting which was attended by 38 delegates from 18 IHO Member States, the Secretariat of the IMO, the Secretariat of the WMO, the Secretariat of the International Mobile Satellite Organization (IMSO), the Chairs of IMO NAVTEX and International SafetyNET Coordinating Panels, Inmarsat and Iridium. The delegates included representatives of 16 NAVAREA Coordinators, one Sub-Area Coordinator and three National Coordinators. The IHO Secretariat was represented by Assistant Director David Wyatt.

The Sub-Committee reviewed the WWNWS documentation, including the proposed editorial amendments to the IMO Resolutions A.705(17), as amended - *Promulgation of Maritime Safety Information*, A.706(17), as amended - *World-Wide Navigational Warning Service*, and A.1051(27) - *World-Wide Met-Ocean Information Warning Service* - prepared at the 14th meeting of the Document Review Working Group (DRWG), received MSI self-assessment reports (see Tasks 3.7.2 and 3.7.3) assessed the content and success of the MSI Capacity Building training courses delivered during the year and prepared a report on the outcome of the meeting for submission to the fourth session of the IMO NCSR in 2017.

The delegates received briefings on e-Navigation and a new e-Broadcast system from Australia, SONSAT (Security of Navigation, Stabilisation, Advice and Training, including the Admiralty Warning and Navigational Information Service (AWNIS)) from the United Kingdom and developments in the provision of mobile satellite Global Maritime Distress and Safety System (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.

The Sub-Committee embarked in the ferry *MS Richard With* to hold focused sessions covering various aspects of Capacity Building (CB). The sessions were led by the CB Regional Coordinator of the East Atlantic Hydrographic Commission (EAtHC), Mr Eric Langlois (France). The sessions considered progress reports on the delivery of MSI training courses, and discussed the processes for reporting the status of MSI provision at RHC meetings and methods for identifying to the Capacity Building Sub-Committee the regions and coastal States most in need of training and assistance.

The next meeting of WWNWS-SC is to be held in Cape Town, South Africa from 28 August to 1 September 2017. This meeting will be followed by a Capacity Building MSI Training Course for the Southern African and Islands Hydrographic Commission (SAIHC) region.

Task 3.7.2 WWNWS Document Review Working Group and Task 3.7.3 Maintain and extend the following IHO standards, specifications and publications

The WWNWS relies on various IMO/IHO documents to provide guidance for the promulgation of internationally coordinated NAVAREA and coastal warnings. The WWNWS system uses SafetyNET and NAVTEX for the dissemination of MSI. Each has its own guidance document. The WWNWS ensures that there is 100% consistency between these documents.

The Document Review Working Group (DRWG) met in the week after the third session of NCSR and commenced editorial amendments to the IMO Resolutions A.705 (17), as amended - *Promulgation of Maritime Safety Information*, A.706 (17), as amended - *World-Wide Navigational Warning Service*, and A.1051 (27) - *World-Wide Met-Ocean Information Warning Service*. The editorial reviews of these resolutions were continued at WWNWS8.

The outcomes of IMO NCSR3 relevant to the WWNWS-SC were reviewed, which included a number of Correspondence Groups and groups developing equipment guidelines in which WWNWS-SC members should be involved. The Chair provided a brief on his recent presentation to the IOC Working Group on Tsunamis and Other Hazards Related to Sea-Level Warning and Mitigation Systems (TOWS-WG) that resulted in agreement by the TOWS-WG for greater engagement with the WWNWS-SC.

It was decided at WWNWS8 that the 15th meeting of the Document Review WG (DRWG15), in addition to continuing work on IMO Resolutions A.705(17), as amended, and A.706(17), as amended, would undertake a review of the IMO Resolutions A.664(16) - *Performance standards for enhanced group call equipment*, MSC.305(87) - *Guideline on operational procedures for the broadcast of maritime safety information concerning acts of piracy and piracy countermeasure operations*) and MSC.306(87) - *Revised performance standards for enhanced group call (EGC) equipment* and prepare proposed amendments for consideration at WWNWS9 in 2017 and subsequent submission to NCSR5 in 2018. Additionally it was agreed to include the MSI CB course training material in the review cycle to ensure it reflected the recent amendments to the Joint MSI Manual and the proposed revisions to the SafetyNET and NAVTEX Manuals.

It was agreed to finalize the work on IMO Resolution A.1051 (27) - *IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document* in preparation for submission to IMO NCSR4 in 2017. Subsequent to WWNWS8, it was decided by the WMO that, due to the recent certification of Peru as the new METAREA XVI Coordinator and the forthcoming 5th session of the WMO-IOC Expert Team on Marine Safety Services (ETMSS5), it would be better to consider these developments and submit the proposed amendments to IMO Resolution A.1051 (27) (*IMO/WMO Worldwide Met-Ocean Information and Warning Service – Guidance Document*) to a later meeting of the IMO NCSR. Additionally the IMO Secretariat suggested aligning the revision of this Resolution with the next round of revisions to IMO Resolutions A.705(17) and A.706(17), as amended, submission of which are not due until NCSR5 (in 2018) at the earliest, and which could include the results of the GMDSS Modernization.

It was agreed that Inmarsat would provide proposed amendments to the Inmarsat SafetyNET Users' Handbook for consideration at DRWG15. Iridium agreed to develop appropriate documentation to support its proposed GMDSS service; this would follow the format of the International SafetyNET Manual but remain a separate document until the system had been recognised by the IMO and a mature operational state had been achieved, after which consideration for a single generic manual for the two systems would be contemplated.

Task 3.7.4 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 for the high seas under the GMDSS. The objective of the course is to increase the flow of MSI to NAVAREA Coordinators for promulgation, and ultimately to emphasize the importance of establishing expertise in the countries within these NAVAREAs, to fulfil their role of National Coordinators.

The Sub-Committee received updated information on the delivery of MSI training courses and the need for the NAVAREA Coordinators to work closely with the Regional CB Coordinators to help developing nations to reach the Phase 1 level (collection and circulation of nautical information, necessary to maintain existing charts and publications up to date) of the IHO CB Strategy. As part of this cooperation, the proposed text of an MSI assessment to be included in national reports to RHC meetings was discussed. The meeting was informed that MSI courses had been conducted in 2016 in St Lucia for members of the Meso American - Caribbean Sea Hydrographic Commission and in Wellington, New Zealand, for members of the South West Pacific Hydrographic Commission. Additionally it was noted that a further three courses were planned in 2017 for the MACHC, North Indian Ocean Hydrographic Commission and the South Africa and Islands Hydrographic Commission.

A critical issue for the continued success of the MSI course was the lack of qualified trainers; the Chair noted there was only one French instructor qualified and available to deliver the MSI course, which restricted the opportunities for delivering courses in languages other than English. It was suggested that a course could be developed to train new trainers, who had a suitable background and the necessary operational experience. It was recognised this would need to be funded and included in the IHO CB strategy plan. It was recommended this issue be raised at the next meeting of the IHO Capacity Building Sub Committee. The meeting recorded its thanks to Australia, France,

New Zealand, UK, and USA for their significant support in conducting the training courses and in the work undertaken in addressing the continuing requirement to review the training material to ensure consistency with the amended supporting documentation.

Task 3.7.5 Contribute to the IMO work items on the modernization of GMDSS

The WWNWS-SC reviewed the relevant matters considered and decisions taken during the 96th session of the IMO Maritime Safety Committee (MSC96) and the third session of the IMO NCSR. The WWNWS-SC, through the IHO, again raised its concerns at IMO NCSR that the company Iridium had provided limited details on how it might fulfil the requirements outlined in IMO Resolution A.1001 (25) - *Criteria for the Provision of Mobile Satellite Communication Systems in the GMDSS*. Iridium is the first commercial satellite provider other than Inmarsat, to attempt to gain approval based on IMO Resolution A.1001 (25).

The Secretariat of the IMO provided a brief on the modernization of the GMDSS and the GMDSS Master Plan, noting the next revision would be issued in mid-September after approval by the Chair of the IMO NAVTEX Coordination Panel and after consultation with the Chair of the IMO SafetyNET Coordinating Panel. The representative of the IMO Secretariat urged that all Area Coordinators provide relevant input to the GMDSS modernization Correspondence Group. The contents of the relevant Annexes of the GMDSS Master Plan were reviewed. The IHO Secretariat highlighted a number of differences between the same information contained in the Annexes of the GMDSS Master Plan and that contained in IHO Publication C-55 – *Status of Hydrographic Surveying and Nautical Charting Worldwide*. NAVAREA Coordinators were requested to highlight to National Coordinators the conflicting information in the two documents and to request they investigate to ensure consistency for their national entries.

Task 3.7.6 Improve the delivery and exploitation of MSI to global shipping by taking full advantage of technological developments

WWNWS-8 considered self-assessment reports from all 21 NAVAREAs. The MSI Self-Assessment document requires NAVAREA Coordinators to complete an MSI Quality Management Survey. There was a pleasing high level of consistency of service described in all of the reports. A number of issues were highlighted, which required further investigation and input from the Chair of the WWNWS-SC, as well as the Chairs of the IMO SafetyNET and NAVTEX Coordinating Panels. The Chair of the Sub-Committee agreed to assist NAVAREA Coordinators, through the IHO Secretariat, to gain the support of National Coordinators in ensuring that all SOLAS MSI responsibilities were being met.

The Secretariat of the WMO provided a brief on the activities of the Organization over the past year, this included details of the work programmes of the six regional associations and working groups and their activities, the need for increased cooperation between NAVAREA and METAREA Coordinators and the continuous emergency response capability were all highlighted, as well as the activities of the regional training and global training centres.

The Secretariat of IMSO provided a presentation on the activities of IMSO and an up-date on the technical assessment of the Iridium system as it seeks recognition as a new GMDSS mobile satellite service provider.

The Chair of the IHO S-124 Correspondence Group updated the Sub-Committee on the progress in the development of the S-124 Navigation Warning Product Specification based on S-100. NAVAREA X provided a presentation on the e-Broadcast capability developed by the Australian Maritime Safety Authority (AMSA), which included a live on-line demonstration of the capability. Inmarsat reported on progress on the Inmarsat-C EGC SafetyNET system developments, including the new SafetyNET II system. Iridium provided an update on developments of the Iridium Satellite system, as the process towards approval recognition as a mobile satellite GMDSS service provider progresses.

Element 3.8 Ocean Mapping Programme

The GEBCO Project is a joint programme that is executed under the governance of the IHO and the IOC. GEBCO is directed by a Guiding Committee (GGC) made up of representatives from both IHO and IOC and is supported by a Technical Sub-Committee on Ocean Mapping (TSCOM), a Sub-Committee on Undersea Feature Names (SCUFN), a Sub-Committee on Regional Undersea Mapping (SCRUM), and a Nippon Foundation/GEBCO Training Project Management Committee. Additional ad hoc working groups are convened as necessary. Through the work of its organs, GEBCO produces and makes available a range of bathymetric data sets and products, including gridded bathymetric data sets, the GEBCO Digital Atlas, the GEBCO world map, the GEBCO Gazetteer of Undersea Feature Names and the GEBCO Cook Book. GEBCO maintains a comprehensive website at http://www.gebco.net. The progress of the GEBCO Project is reported below.

A series of meetings and workshops were held in Monaco from 15 to 17 June as part of a Forum for Future Ocean Floor Mapping organized by the GGC through the support of the Nippon Foundation of Japan with assistance from the IHO Secretariat.

The Forum was preceded by a Polar Mapping Workshop held at the IHO Secretariat on 12 and 13 June, at which around 40 ocean mappers, scientists, cartographers and hydrographic surveyors gathered to discuss ways to progress new editions of the International Bathymetric Chart of the Southern Ocean (IBCSO) and the International Bathymetric Chart of the Arctic (IBCA), what additional data has been gathered but is not reflected in the maps and how to obtain this additional and very useful data. The chairs of the Arctic Regional Hydrographic Commission (ARHC), Mr Denis Hains, Hydrographer-General of Canada, and the Hydrographic Commission on Antarctica (HCA), President Robert Ward, gave presentations on the current state of charting and the problems that the lack of bathymetric data for the regions is causing.

The polar mapping workshop was followed by a day of briefings for alumni from the Nippon Foundation Ocean Mapping course at the University of New Hampshire, USA. Approximately 45 alumni students were welcomed to the IHO by President Robert Ward, before receiving briefings on the Forum and their role in it. Mr Yohei Sasakawa, Chairman of the Nippon Foundation, joined the alumni for part of their meeting.

The Forum opened at the *Musée océanographique* in Monaco with approximately 200 delegates from a wide community of participants, including hydrographers, oceanographers, cartographers, and representative from industry, science and academia. The Forum was honoured by the presence of His Serene Highness Prince Albert II of Monaco, who opened the Forum and inaugurated the associated GEBCO and Nippon Foundation poster display. During his address Mr Yohei Sasakawa challenged the delegates to complete mapping the ocean floor by 2030. Seven IHO Member States were represented by their national Hydrographers and senior representatives from a number of other IHO Member States' Hydrographic Offices were also present. Opening addresses were delivered by President Ward and Dr Thorkild Aarup, representing the Executive Secretary of the IOC. These addresses were followed by thought-provoking presentations by Dr Robert Ballard, Professor Larry Mayer, Mr David Heydon, Ms Kristina Gjerde, Ms Jyotike Virmani and Mr Bjorn Valving. Mr Simon Winchester, notable author and raconteur, closed the first day with his observations on the history and significance of the oceans to mankind.

The second day of the Forum consisted of four panel sessions which addressed:

- The Use of bathymetry: the deep ocean perspective,
- The Use of bathymetry: the coastal perspective,
- New tools and techniques in ocean mapping, and
- Mapping the world ocean floor.

P-7

These panel sessions generated active participation with all four themes being explored through wide-ranging comments and discussion. These sessions led into a third day, that consisted of four focus group sessions, which explored the issues raised on the second day and discussions on how to take the key items forward to develop a roadmap for the next 10 to 15 years of GEBCO activity and to provide input to the Forum communiqué.

Task 3.8.1 Conduct meetings of relevant GEBCO bodies

Task 3.8.1.1 GEBCO Guiding Committee

The 33rd meeting of the GEBCO Guiding Committee (GGC) was held in Valparaíso, Chile, from 13 to 14 October. Director Mustafa Iptes and Assistant Directors Anthony Pharaoh and David Wyatt (GGC Secretary), represented the IHO secretariat.

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. A detailed report was received covering education and outreach activities, the results of a year-long focused study.

The Chair of the Sub-Committee on Undersea Feature Names (SCUFN) highlighted difficulties that had been experienced with regard to some submissions considered at the recent SCUFN29 meeting in Boulder, Colorado. He presented some proposed revision to the SCUFN Terms of Reference (ToR) and its Rules of Procedure (RoP), which are aimed at clarifying the procedures at future meetings. The GGC advised the Chair of SCUFN to request the IHO-IAG Advisory board on the law of the sea (ABLOS) to provide relevant technical clarification and guidance to enable the further development of suitable texts for the revision of the ToR and RoP, thereby enabling the SCUFN to better consider proposals that occur in the sea area between national territorial waters and the Area Beyond National Jurisdiction. It was proposed that the proposed new texts, once adjusted, should be included in the report of the 29th meeting of SCUFN and subsequently considered for endorsement by the GGC by correspondence.

The GGC discussed outreach and ways to raise the profile of the GEBCO project among the different stakeholder and user communities including the Member States of the IHO and the IOC, the maritime and scientific community, and the general public. It was noted that different strategies would be required for each of these groups. The GGC devoted considerable time to discussions on its proposed Seabed 2030 Project, including the structure, governance, oversight and reporting of the Project. The Seabed 2030 Project Establishment Team presented a draft Roadmap and Business Plan and

requested GGC endorsement to continue the development of the project, including a submission to the Nippon Foundation for funding support.

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 contingency balance of 9,000€ was maintained for 2017 to cover emergent items. The draft consolidated GEBCO Work Plan and budget was to be reported to the 9th meeting of the IHO Inter-Regional Coordination Committee (IRCC) and the 29th meeting of the IOC Assembly, for consideration and endorsement.

It was agreed that the 34th meeting of the Committee would take place, together with meetings of TSCOM, SCRUM and the GEBCO Science Day, in Busan, Republic of Korea, during the week 13 to 17 November 2017.

Task 3.8.1.2 Technical Sub-Committee on Ocean Mapping (TSCOM) and Task 3.8.1.3 Sub-Committee on Regional Undersea Mapping (SCRUM)

The GEBCO Technical Sub-Committee on Ocean Mapping (TSCOM) and the Sub-Committee on Regional Undersea Mapping (SCRUM) held a joint meeting from 10 to 11 October in Valparaíso, Chile. The meeting was co-chaired by Dr Karen Marks (USA), (Chair of TSCOM), and Professor Martin Jakobsson (Sweden), (Chair of SCRUM).

The TSCOM is responsible for producing and maintaining the GEBCO global digital grids which are used by ocean scientists, academia, map producers and many other communities.

The meeting reviewed new contributions of bathymetric data that had been received in coastal and shallow water. A new GEBCO 30 arc-second global grid will commence production in 2017. The new grid will be based on the existing GEBCO_2014 grid and will include new data contributions from New Zealand Regional Bathymetry grids, the Global Multi-Resolution Topography Data Synthesis (GMRT) grid and ENC sounding recently provided by IHO Member States (which include Argentina, Colombia, Brazil, Ukraine, and Uruguay). Bathymetry compilations for the Aleutian Islands, Cook Inlet, central Gulf of Alaska and Norton Sound will also be included as well as new track line bathymetry from the IHO Data Centre for Digital Bathymetry (DCDB). Figure-A illustrates new bathymetric data that is available for inclusion in the new GEBCO Global grid.

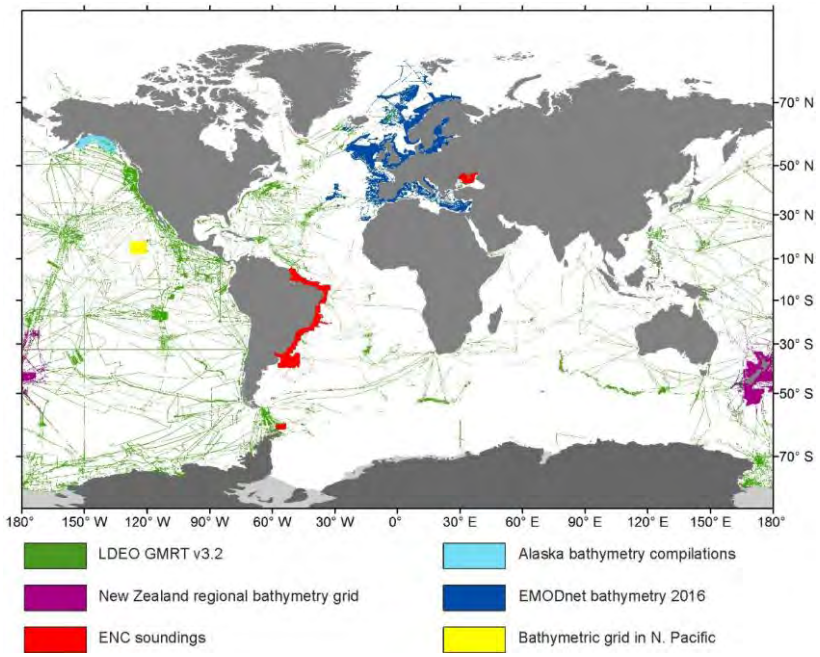


Figure-A New sources of bathymetric data.

Reports were provided on a number of topics that included the Forum for Future Ocean Floor Mapping, the EMODnet Project, the development of a Digital Elevation Model based on High Seas

Data, Remodelling of the GEBCO Undersea Feature Names Database, the Indian Ocean bathymetric grid, the Canadian regional mapping programmes, and the status of the International Bathymetric Chart of the Arctic Ocean.

At the conclusion of the SCRUM meeting Professor Martin Jakobsson stood down as Chair and was replace by Ms Vicki Farrini (USA).

Task 3.8.1.4 Sub-Committee on Undersea Feature Names (SCUFN)

The 29th meeting of the IHO-IOC GEBCO Sub-Committee on Undersea Feature Names (SCUFN) was hosted at the National Center for Environmental Information (NCEI) of the National Oceanic and Atmospheric Administration (NOAA), in Boulder, Colorado, USA, from 19 to 23 September.

SCUFN is tasked with selecting the names of undersea features to appear in the products of the IHO-IOC General Bathymetric Chart of the Oceans (GEBCO) project and on international nautical charts. These names, widely used in scientific publications also, are made available in the GEBCO Gazetteer of Undersea Features Names (www.gebco.net => Data and products => Undersea feature names => view and download).

The meeting, chaired by Dr Hans Werner Schenke (IOC representative) from the Alfred Wegener Institute for Polar and Marine Research (AWI - Germany), was attended by 25 participants, including 10 of the 12 SCUFN members (five IOC and five IHO representatives), together with 14 observers including Mr Shin Tani (Chair of the GEBCO Guiding Committee) and Mr Osamu Miyaki (IOC Secretariat). Assistant Director Yves Guillam (SCUFN Secretary) represented the IHO Secretariat.

The meeting was opened by the Chair of SCUFN who welcomed all the participants and introduced the two new SCUFN Members: Ms Roberta Ivaldi (Italy, IHO representative) and Ms Ksenia Dobrolyubova (Russian Federation, IOC representative). He also paid tribute to Mr Norman Cherkis who informed the members in August that he wished to step down from his position in SCUFN. In accordance with the SCUFN Terms of Reference, the Secretary informed the meeting of several further anticipated changes to the membership due to occur in 2018 and presented the timeline for the IHO and IOC Secretariats to prepare calls for nominations to fill vacancies.

The Sub Committee considered proposals for 133 undersea feature names, submitted by various bodies and supporting organizations from the following countries: Brazil (7), China (50), Denmark (1), Dominican Republic (2), France (1), Japan (23), Republic of Korea (2), Malaysia (4), New Zealand (31), Russian Federation (1), UK (3) and USA (8). The Sub Committee decided to follow the experimental fast-track procedure in its review of the proposals made by Canada (12) and New Zealand (84) related to names that already appear on nautical charts. It was agreed that for the time being SCUFN could not consider in a systematic manner the other 139 names that had been proposed by Canada for international recognition by SCUFN because they relate to features located in its territorial sea. This outstanding task will be addressed later, subject to the establishment by the IHO Hydrographic Services and Standards Committee (HSSC) of an S-100 Undersea Feature Names Project Team for which draft Terms of Reference were endorsed at the meeting, thanks to input provided by Canada.

While a large number of the names proposed to the Sub Committee were accepted, decisions on some others were postponed for further consideration for various reasons, including the increasing number of submissions now being received and the lack of time available during the meeting.

In addition to consideration of the naming proposals, the Sub Committee considered several "corporate" issues, including:

- The maintenance and improvement of the GEBCO Gazetteer interface,
- The ways and means to improve the efficiency and quality of SCUFN activities (inter connexion of the web services that already exist: the IHO SCUFN webpage, the internal SCUFN submission and review web services developed by the Republic of Korea, and the GEBCO Gazetteer itself maintained by NOAA),
- The future of SCUFN (membership, scope, new Edition of B-6 - *Standardization of Undersea Feature Names (Guidelines, Proposal Form Terminology)* - including the integration of a fast-track procedure for existing names which are already charted, the capitalization of best practices, the relations between naming authorities in common areas of interest, etc.),
- The increasing resources needed to incorporate SCUFN naming decisions into the GEBCO Gazetteer and the fact that this can only be achieved by contracting out some work during the inter-sessional period.

As a consequence of a contract awarded in 2015, the SCUFN Members were pleased to note a decrease in the total number of pending names (proposals and related actions) between 2015 and 2016.

Task 3.8.2 Ensure effective operation of IHO Data Centre for Digital Bathymetry

Since its inception, the IHO Data Centre for Digital Bathymetry (DCDB) has become a prominent repository of digital oceanic bathymetry and is used by IHO Member States and other ocean science communities. The IHO DCDB facility is generously hosted and operated by the National Oceanographic and Atmospheric Administration (USA) on behalf of the IHO Member States.

The IHO DCDB data store contains oceanic soundings that have been acquired by hydrographic, oceanographic and other vessels during surveys or while on passage. These data are used for the production of improved and more comprehensive bathymetric maps and grids, particularly in support of the GEBCO Ocean Mapping Programme (see Tasks 3.8.4 and 3.8.5). Bathymetric data located at the IHO DCDB can be viewed/filtered via a web map interface, and freely downloaded. The map interface can be accessed from: http://maps.ngdc.noaa.gov/viewers/bathymetry/.

Task 3.8.2.1 Crowd-Sourced Bathymetry

As a result of Decision 8 of the EIHC-5, the IRCC established a Crowd-sourced Bathymetry Working Group (CSBWG) at its seventh meeting (see IHO CL 42/2015).

The CSBWG was tasked to examine how best to incorporate, manage and use bathymetric data acquired by other than conventional means and develop principles and guidelines to enable the appropriate collection and use of crowd-sourced bathymetry for the benefit of all stakeholders interested in knowing the shape and nature of the seafloor and its depths.

The CSBWG was also tasked to draft an IHO publication on policy for trusted crowd-sourced bathymetry including guidelines on the collection and assessment of CSB data, not only for potential use for charting purposes but also for its wider use in non-navigational applications. The publication should take into account the work to enhance the IHO DCDB as a data discovery and upload/download portal for Crowd-Sourced Bathymetry and lessons learned and specifications created during the IHO CSB pilot projects. See Terms of Reference and Work Program for further information.

The working group held its second meeting at the offices of the National Oceanographic and Atmospheric Administration (NOAA) - National Centers for Environmental Information (NCEI) in Boulder, Colorado, USA on 10 and 11 February. The Chair of the CSBWG, Ms Lisa Taylor (USA), chaired the meeting which was attended by representatives from three Member States (Italy, Japan and USA), and observers and expert contributors from Olex AS and Sea ID, which are two companies

involved in crowd-sourcing technologies. Assistant Director David Wyatt (CSBWG Secretary) represented the IHO Secretariat.

The CSBWG received verbal reports from the coordinators of its Correspondence Groups. The reports covered metadata and data formats, uncertainty, and systems and hardware. Discussion sessions were held with the systems developers working on enhancements to the DCDB database and user web-portal and NOAA legal counsel for the USA Extended Continental Shelf Project Office. The meeting focused on the structure and contents of the CSB Guidance Document to be presented as an initial draft to the IRCC at its 8th meeting in Abu Dhabi, UAE in May. Work on this was proceeding well.

The working group held its third meeting at the offices of the Leibniz Institute for Baltic Sea Research (IOW) in Warnemünde, Germany on 7 and 8 November. The new Chair of the CSBWG, Ms Jennifer Jencks (USA, and Director of the DCDB), chaired the meeting which was attended by representatives from ten Member States (Canada, Denmark, Finland, France, Germany, India, Italy, Norway, Portugal and USA), and observers and expert contributors from SevenCs and Sea-ID. Secretary-General Robert Ward and Assistant Director David Wyatt represented the IHO Secretariat. Mr Serge Gosselin (Canada) was elected as vice-Chair of the Working Group to occupy the previously vacant position.

The CSBWG received verbal reports from the coordinators of its Correspondence Groups that had been tasked with drafting specific sections of the Guidelines. During the meeting the various draft sections of the guidelines were developed further. It was agreed that an initial draft version would be circulated to IHO Member States and targeted stakeholders for their comments in preparation for the presentation of a draft to the IRCC at its 9th meeting in Paramaribo, Suriname, in June 2017.

It was agreed that a further meeting of the working group would be beneficial to review the comments received on the initial draft prior to the IRRC9. It was therefore planned to hold a fourth meeting of the CSBWG on 13 and 14 February 2017 at the University of New Hampshire, USA. This would be followed by a meeting of the Atlantic Seabed Mapping International Working Group (ASMIWG).

The ASMIWG was established in 2015 to address seabed mapping issues related to the implementation of the Galway Statement of 2013 through which the European Union (EU), USA and Canada agreed to join forces on Atlantic Ocean research. The working group held two meetings in 2016: the 5th meeting was held at the Marine Institute in Rinville, Galway, Ireland, on 29 June and the 6th meeting at the offices of the Leibniz Institute for Baltic Sea Research (IOW) in Warnemünde, Germany, on 11 November. Both meetings were chaired by Mr Alan Stevenson, British Geological Survey (BGS) / EuroGeoSurvey Marine Geology Expert Group (EGS MGEG) with representatives from the EU, Canada and USA as well as representatives from the European Commission (EC) and Non-Governmental Organizations. Assistant Director David Wyatt represented the IHO and the GEBCO Project at both meetings.

The working group reviewed the progress of its work plan and the direction and guidance provided from the Canada-EU-US Tripartite Implementation Committee. The meetings received information on North Atlantic transects undertaken in *L'Atalante*, a research vessel operated by *Institut français de recherche pour l'exploitation de la mer* (IFREMER) (French Research Institute for Exploration of the Sea), *Celtic Explorer*, a research vessel operated by the Marine Institute of Ireland (INFOMAR), and the Canadian Coast Guard vessel CCG *Louis S. St-Laurent* en route to the Arctic. The working group also welcomed two new datasets received from Portugal and Spain covering their Continental Shelf extension submissions.

Updates were provided on progress with the developments to the IHO DCDB and the North Atlantic Data Viewer, where data gathered during transects will be made publically available. Additionally, update briefs were provided on the activities of the Ocean Literacy WG, EMODnet, International Research Ship Operators (IRSO), IHO CSBWG, GEBCO Forum for Future Ocean Floor Mapping GEBCO Seabed 2030 Project, "*A Trans-Atlantic assessment and deep-water ecosystem-based spatial management plan for Europe*" (ATLAS) and "*Deep-sea Sponge Grounds Ecosystems of the North Atlantic*" (SponGES), European Global Ocean Observing System (EGOOS) and Atlantic Ocean Research Alliance Coordination and Support Action (AORA CSA).

The working group was informed that Canada would assume the position of Chair of the ASMIWG from 1 January 2017 and that the position of Research Vessel Coordinator (RVC) would be funded by the Canadian Hydrographic Service (CHS) initially for a period of two years. The RVC would be responsible for identifying transect opportunities, liaising with appropriate authorities and organizations to obtain vessel berths and time, and filling the berths with suitably qualified personnel to gather and process the data obtained for inclusion in the AORA database.

The Marine Institute of Ireland (Infomar) reported that it had provided data from recent transects to the BBC for use in the Blue Planet II television series.

Taking into account the directive of the Tripartite Implementation Committee, a draft 'Next steps' document and recommendations were created. This would report on activities to date, proposals for future actions and the identification of pilot project areas, highlighting the benefits of each area. These areas would be generated from a series of prioritised 400 square-mile rectangles covering unsurveyed sections of the North Atlantic, the limits of which, it was agreed, would follow the limits detailed in IHO Publication S-23 - *Limits of Oceans and Seas*. It was noted that the report should be submitted to the Implementation Committee by the end of January 2017.

Participants were briefed on the new AORA website (http://www.atlanticresource.org) created to support the ASMIWG activities and the SharePoint application for use by ASMIWG members to share documents and into which all meeting documents and presentations have been placed.

At the end of the 6th meeting, Mr Stephen Locke (Natural Resources Canada) took over the role of Chair of the ASMIWG. The Implementation Committee confirmed that the next, and seventh, meeting of the ASMIWG would take place at the University of New Hampshire, USA on 15 and 16 February 2017.

Task 3.8.3 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 (see Task 3.8.4).

Task 3.8.4 Maintain IHO bathymetric publications:

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

Bathymetric data from ten multi-beam and single beam surveys were added to the IHO DCDB during 2016. These data can be viewed or downloaded using the web mapping facility provided at: http://maps.ngdc.noaa.gov/viewers/bathymetry/.

In response to IHO CL 11/2016, reiterating the request that Member States provide bathymetry in coastal and shallow water areas, contributions were received from Argentina, Colombia, Brazil, Ukraine, and Uruguay. An index of data received is available from the GEBCO website at http://www.gebco.net/data_and_products/gridded_bathymetry_data/shallow_water_bathymetry/.

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

Edition 4.1.0 of Publication B-6 on the Standardization of Undersea Feature Names entered into force in September 2013. It provides guidelines for naming features, a naming proposal form and a list of generic terms with definitions. A draft new Edition of B-6 was developed through contract support to include the outcome of the work done by the SCUFN Generic Term Sub-group and some editorial corrections. The SCUFN agreed to put on hold the preparation of the new Edition, due to the development and experimentation of the fast-track procedure for already-charted existing features. The sub-committee decided to consider further any short term requirements for clarifications.

In order to address the need to harmonize under the S-100 framework the undersea feature names definitions that already exist in B-6, in the Feature Concept Dictionary of the IHO GI Registry, in the S-57 Feature Catalogue and in the IHO Hydrographic Dictionary S-32, the SCUFN developed a proposal to create an Undersea Feature Names Project Team (UFNPT). Following its endorsement by the HSSC, the establishment of the project team will be initiated in early 2017.

- ***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)), was maintained by the IHO Secretariat through contract support (see Task 3.8.8). Some maintenance issues and the requirements for possible upgrades were further investigated.

- ***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. No update was issued in 2016.

- ***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. The Cook Book has been adopted as an important resource by the University of New Hampshire, the Texas A&M University and various other educational institutions.

B-11 was updated in July and in December. The updates include two new sections in chapter 13 on the use of CARIS tools and a new chapter 15 on Map Digitizer Program Version 2.1.0.

Task 3.8.5 Contribute to outreach and education about ocean mapping

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

The GEBCO Outreach Working Group considered how to improve the GEBCO website in order to make ocean mapping more interesting / enticing for scholars and students. The WG 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.

A significant GEBCO annual outreach event is the annual Science Day which is normally collocated with the annual GGC meeting. The event includes oral presentations and poster displays on topics relating to ocean-floor mapping and its applications. The 2016 edition was held on 12 October.

The presentations are available at:
http://www.gebco.net/about_us/meetings_and_minutes/gebco_meetings_2016.html.

In addition, the IHO-IOC GEBCO Cook Book (B-11 – see Task 3.8.4) continues to be used as an important educational resource for ocean mapping students.

Task 3.8.6 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.

Task 3.8.7 Develop short course and course material on compiling digital bathymetric models (DBMs) to be included in GEBCO from a heterogeneous bathymetric source database. Associated deliverables: -a course curriculum

Due to a lack of resources, no activity was conducted in 2016 on the development of short courses or course material related to compiling digital bathymetric models.

Task 3.8.8 Update and enhance the GEBCO Gazetteer (B-8) for internet access

Maintenance of the underlying geospatial database of the on-line gazetteer is carried out by a network of appointed editors (mainly, SCUFN members) under the coordination of an Administrator who is currently the SCUFN Secretary from the IHO Secretariat. The database contained about 3,945 features at the end of 2016.

The continuing maintenance of the interface, for corrections and possible upgrades, was raised at the SCUFN-28 meeting in October 2015 and also at SCUFN-29 in September 2016, then at the 33rd meeting of the GEBCO Guiding Committee as a matter of concern, noting that the Gazetteer of Undersea Feature Names database is connected to other geospatial portals around the world. Dysfunctions of the maintenance interface that were also reported to NOAA at the end of 2016 prevented the IHO Secretariat from including the names approved at SCUFN-29 into the database.

Element 3.9 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 two representatives from 27 Member States and eleven Expert Contributors participated in this activity during the period of this report.

Task 3.9.1 Conduct meetings of MSDIWG

The Marine Spatial Data Infrastructures Working Group (MSDIWG) supports the IHO work programme activities related to Spatial Data Infrastructures (SDI) and/or Marine Spatial Data Infrastructures (MSDI), monitors SDI activities and trends and promotes the use of IHO standards and Member States' marine data in SDI activities. The MSDIWG is also tasked to liaise with other relevant bodies to increase awareness of marine spatial data, to identify ways for the IHO to contribute to the development of SDI/MSDI in support of Member States, to identify possible solutions to any significant technical issues related to interoperability between maritime and land based inputs to SDI and to identify any IHO capacity building requirements related to MSDI.

The Working Group held its seventh meeting at the Japan Hydrographic and Oceanographic Department (JHOD) in Tokyo, Japan, from 27 to 29 January. The Chair of the MSDIWG, Mr Jens Peter Hartmann (Denmark), chaired the meeting which was attended by 18 representatives from 13 Member States (Argentina, Brazil, Denmark, France, Germany, Indonesia, Japan, Malaysia, Philippines, Singapore, Spain, Thailand and USA), and nine observers and expert contributors from Caris, ESRI, IIC Technologies, Open Geospatial Consortium (OGC), OceanWise, Seoul University, SevenCs and the Pacific Community (SPC). President Robert Ward and Assistant Director Alberto Costa Neves represented the IHO Secretariat.

The meeting considered the role of the Working Group in updating IHO Publication C-17 - *Spatial Data Infrastructures: "The Marine Dimension" - Guidance for Hydrographic Offices* and how to incorporate the necessary information that will assist Member States to provide hydrographic-related data in support of national and regional developments beyond nautical charting and as part of the national spatial data infrastructure. The meeting agreed that an updated edition of the publication should also identify and promote best practice, indicate existing and new standards, and provide appropriate syllabi for education and training in MSDI. Participants also discussed ways to include relevant activities in Regional Hydrographic Commissions and provide examples of the benefits of involvement in an MSDI.

Participants to the MSDIWG7 meeting

Participants also considered the relevant standards, including those related to new technologies such as the use of aerial vehicles. The meeting was informed of developments for the collection, processing and availability of significant sized datasets in an MSDI and the use of cloud storage and processing. Participants also considered use-cases for oil spill response and the development of business cases to help in the establishment of MSDIs. The meeting considered the newly created Arctic SDI, the MSDI component to the common operating picture (COP) and the need and suitability of S-100-based product specifications for coastline, administrative borders, installations at sea, restricted areas, ship routes, obstructions and depth contours.

The meeting discussed the communication mechanisms available to raise awareness of the value of MSDI, to educate decision makers on their roles and responsibilities and to guide hydrographic offices on the establishment of MSDI. It was decided that such communication will be done through the submissions to the International Hydrographic Conference or Assembly, IRCC, RHCs and CBSC, by improving the IHO web pages and by creating "Ambassadors for MSDI". During the meeting a questionnaire developed by Canada to identify aspects of established MSDIs and best practices was reviewed in order to be used during the revision process of IHO Publication C-17.

Participants discussed the progress made with the improved MSDI training syllabus submitted to the seventh meeting of the IRCC and the use of e-learning and availability of online learning platforms such as *Ocean Teacher* made available by the International Oceanographic Data and Information Exchange (IODE) of the IOC, and other programmes provided by universities and industry members.

The MSDIWG7 established four groups for developing a revised framework for IHO Publication C-17 (Group 1), the identification of case studies and best practices (Group 2), the identification of key datasets for non-navigational purposes (Group 3) and the key messages to be presented to the next International Hydrographic Conference or Assembly to be held in April 2017 (Group 4).

Amongst the improvements to the IHO website the meeting reviewed the creation of a GIS layer to display examples of SDI and MSDI around the world. The MSDIWG7 meeting was preceded by an Industry Demonstration Workshop (25 January) and by an MSDI Open Forum (26 January) attended by over 100 people. The Open Forum explored the theme: "*Contributing to the successful delivery of MSDI*". Both events were co-hosted by the JHOD and by the Ocean Policy Research Institute, the Sasakawa Peace Foundation (OPRI-SPF) and were held at Miraikan Hall, in Tokyo, together with a poster session presenting cases of success from government, academia and industry.

The next meeting of the MSDIWG was planned to take place on 31 January to 2 February 2017, in Vancouver, Canada.

Task 3.9.2 Maintain the relevant IHO standards, specifications and publications

The MSDIWG developed a draft edition of the IHO Publication C-17 *Spatial Data Infrastructures: "The Marine Dimension" - Guidance for Hydrographic Offices* (see IHO CL 59/2016). The final version is expected to be submitted to IRCC9 for endorsement.

Task 3.9.3 Develop training syllabi for MSDI and associated learning subjects

The MSDIWG developed and submitted to the IRCC the following syllabi:

- *Syllabus for MSDI orientation, Syllabus for Fundamentals of a Marine Spatial Data Infrastructure (MSDI)*,
- *Syllabus for Database Design,*
- *Data Management and MSDI for Practitioners*, and
- *Syllabus for Marine Spatial Data Infrastructure (MSDI) for Managers*.

The WG now monitors the use of the syllabi in order to identify future improvements.

New and Revised IHO Publications

The following new IHO publications or revised editions were issued during 2016 and are available from the IHO website.

DATE	Announced Via CL	TITLE
21/01	5	**M-2** - IHO Publication The Need for National Hydrographic Services – Release of Ed. 3.0.5
15/03	15	**S-4** - Adoption of the Revision 4.6.0 of IHO Publication: Chart Specifications of the IHO
23/08	41	**M-1** - Entry into force of the Amendments to the Convention on the IHO and its supporting Basic Documents.
20/09	45	**M-7** - Approval of Edition 8.0.0 of IHO Publication: Staff Regulations
28/09	50	**S-5A** - Adoption of Edition 1.0.0 of IHO Publication Standards of Competence for Category "A" Hydrographic Surveyors
06/10	55	**P-7** - Annual Report of the IHO for 2015 and approval of the Recommendations in the Finance Report
Dec	/	**M-2** - IHO Publication The Need for National Hydrographic Services – Release of Ed. 3.0.6

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-11 Part B INTernational Chart Catalogue (see Task 3.6.4)
- S-32 - Hydrographic Dictionary
- S-62 - List of Data Producer Codes

Status Report on Performance Monitoring (2016)

Background

The introduction of IHO performance indicators was decided in 2009 by the 4th Extraordinary International Hydrographic Conference (EIHC-4), together with the adoption of the IHO Strategic Plan.

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

> *The implementation of performance indicators (PIs) is based on a two level approach:*
>
> - *strategic level: a small number of PIs associated with the objectives of the IHO (1 or 2 PIs per objective), to be agreed by the Conference (the Conference to be replaced by the Assembly when the revised IHO Convention enters into force) and managed by the IHB (the IHB to be replaced by the Secretary General and the Council when the revised IHO Convention enters into force);*
> - *working level: PIs associated with the strategic directions and managed by the appropriate 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*
>
> *Accordingly, the assessment of the working level PIs and the review of progress with the strategic directions are considered in two phases: an initial review by the leading organ and an overall review by the IHB (the IHB to be replaced by the Secretary General and the Council when the revised IHO Convention enters into force).*
>
> *Together with the assessment of the strategic PIs, these results are then submitted for consideration by the Conference (the Conference to be replaced by the Assembly when the revised IHO Convention enters into force). The submission should include a qualitative and, where practicable, a quantitative assessment of progress based on the value of the PIs. It should also include recommendations on management actions to be considered where trends indicate either a lack of progress or a change to an underlying assumption/direction is required. In this way the aim can be maintained and evidence of progress monitored/presented.*

The EIHC-4 adopted nine strategic performance indicators (SPIs) associated to the seven objectives of the IHO and invited the IHB Directing Committee to consider, in liaison with the HSSC and the IRCC, the implementation of working level performance indicators based on list of potential indicators associated with the strategic directions.

In 2012, the XVIIIth IHC welcomed the monitoring system to be put in place by the IHB Directing Committee based on the Strategic Performance Indicators (SPI) of the Strategic Plan (see CONF.18/WP.1/Add.2) and invited them to take action. Moreover, the HSSC and the IRCC were invited to review the working level performance indicators relevant to them.

The Annual Report of the IHO for 2012 included Performance Indicators for the first time.

Table 1

Strategic Performance Indicators

This Table provides values for the Strategic Performance Indicators for 2016.

The values for 2015 are included to enable trends and comparisons to be made.

No PI	Designation	Source	Status 31 Dec 2015	Status 31 Dec 2016	General Trend
SPI 1	Number and percentage of coastal States providing ENC coverage directly or through an agreement with a third party.	**WEND WG through RHCs**	No suitable information provided by RHCs IHO Secretariat estimate:~66%	No suitable information provided by RHCs IHO Secretariat estimate[9]:~66%	⇔
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.	**WEND WG and IHO on-line catalogue of coverage**	Small scale: ~ 100% Medium scale: 92% Large scale: 97%	Small scale: ~ 100% Medium scale: 93% Large scale: 98%	⇔ ⇑ ⇑
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.	**CBSC through RHCs**	No suitable information was provided by most RHCs[10]		
SPI 4	Percentage of "acceptable" CB requests which are planned. (*Percentage of submitted CB requests that were approved*)	**CBSC**	**93%**	**100%**	⇑

[9] Information is difficult to obtain from Primary Charting authorities acting on behalf of coastal States.

[10] The CBSC is developing a procedure to allow the RHC CB Coordinators to assess the status of hydrographic services in coastal States.

No PI	Designation	Source	Status 31 Dec 2015	Status 31 Dec 2016	General Trend
SPI 4 bis	Percentage of planned CB requests which are subsequently delivered.	**CBSC**	**79%**	**88%**	⇑
SPI 5	Number of standards issued (including new editions) [11], per category: - hydrographic standards to enhance safety of navigation at sea, - protection of the marine environment, - maritime security, - economic development.	**IHO Secretariat**	**4** (See Annex A) *Safety of navigation: 4* *Protection of the marine environment: 0* *Maritime security: 0* *Economic development: 0*	**2** (See Annex A) *Safety of navigation: 2* *Protection of the marine environment: 0* *Maritime security: 0* *Economic development: 0*	⇓ ⇓ ⇔ ⇔ ⇔
SPI 6	Number of potential new IHO MS (indicated by the start of the application process) relative to the number of "non-IHO" IMO MS.	**IHO Secretariat through the Government of Monaco**	**8 / 86** *Number of IMO MS: 171* *Number of IHO MS: 85*	**8 / 86** *Number of IMO MS: 172* *Number of IHO MS: 85*	⇔ ⇑ ⇔

[11] Versions of standards developed originally in English, which are issued in other languages later on, are not accounted.

No PI	Designation	Source	Status 31 Dec 2015	Status 31 Dec 2016	General Trend
SPI 7	Increase in participation / membership in RHCs.	**IRCC through RHCs**	No suitable information provided by RHCs IHO Secretariat estimate[12]: MS participation: 84% Non MS participation: 60%	No suitable information provided by RHCs IHO Secretariat estimate[13]: MS participation: 90% Non MS participation: 53%	⇑ ⇓
SPI 8	Percentage of available / agreed ENC [production] schemes.	**WEND WG through RHCs or International Charting Coordination Working Groups (ICCWG)**	IHO Secretariat estimate for UB1, 2 and 3 based on existing coverage: **~82%**	IHO Secretariat estimate for UB1, 2 and 3 based on existing coverage: **~82%**	⇔

[12] Based on:
- Number of RHC meetings: 13
- Participation of IHO MS: MS represented 86 times out of 99 possible attendances
- Participation of non IHO MS: Non-MS represented 32 times out of 53 possible attendances

[13] Based on:
- Number of RHC meetings: 10
- Participation of IHO MS: MS represented 74 times out of 82 possible attendances
- Participation of non IHO MS: Non-MS represented 25 times out of 47 possible attendances

P-7

Table 2

HSSC Working Level Performance Indicators

This table provides values for the Working Level Performance Indicators for 2016 associated with Work Programme 2 as agreed by HSSC-4.
Values for 2015 are included to enable trends and comparisons to be made.

Metric	Source	Rationale	Status 31 Dec 2015	Status 31 Dec. 2016	General Trend
Number of S-100 based product specifications approved	**IHO Secretariat**	Relative indicator of uptake of IHO standards including for purposes other than SOLAS navigation	**0**	**0**	⇔
Percentage of annual work programme achieved	**HSSC WGs (all)**	Progress against objectives in the strategic plan	**46%**	**42%**	⇓
Total number of participants at meetings (Member States [MS] and Expert Contributors [EC])	**HSSC WGs (all)**	Indicates participation of MS and wider community in execution of the plan	**158** *MS: 130* *EC: 28* *(7 meetings)*	**218** *MS: 150* *EC: 68* *(9 meetings)*	⇑ ⇑ ⇑ ⇑
Number of technical revisions and clarifications approved	**IHO Secretariat**	Indicative of ability to provide comprehensive, safe and effective standards	**7**	**1**	⇓
Number of ENCs distributed annually under license (equivalent annual licences)	**PRIMAR and IC-ENC**	Relative indicator of ENC usage throughout SOLAS market[14]	**2,678,741**[15]	**3,149,772**[16]	⇑

[14] Total of PRIMAR and IC-ENC distribution only - does not include local distribution or other distribution mechanisms.
[15] Total of PRIMAR (1,098,154) and IC-ENC (1,580,587).
[16] Total of PRIMAR (1,208,218) and IC-ENC (1,941,554).

P-7

Table 3

IRCC Working Level Performance Indicators

This table provides values for the Working Performance Indicators for 2016 associated with Work Programme 3 as agreed by the IRCC.
Values for 2015 are included to enable trends and comparisons to be made.

No PI	Designation	Source	Status 31 Dec. 2015	Status 31 Dec. 2016	General Trend
WPI 15	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.	**WEND WG through RHCs**	**See SPI 2**		
WPI 16	Number of additional IHO MS starting to produce & maintain (with/without support) relevant ENCs (contributing to 'adequate coverage') in the reporting period relative to those already producing at 01 Aug. 2008.	**WEND WG through RHCs**	**1**	**1**	⇔
WPI 17	Percentage of coastal States delivering hydrographic services - categorized by CB phases (MSI services, surveying capabilities, charting capabilities), directly or through an agreement with a third party, at the end of the reporting period.	**CBSC through RHCs**	**See SPI 3**		

No PI	Designation	Source	Status 31 Dec. 2015	Status 31 Dec. 2016	General Trend
WPI 18	Percentage of IHO MS updating their C-55 entry data regarding hydrography survey, INT charts, ENC, and MSI in the reporting period.	**IRCC through RHCs**	**24%** (20/85)	**22%** (19/85)	⇓
WPI 19	*Status of hydrographic surveys in each region.*	**IRCC through RHCs**	**Metrics yet to be defined by IRCC**		
WPI 20	Percentage of agreed INT chart schemes, percentage of INT charts available. [17]	**IRCC through RHCs or ICCWGs**	**88% (14 schemes out of 16)** **79% (1,588 charts published out of 2,009 planned)**	**88% (14 schemes out of 16)** **79% (1,614 charts published out of 2,042 planned)**	⇔ ⇔
WPI 21	Percentage of agreed ENC schemes, percentage of ENC available.	**WEND WG through RHCs or ICCWGs**	**See SPI 8**		
WPI 22	Increase in effective MS participation in RHC activities.	**IRCC through RHCs.**	**No suitable information provided by RHCs**		
WPI 23	Percentage of coastal States which are IHO Member States[18].	**IHO Secretariat**	**55%** **(84/152)**	**55%** **(84/152)**	⇔
WPI 24	Number of new coastal States joining the IHO during the reporting period.	**IHO Secretariat**	**3**	**0**	⇓

[17] Regions A and N, for which no scheme is available yet, are excluded.

[18] Serbia is not considered as a coastal State.

No PI	Designation	Source	Status 31 Dec. 2015	Status 31 Dec. 2016	General Trend
WPI 25	Number of potential new IHO MS (indicated by the start of the application process) relative to the number of "non-IHO" IMO MS.	**IHO Secretariat**	**See SPI 6**		
WPI 26	Percentage of coastal States which have achieved CB phase 1, 2 or 3 and established a National Hydrographic Office.	**CBSC through RHCs**	**No suitable information was available at the IHO Secretariat**		
WPI 27	Number of States which have achieved CB phase 1, 2 or 3 and established a National Hydrographic Office in the reporting period.	**CBSC through RHCs**	**No suitable information was available at IHO Secretariat**		
WPI 28	Percentage of coastal States which provide ENC coverage directly or through an agreement with a third party.	**WEND WG through RHCs**	**See SPI 1**		
WPI 29	Percentage of coastal States which have set up a national geospatial infrastructure.	**IRCC through RHCs**	**No information available at the IHO Secretariat to make an estimate**		
WPI 40	Number of agreements signed in the reporting period, including bilateral agreements and RENC membership, etc.	**IRCC through RHCs**	**Limited information available at the IHO Secretariat** **IHO Secretariat estimate: 4**[19]	**Limited information available at the IHO Secretariat** **IHO Secretariat estimate: 2**[20]	⇓

[19] New Members of PRIMAR (Ukraine, not registered in 2014), IC-ENC (Oman, USA/NOAA, Israel).

[20] New Members of IC-ENC (Malta, Tunisia).

No PI	Designation	Source	Status 31 Dec. 2015	Status 31 Dec. 2016	General Trend
WPI 41	Percentage of planned CB events that are achieved.	**CBSC**	**See SPI 4bis**		
WPI 42	Number of acceptable CB requests received.	**CBSC**	**30**	**33**	⇑
WPI 43	Percentage of "acceptable" CB requests which are planned.	**CBSC**	**See SPI 4**		

P-7

P-7

List of IHO Secretariat Travel (2016)

DATE	NAME	MEETING	DESTINATION	COUNTRY
JANUARY				
14 15	IPTES	CHART Coordination meeting	Taunton	UNITED KINGDOM
18 19	BESSERO	IHO-EU Network Working Group 4	Saint Mandé	FRANCE
25 29	WARD	MSDIWG 7	Tokyo	JAPAN
25 29	COSTA NEVES	MSDIWG 7	Tokyo	JAPAN
FEBRUARY				
01 05	WARD	E-nav underway Conference	Copenhagen	DENMARK
01 07	BESSERO	High level technical visit to Liberia (CBWP)	Monrovia	LIBERIA
08 09	WYATT	GEBCO Guiding Committee Secretary handover	Boulder	UNITED STATES OF AMERICA
08 10	WARD	Cat. A Graduation ceremony	Jeddah	SAUDI ARABIA
10 11	WYATT	CSBWG 2	Boulder	UNITED STATES OF AMERICA
18	BESSERO	Meeting with DG MARE (EU)	Brussels	BELGIUM
23 26	WARD	EAHC –Sub Committee 3	Jakarta	INDONESIA
29 04	BESSERO	NCSR3	London	UNITED KINGDOM
29 04	WYATT	NCSR3	London	UNITED KINGDOM
MARCH				
08 10	WYATT	DRWG14	Liverpool	UNITED KINGDOM
08 10	IPTES	WENDWG 6	Stavanger	NORWAY
08 10	GUILLAM	WENDWG 6	Stavanger	NORWAY
14 16	WYATT	NIOHC 16	Chittagong	BANGLADESH
14 18	WARD	APHoMSA 17	Queenstown	NEW ZEALAND
14 18	PHARAOH	S-100 WG	Tokyo	JAPAN
14 18	BAEK	S-100 WG and report status IHO GI Registry	Tokyo	JAPAN
APRIL				
07 08	BESSERO	SWAtHC 10	Buenos Aires	ARGENTINA
04 15	COSTA NEVES	IBSC 39	Brest	FRANCE
11 13	BESSERO	NHC 60	Stavanger	NORWAY
11 14	WARD	CIRM Conference and IIM visit	Portofino	ITALY
12 13	PHARAOH	CIRM Workshop	Portofino	ITALY
21 22	IPTES	CHART Coordination meeting	London	UNITED KINGDOM
21 22	WYATT	F-FOFM planning meeting	London	UNITED KINGDOM
25 29	WYATT	TWCWG 1	Niteroi	BRAZIL
MAY				
02 03	COSTA NEVES	IALA – IHO Seminar on MSI	Lisbon	PORTUGAL
03 04	IPTES	BASWG 13	Istanbul	TURKEY
11 20	WYATT	MSC 96	London	UNITED KINGDOM
16 18	BESSERO	MSC 96	London	UNITED KINGDOM
10 12	GUILLAM	DQWG 11	Arlington, VA	UNITED STATES OF AMERICA
17	WARD	Capacity Building Meeting (IMO)	London	UNITED KINGDOM
24 26	BESSERO	IALA Workshop on Shore-based Maritime Services	Lisbon	PORTUGAL
24 26	COSTA NEVES	CBSC14	Abu Dhabi	UNITED ARAB EMIRATES
24 26	IPTES	CBSC14	Abu Dhabi	UNITED ARAB EMIRATES
29 31	COSTA NEVES	IRCC 8	Abu Dhabi	UNITED ARAB EMIRATES
29 31	IPTES	IRCC 8	Abu Dhabi	UNITED ARAB EMIRATES
30 01	WARD	IRCC 8	Abu Dhabi	UNITED ARAB EMIRATES

DATE	NAME	MEETING	DESTINATION	COUNTRY
JUNE				
01 02	BESSERO	HCCS Chair Group Workshop	Saint Mandé	FRANCE
01 02	GUILLAM	HCCS Chair Group Workshop	Saint Mandé	FRANCE
07 10	IPTES	IOC Executive Council 49	Paris	FRANCE
13 17	PHARAOH	ISO TC 211	Tromsø	NORWAY
21 23	BESSERO	NSHC 32	Dublin	IRELAND
27 30	GUILLAM	HCA 14	Tromsø	NORWAY
28 30	WARD	HCA 14	Tromsø	NORWAY
29	WYATT	ASMIWG5	Galway	IRELAND
JULY				
11 15	WYATT	IMO-ITU-EG 12	London	UNITED KINGDOM
11 15	WARD	22nd Session of the ISA Assembly	Kingston	JAMAICA
15	BESSERO	Signing of MoU IHO- MOWCA	Brussels	BELGIUM
18 20	WARD	British Antarctic Survey	Cambridge	UNITED KINGDOM
21	WARD	WHD Celebrations	London	UNITED KINGDOM
AUGUST				
01 02	IPTES	World Bank Funding meeting	Washington	UNITED STATES OF AMERICA
01 05	WARD	UN GGIM 6	New York	UNITED STATES of AMERICA
03 05	IPTES	USM Graduation ceremony	Gulf Port	UNITED STATES OF AMERICA
10 12	WARD	Dishidros WHD Celebrations	Jakarta	INDONESIA
20 22	WARD	XXXIV SCAR Meeting	Kuala Lumpur	MALAYSIA
29 31	PHARAOH	SAIHC 13	Cape Town	SOUTH AFRICA
29 31	WARD	SAIHC 13	Cape Town	SOUTH AFRICA
SEPTEMBER				
12 16	WYATT	WWNWS8	Ålesund	NORWAY
13 16	PHARAOH	S-101 Test strategy meeting	Rostock	GERMANY
13 16	BAEK	S-101 Test strategy meeting	Rostock	GERMANY
19 23	GUILLAM	SCUFN 29	Boulder	UNITED STATES OF AMERICA
20 21	IPTES	IC-ENC SC17	Amsterdam	NETHERLANDS
27 29	IPTES	BSHC 21	Klaipeda	LITHUANIA
OCTOBER				
03 06	GUILLAM	ARHC 6	Iqaluit	CANADA
05 06	IPTES	High Level visit	Baku	AZERBAIJAN
10 12	COSTA NEVES	IMO TC 66	London	UNITED KINGDOM
10 14	PHARAOH	GEBCO TSCOM SCRUM	Valparaíso	CHILI
10 14	WYATT	GEBCO XXXIII	Valparaíso	CHILI
11 16	BESSERO	African Union Extraordinary Summit on Maritime Security, Safety and Development	Lomé	TOGO
12 14	WARD	IRSO Meeting	Naples	ITALY
13 14	GUILLAM	EC- IHO 8 & IENWG 5	Brussels	BELGIUM
13 14	IPTES	GEBCO Guiding Committee XXXIII	Valparaíso	CHILI
18 20	BESSERO	EAtHC 14	Cadix	SPAIN
18 20	GUILLAM	EAtHC 14	Cadix	SPAIN
19	WARD	ICS Marine Committee to present CSB	London	UNITED KINGDOM
24	IPTES	Liaison visit to Chart course	Taunton	UNITED KINGDOM
26 28	WYATT	ABLOS BM 23	Seoul	REPUBLIC OF KOREA

DATE	NAME	MEETING	DESTINATION	COUNTRY
NOVEMBER				
02 04	COSTA NEVES	IHO – NF Alumni Workshop	Bangkok	THAILAND
02 04	IPTES	IHO – NF Alumni Workshop	Bangkok	THAILAND
07 08	WYATT	CSBWG 3	Rostock	GERMANY
07 08	WARD	CSBWG 3	Rostock	GERMANY
08 10	WARD	HYDRO 2016	Rostock	GERMANY
09 10	IPTES	GEO XIII Plenary meeting	St Petersburg	RUSSIAN FEDERATION
09 10	WYATT	HYDRO 2016	Rostock	GERMANY
11	WYATT	ASMIWG 6	Rostock	GERMANY
15 17	WYATT	IMSO 24	London	UNITED KINGDOM
21 25	WYATT	MSC 97	London	UNITED KINGDOM
22 23	GUILLAM	PAC 23	Riga	LATVIA
24 25	COSTA NEVES	IBSC S-8A/B Drafting Group meeting	Singapore	SINGAPORE
28 02	COSTA NEVES	SWPHC 14	Nouméa	NEW CALEDONIA
28 02	WARD	SWPHC 14	Nouméa	NEW CALEDONIA
28 02	PHARAOH	ISO TC211	Redlands	UNITED STATES OF AMERICA
30 02	BESSERO	World Ocean Council Sustainable Ocean Summit	Rotterdam	NETHERLANDS
DECEMBER				
05 09	PHARAOH	S-121 PT meeting	New York	UNITED STATES OF AMERICA
05 09	GUILLAM	NIPWG 3	Busan	REPUBLIC OF KOREA
12 13	WYATT	IHO IMO WMO	Geneva	SWITZERLAND
12 16	COSTA NEVES	MACHC 17	Belem	BRAZIL
12 16	WARD	MACHC 17	Belem	BRAZIL

P-7

Responsibilities of the Secretary-General and Directors

Robert WARD – Secretary General

- Relations with EU, the United Nations including IMO 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;
- Translation services;
- IHO Publications;
- Administration of the IHO Secretariat, Information Technology;
- Administration of the Personnel of the IHO Secretariat, Staff Regulations;

and the following Regional Hydrographic Commissions:

- Arctic Regional Hydrographic Commission;
- East Asia Hydrographic Commission;
- Meso American - Caribbean Sea Hydrographic Commission;
- South Africa and Islands Hydrographic Commission;
- South West Pacific Hydrographic Commission;

and the following Commission:

- Hydrographic Commission on Antarctica.

Mustafa IPTES - Director (Regional Coordination 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;
- International Hydrographic Review;
- IHO Assembly;
- Annual Report;

and the following Regional Hydrographic Commissions:

- Baltic Sea Hydrographic Commission;
- Mediterranean and Black Seas Hydrographic Commission;
- North Indian Ocean Hydrographic Commission;
- ROPME Sea Area Hydrographic Commission;
- USA and Canada Hydrographic Commission.

P-7

Gilles BESSERO - 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;
- Nordic Hydrographic Commission;
- North Sea Hydrographic Commission;
- South East Pacific Regional Hydrographic Commission;
- South West Atlantic Hydrographic Commission.

P-7

Responsibilities of the Staff of the IHO Secretariat in 2016

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

Technical, Administrative and Service Staff

Ms I. BELMONTE	WPE	Website and Publications Editor
Ms S. BRUNEL	AAA	Administrative and Accounting Assistant
Ms L. CHAVAGNAS	OA	Office Assistant
Mr D. COSTIN	ITO	Information Technology Officer
Ms C. FONTANILI	PA	Personal Assistant to the Directing Committee
Mr A. MAACHE	BSA	Bureau Support Assistant
Mr D. MENINI	CGA	Cartography and Graphics Assistant
Ms M. MOLLET	REG	Registrar, Librarian
Ms B. WILLIAMS	HREG	Head of Registry *[to May]*
Mr J. WOOTTON	TSSO	Technical Standards Support Officer *[from October]*

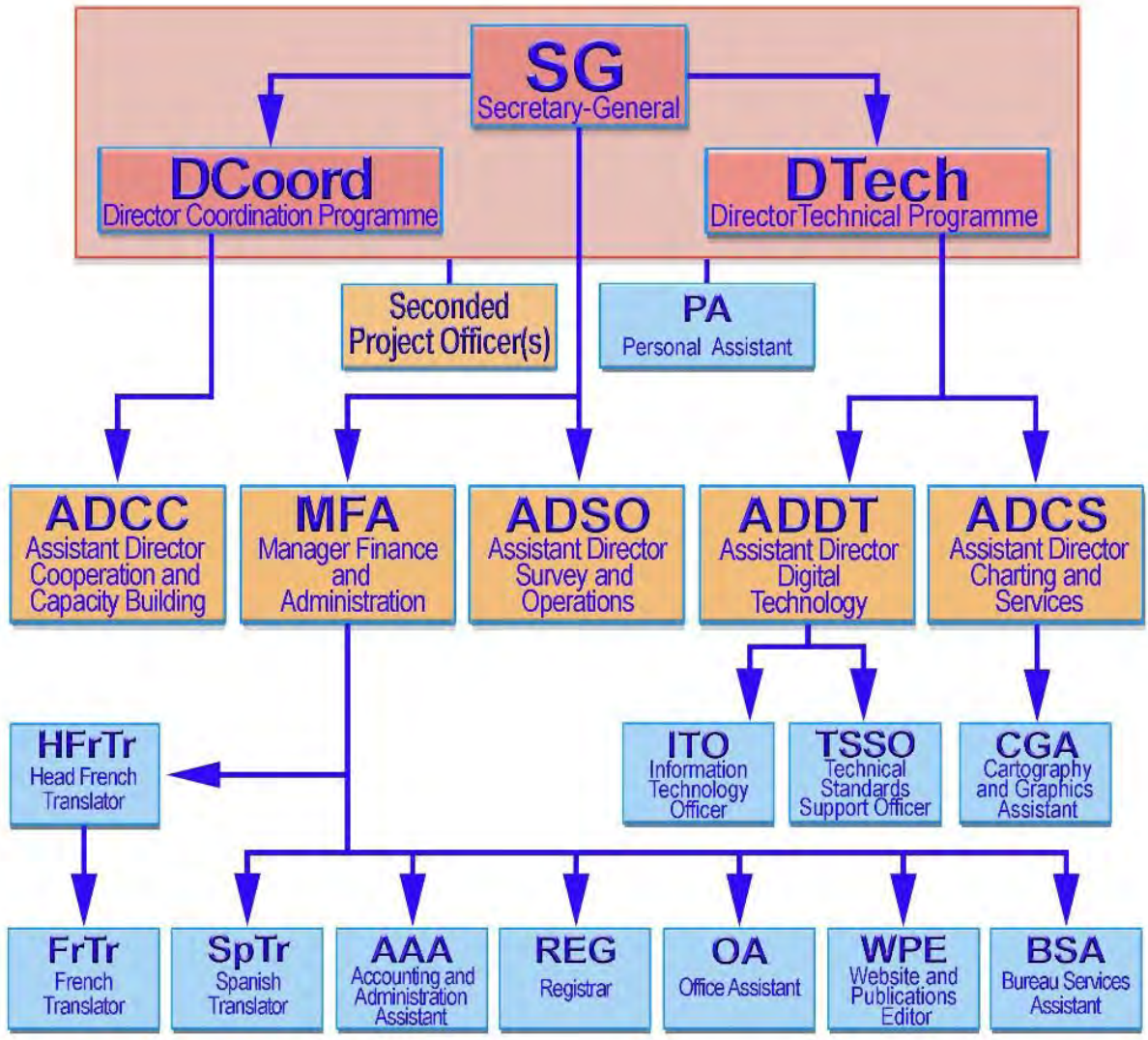
Associate Professional Officers

Mr Y. BAEK	(Republic of Korea)	S-100 Registry & Online Registration Projects
Mr K. KANEDA	(Japan)	GIS and IT Projects
Commander L. HERNANDEZ RUBIN	(Peru)	Spanish Dictionary revalidation project

P-7

P-7

Organizational Diagram of the IHO Secretariat
(8 November 2016)



P-7