

**Paper for Consideration by  
34<sup>th</sup> NSHC Meeting  
IHO Secretariat Report**

<b>Submitted by:</b>	Secretariat of the IHO
<b>Executive Summary:</b>	This paper reports on activities of the IHO Secretariat that may impact the work of the North Sea Hydrographic Commission.

### **Status of Membership of the IHO**

1. The IHO membership stands at 94. In 2021, Lebanon acceded to the IHO Convention. Unfortunately, Democratic Republic of the Congo, Serbia, Syria and Vanuatu remain suspended from Member States rights.

### **2<sup>nd</sup> IHO Assembly**

2. The 2<sup>nd</sup> IHO Assembly initially scheduled to take place in April 2020, was postponed to November 2020 due to the pandemic situation. For the same reason it was necessary to propose an alternative scenario to conduct the forthcoming Assembly session and Council meeting as remote events. IHO ACL 19/2020 informed about the positive vote of the Member States in favour on the proposed scenario on the postponement of the 2<sup>nd</sup> Session of the IHO Assembly (A-2) and associated activities resulting from exceptional circumstances due to COVID-19 (IHO ACL 17/2020 refers). This scenario, approved by vote by 21 September 2020, is explained in the Assembly Circular Letter ACL29 Rev1/2020.

3. As a consequence, the Secretariat invited Member States to vote by correspondence on proposals submitted for consideration by the 2<sup>nd</sup> session of the Assembly (IHO ACL 21/2020 and IHO ACL 22/2020). Among other items, IHO ACL 26/2020 reported on the approval of the Revision of the IHO Resolution 2/1997 – Establishment of Regional Hydrographic Commissions (RHC) (Assembly Document A2\_2020\_PRO3-1\_EN\_Res\_21997\_cc\_v1). All the documents related to the 2<sup>nd</sup> Assembly are available at the IHO website and the Proceedings, when ready, will be available there as well.

4. At the 2<sup>nd</sup> Assembly the IHO Member States approved the new IHO Strategic Plan which lays out the organization's priorities for the coming years. The inclusion of Goal 3 related to participation in international initiatives on the sustainable use of the oceans, confirms that the IHO is now, also, clearly committed to reconciling the use and the preservation of the marine environment, in line with the global initiatives, such as UN Decade for Ocean Science and Seabed 2030. Traditionally, hydrographic data was used mostly for the safety of navigation, however increasingly it is being used by a wide variety of stakeholders for an expanding number of applications, including purposes not previously considered, such as to monitor changes and effectively protect the Oceans.

5. Assembly participants approved the roadmap for the implementation of the IHO Universal Data Model (S-100) which can be utilized by all users of ocean data including navigation, marine energy, oceanography etc. The IMO e-navigation Strategy Implementation Plan requires that all Maritime Services be S-100 conformant, as it specifies the method for data modelling and developing product specifications.

6. Member States also approved the new project proposed by Canada on Empowering Women in Hydrography - EWH, which aims to increase gender equity and the number of women in leadership positions. The project will include training and communication on different hydrographic careers.

7. Finally, as clear example of how the Hydrographic Community is evolving and dealing with extraordinary circumstances, the Assembly approved the establishment of a new IHO e-learning centre hosted by the Republic of Korea at the Korea Hydrographic and Oceanographic Agency (KHOA). The organization had been wanting to increase the offering in terms of distance training for some time and the current pandemic highlighted the need for this.

8. **Recommendation.**

- NSHC is invited to consider the need to adapt their respective instruments to comply with the recommendations of the IHO Resolution 2/1997 as amended by A-2 as appropriate.

### **IHO Council Activities**

9. Due to COVID-19 restrictions, the fourth meeting of the IHO Council (C-4) took place on 19 November 2020 via video conference, just after the 2nd Assembly (A-2). The Council had been tasked with making the Strategic Plan real, a task that must be accomplished quickly to ensure that the IHO reaches its goals. Besides, the A-2 had also tasked the Council with implementation of the S-100 Roadmap, which included S-100 standards and offered increasing safety of navigation by ensuring that the most up-to-date information is available with the vision of its delivery to mariners seamlessly integrated with other data such as navigational aid information and weather. The A-2 had tasked the Council to work through the technical, operation and regulatory challenges associated with the transition from paper-based products and S-57 ENC's to the S-100 suite of standards and services. Summary report of the 4<sup>th</sup> Meeting of the IHO Council is available at the IHO web site.

10. According to Article 16 of the General Regulations of the IHO, the Secretary-General informed the NSHC about the allocation of one Council Seat to the Commission. The NSHC Chair informed the Secretariat on the Commission's decision to select Germany for the seat. It is noted that the NSHC members are well represented in the IHO Council, namely France (via MBSHC), Sweden (via BSHC), the Denmark, Norway and United Kingdom (via hydrographic interest).

11. The fifth meeting of the IHO Council is scheduled to take place at the IHO Secretariat, Monaco from 19 to 21 October 2021 as physical meeting but pending the pandemic situation.

12. **Recommendation.**

- NSHC Members to identify possible subjects to be brought forward to C-5.

### **INT Chart and ENC Production Coordination - Region D**

13. According to the IHO Secretariat records, United Kingdom (Mr Lee Truscott, UKHO), is the designated INT Chart / ENC Coordinator for Region D. The INT Chart Coordinator participated in the Workshop for INT Chart/ENC Coordinators that was held back-to-back to the NCWG5 meeting in Stockholm, Sweden in November 2019. One of the objectives of this workshop was to prepare recommendations in relation to INT charts that were finally included into the NCWG report on the Future of the Nautical Paper Chart submitted to HSSC12 in November 2020. HSSC supported the NCWG proposal that there is no need to add a new work item in the NCWG Work Plan to develop a separate specification for simplified or back-up nautical charts at this time. The NCWG was tasked to add a work item in its Work Plan to develop ways to enable or enhance HO's ability to produce paper charts or raster chart images directly from S-101. HSSC agreed to provide some recommendations to IRCC from the report on the INT chart concept and ENC Schemes.

14. Considering that INTOGIS II on-line services, commissioned 02 January 2020, represent a major step in advancing the management of ENC Schemes and other INT Charts, it has been decided that all regional databases will be designated Ed. 4.0.0 January 2020. The procedure to maintain and update the regional bases for ENC Schemes (and INT Charts if needed) remain the same as for INTOGIS I.

15. At its 15<sup>th</sup> meeting in Monaco (February 2020), the Data Quality Working Group discussed recommendations for modelling the quality of bathymetric data in S-101 ENCs. Some use cases highlighted the critical role of these components for route planning and route monitoring for mariners. Questions were raised on the applicability of data quality indicators (horizontal and vertical accuracy) not only to wrecks, soundings, underwater rocks, but also to depth contours in future S-101 ECDIS. Principles for using data quality indicators were tested in some scenarios and reported by Italy, Finland and Norway. These examples demonstrated the potential of data quality indicators for improving safe navigation but also highlighted the complex situations in some coastal areas. It is considered that Hydrographic Offices will have to face new challenges when encoding some data, in particular when they are provided by different sources. Thanks to the offer made by the USA (NOAA), it is intended to provide a capability to share these scenarios; other data quality information in general; and make data quality assessment software tools available to all, through a collaborative wiki access.

16. **Recommendations.**

- Noting the production concerns already raised by S-57 ENC Producers who have started to engage in the next steps of transition towards future parallel production of S-101 and S-57 ENCs in their offices, NSHC members are invited to forward their options and possible guidance on the way to allocate as automatically as possible, meaningful quality values of bathymetric data in future S-101 ENCs from the former S-57 ENCs M\_QUAL/CATZOC values.
- Member States are invited to consider the wider population of the publication S-67 Ed.1.0.0 Mariners' Guide to Accuracy of Depth Information in ENCs to bring this important aspect to the practisers. Chinese and French versions are planned for May 2021.

**Recent activities concerning WEND**

17. The 11<sup>th</sup> meeting of the Worldwide ENC Database Working Group (WENDWG), initially scheduled in the USA, was arranged by video teleconference (VTC) from 17 to 18 February 2021. The objectives of the meeting were:

- Final development of a new IHO Resolution on WEND-100 Principles to be submitted to the IRCC in June;
- Development of Guidelines for the Implementation of WEND-100 Principles and their application to the various S-1xx Products;
- Contribution of the WENDWG to the incremental development of the Roadmap on the S-100 Implementation Decade;
- Proposal for the evolution of INTOGIS II to INTOGIS III, as a platform to manage and monitor the availability of S-100 services as they develop
- Follow-up on the Status of the Production of HD ENCs by Region.

18. The endorsement of WEND-100 Principles offers the unique opportunity for Member States, Regional Hydrographic Commissions, supported by the IHO and the WENDWG in particular, on the most cost-effective option(s) to move from existing S-57 ENC schemes to S-101 ENC schemes. A feasibility and impact study on new grid-based schemes, where possible, or keeping the existing S-57 ENC schemes for the next decades, were recommended to assess the best way forward for each commission and for end-users, including mariners. An

ad hoc drafting group will prepare some guidelines and recommendations on the establishment of S-101 ENC Schemes before the production starts.

19. On the assumption that some S-1xx products (i.e. S-102, S-104, S-111, S-128 and S-129) may be ready for implementation and dissemination before S-101 ENCs are produced, the WENDWG agreed to set up another ad hoc drafting group led by the Netherlands to develop some Implementation Guidelines in application of the WEND-100 Principles, without waiting for the adoption by the Member States<sup>1</sup> of the new IHO Resolution.

20. Thanks to the support provided by KHOA (ROK), the WENDWG agreed on the way forward to consider the subsequent development of INTToGIS III, using S-128 standard as far as possible, in order to allow HOs and other users to manage and visualize S-1xx products coverage in the future. This new functionality offered through the IHO GIS toolbox could become a key component of the Roadmap for the S-100 Implementation Decade. Suggestions were made by the RENCs to first make an inventory of the existing digital catalogues, overlap and gap checkers, in order to optimize the efforts.

21. **Recommendations.**

- Contribute to the global and regional discussions on improvements of S-101 ENC schemes.
- Raise the awareness that implementation and dissemination of S-1xx products before S-101 ENCs are produced may create a business case for the breakthrough of the S-100 concept.
- Take note of the subsequent development of INTToGIS III as concrete step to act on the basis of the new IHO strategic goals and targets aiming to implement smart digital services.

## **Maritime Safety Information Services**

22. Work by the International Maritime Organization (IMO) on the modernization of the Communications and Global Maritime Distress and Safety System (GMDSS) continues with the on-going review and updating of the SOLAS chapters III and IV and on the related and consequential amendments to existing instruments. The consequential changes as a result of the recognition of the Iridium SafetyCast service as a recognised mobile satellite service (RMSS) provider in the GMDSS continue to be implemented. The Iridium SafetyCast service has become SOLAS carriage compliant from 1 January 2020. However, a significant number of operational testing issues remain to be completed before the service can be declared fully operational. Member States are reminded of the resources required and the responsibilities for their national Coordinator to perform their functions as part of the GMDSS. The national Coordinator should have established sources of information relevant to the safety of navigation within national waters, effective communications with the NAVAREA Coordinator and adjacent national Coordinators, if needed, and access to broadcast systems for transmission to their area of national responsibility.

23. **MSI Capability and Supportability.** The IHO Capacity Building strategy lays particular emphasis on the fundamental capability for all coastal States to provide a maritime safety information (MSI) service in support of their international obligations.

24. **Recommendations.** The Chair is requested to encourage all NSHC members to:

- encourage all information providers (NAV and MET Area Coordinators and RCCs) to complete agreements with all RMSS and commence the necessary testing of the

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<sup>1</sup> With Council 5 in October 2021, the new IHO Resolution will be adopted at the beginning of 2022.

SafetyCast system to progress towards declaring full operational status;

- use and following the guidance provided in S-53 – Joint IMO/IHO/WMO Manual on Maritime Safety Information;

## **CAPACITY BUILDING PROGRAMME**

25. The level of activity of the IHO Capacity Building (CB) Programme in 2019 remained at the same level as in 2018. Expenditure in the IHO 2019 CB Work Programme (CBWP) was 872 832 Euros, 1% smaller than the budget for the previous year. In 2019, 91% of the budgeted work programme was executed and funds distributed.

26. Expenditure in the IHO 2020 CB Work Programme (CBWP) was 501 030 Euros, 43% smaller than the budget for the previous year. Ongoing financial support is provided by the Nippon Foundation of Japan, the Republic of Korea and by a contribution from the IHO budget with in-kind support from Member States and from industry stakeholders. The Secretariat is continuing its campaign to find additional donor States and funding organizations. Because of the pandemic situation, in 2020, only 50% of the budgeted work programme was executed and funds distributed.

27. The NSHC MS did not benefited from activities under the IHO CB Work Programme (CBWP), instead, some of the NSHC MS did a great deal in active support of CB Work Programme activities, namely France and United Kingdom for their worldwide engagement in CB activities for the benefit of developing countries. Others are engaged directly in developing countries like Norway which helps Albania and helped Mozambique to develop hydrographic capabilities.

### 28. **Recommendation.**

- Member States in the NSHC are invited to identify opportunities in national or regional funding agencies to incorporate hydrographic development in the broader projects supporting developing countries.

## **Crowd-Sourced Bathymetry, GEBCO and Seabed2030**

29. In accordance with Decision 8 of the EIHC5, IRCC7 established the Crowdsourced Bathymetry Working Group (CSBWG) to develop guidelines on the collection and use of crowdsourced bathymetry (CSB). The CSBWG generated the draft IHO publication B-12 – IHO Guideline on Crowdsourced Bathymetry. Edition 2.0.0 was circulated under IHO CL 11/2019 and its approval was announced in IHO CL 28/2019. Replies to Annex B of IHO CL11/2019 and to CL 21/2020 have been analysed and a table of coastal States indicating positive support for the activity and the provision of data into the public domain within all or parts of their waters of national jurisdiction has been generated and published on the IHO website for the guidance of the wider maritime community (IHO CL 47/2019 refers). Member States may advise the Secretary - General at any time of any change to their originally stated position.

30. The web-based interface portal to the IHO Data Centre for Digital Bathymetry (DCDB), hosted by the USA in Boulder, Colorado, as part of its commitment to the system of World Data Centres, is being upgraded to be compatible with the crowdsourced bathymetry initiative. This will enable an IHO-led CSB infrastructure to be established and promoted across the wider maritime community. NSHC members are invited to consider the impacts of the increasing global societal and United Nations (UN) driven need to complete the picture of the

seafloor as well as the potential benefits to individual coastal States.

31. A series of meetings related to the GEBCO project were held online from 11 to 20 January 2021. The engagement with the IHO Crowdsourced Bathymetry Working Group (CSBWG) and the various Regional Hydrographic Commissions was noted and a number of regional projects and initiatives were highlighted, including AusSeabed and work with the Schmidt Ocean Institute vessel RV *Falkor* around the Australian coast, various projects in Canada and an initiative to restart the South East Pacific Bathymetric Chart through collaboration between the South East Pacific Regional Hydrographic Commission (SEPRHC) member states. Activities in China, Ireland, USA and Europe under the European Marine Observation and Data Network (EMODnet) were presented.

32. For the thirteenth consecutive year, the GEBCO Project organized a symposium on the theme of 'Map the Gaps'. The symposium was held as a series of webinar sessions and opened by Dr Vladimir Ryabinin, Executive Secretary of the IOC, and Capitaine de vaisseau Pierre-Yves Dupuy, Deputy Director Service hydrographique et océanographique de la Marine (Shom) and Director Public Services and International Relations. The symposium, which included contributions from a broad spectrum of institutions involved in all aspects of ocean mapping, featured 34 presentations on a diverse range of topics and one panel session on Diversity, Equity and Inclusion in Ocean Mapping. The symposium was closed by Director Luigi Sinapi. The associated presentations and session recordings are available from the GEBCO web site at: (<https://www.mapthegaps.org/symposium/>).

### **GEBCO support through Seabed 2030 Project**

33. The Nippon Foundation (NF)-GEBCO Seabed 2030 project builds on more than 100 years of GEBCO history; the project has established regional connections to all corners of the World and benefits from the human network of ocean mapping capacity built over 17 years through the Nippon Foundation - University of New Hampshire (UNH) ocean mapping training project. Through Seabed 2030, GEBCO's role is recognized and reinforced as the authoritative international initiative for mapping the World Ocean, from the coasts to the deepest trenches.

34. Seabed 2030 has established a network of four regional centres. Each centre focuses on discovering, gathering and assembling all available bathymetric data from their region to produce regional datasets and resulting products. The NSHC region is covered by the Atlantic and Indian Oceans Regional Center located at the Lamont-Doherty Earth Observatory, Columbia University, USA; the Arctic and North Pacific Oceans Regional Center co-located at Stockholm University, Sweden, and University of New Hampshire, Durham, USA and the South and West Pacific Ocean located at the National Institute of Water and Atmospheric Research (NIWA), New Zealand are the other Regional Centers. A global centre, established at the National Oceanographic Centre (NOC), UK, merges the regional datasets to generate the annual GEBCO grid as well as other products. Within this structure, the IHO-DCDB will remain the central GEBCO repository for all raw bathymetric data and all Seabed 2030 project data will be based there.

35. GEBCO plans to release the updated GEBCO on annual basis now. The 2020 grid was published in April 2020. Based on the variable resolution coverage, which was recently calculated and takes into account current technology capabilities, the cover has increased from 6% in the 2014 grid to 19% in the 2020 grid. Most of this increase has been achieved through the release of previous survey data, which had not been placed in the public domain and was

not available to GEBCO. The 2019 grid included the data gathered by the two contracts in the search for MH370, which have been released by the Australian authorities. The 2020 included data from the five deeps project.

36. **Recommendation**. Encourage Members, Associate Members and Observers to:

- make data freely available for inclusion in the DCDB and the widest possible use, in accordance with IHO Resolution 1/2017;
- reply to IHO CL 21/2020;
- review national legislation to remove barriers restricting CSB activities within their waters;
- actively support the collection of data within their waters;
- identify further potential sources of bathymetric measurements and survey data providers to support EMODNET as collaborating partner of GEBCO via DCDB.
- continue inviting Seabed 2030 project representatives to NSHC meetings to discuss options for deepened cooperation and support;
- encourage Members to make more detailed and comprehensive seabed data available – in particular deep ocean data from transit or commercial / scientific surveys on the spot;
- make more people aware of the importance of gaining a complete picture of the seabed.

#### **IHO GIS and Databases**

37. Work has continued on the development of the IHO GIS which is composed of two main parts:

- a country information database, and
- a regional information database.

38. The country information database has been progressively upgraded to include additional administrative information and facilitate the maintenance of the IHO Yearbook (IHO Publication P-5) and related lists posted on the IHO website. Countries in the NSHC Region are invited to review their entry in the Yearbook on an annual basis and provide the IHO Secretariat with the appropriate updates or report no change. The status of updates in the IHO Country Information Database concerning the NSHC Countries, including those provided for C-55, is as follows:

<b>Country</b>	<b>P-5 –Yearbook Last update received</b>	<b>C-55 Last update received</b>
Belgium	February 2020	March 2019
Denmark	January 2019	May 2017
France	February 2020	June 2017 - October 2018
Germany	February 2020	August 2017
Iceland	January 2020	November 2016
Ireland	November 2014	November 2013

<b>Country</b>	<b>P-5 –Yearbook Last update received</b>	<b>C-55 Last update received</b>
Netherlands	February 2020	December 2017
Norway	February 2020	February 2020
Sweden	February 2020	July 2019
United Kingdom	November 2019	February 2018

39. An Esri-based GIS solution is being implemented to develop further the regional information database. This will enable access to various layers of information through the IHO website and through cloud-based online GIS options. The IHO ENC Catalogue and the IHO GIS for Antarctica have been transferred to this new environment. Several other layers are already available from the IHO website.

40. Work has continued on developing a GIS database application to support C-55 - Status of Hydrographic Surveying and Charting Worldwide and the work of the IHO. In response to the request to complement C-55 composite data (percentage of areas adequately surveyed / requiring re-survey / not surveyed) with CATZOC information. The CBSC established the C-55 Review Project Team (C-55RPT) to deal with this task.

41. **Recommendation.**

- Countries in the NSHC Region are invited to review their entry in the IHO Yearbook and C-55 and to provide the IHO Secretariat with the appropriate updates or to report no change. (CL 20/2019 refers).

**IHO Centenary Celebrations (IHO-100)**

42. The years 2019 and 2021 are important in the history of the International Hydrographic organization. 2019 marks the centenary of the 1<sup>st</sup> International Hydrographic Conference, which was held in London in 1919 and 2021 will be the centenary of the establishment of the International Hydrographic Bureau (IHB) in 1921 in Monaco as precursor of the modern IHO.

43. The IHO Secretariat has already undertaken the preparations and execution for the centenary celebrations of the International Hydrographic Organization ranging from 2019 to 2021 as important milestones of the IHO. A symposium, an exhibition, outreach events and similar activities were executed in 2019 and others are planned in 2020 and 2021, either independently or jointly with sister institutions and agencies. The "peak-of-the-peak" will be World Hydrography Day (WHD) on 21 June 2021. There will also be an opportunity to present IHO's achievements at the United Nations General Assembly in September 2021 and at the IMO Assembly in November 2021.

44. The main activities held and other scheduled for the IHO centenary celebrations, coordinated by the IHO Secretariat are as follows (CL 32/2017 & CL 29/2021 refer):

- An exhibition on "Historical Nautical Charts and Mediterranean". This event was held at the Monaco Yacht Club from 1 to 13 April 2019, with a resounding success.
- An international Symposium on "A Historical Approach for Measurements and Protection of Oceans and World Waters". This event was held at the Oceanographic



Museum of Monaco from 20 to 21 June 2019 (in conjunction with the World Hydrography Day).

- To highlight the centenary celebrations as part of the media and press-campaign associated the Council meetings in 2020 and 2021.
- The publication of an IHO Prestige Book on "100 Years of International Cooperation in Hydrography".
- To hold the 2021 World Hydrography Day in Monaco as hybrid event.
- The centenary events could also be linked with the United Nations Decade of Ocean Science for Sustainable Development (2021-2030), the UN General Assembly in September and the IMO Assembly in December 2021.

### **World Hydrography Day 2021**

45. As announced in CL 01/2021, the selected theme for the celebration of World Hydrography Day in 2021 (WHD 2021) is:

***"One hundred years of international cooperation in hydrography"***

46. The theme is designed to showcase progress in knowledge and technology over the past 100 years, while celebrating the ground-breaking work which was done during this period. The goal is to highlight the past, present, and future of hydrography by showing the important work of early hydrographers, progress in technology, and state of the art technology. Australia, Bangladesh, Ecuador, Germany, India, Japan, Mauritius, Poland, Portugal, Republic of Korea, Sweden, Thailand, the United Kingdom, and the United States of America responded to the invitation to share historical pictures of their work as well as pictures/videos of modern technologies such as autonomous vehicles and drones. The Secretariat thanks all the contributors for the provision of suitable materials.

### **International Hydrographic Review**

47. Twice a year, the IHR provides an opportunity for Member States to publicize technical and other achievements in their region. An editorial board comprising a representative from each region has been established. The representative for the NSHC is Mr Georg Lárusson (Iceland). Mr Brian Connon (USA) has been appointed as the IHR Editor from 1 January 2020.

48. Papers for consideration for publication in the IHR should be forwarded directly to the editor (ihreview@iho.int, copy to Brian.Connon@usm.edu). The deadlines are for submissions are:

- end of January for the May Edition
- end of July for the November Edition

49. The IHO Secretariat has been working with the University of New Brunswick (UNB), Canada, in a project to develop and maintain a digital repository of the complete library of the IHR. As a result, the full collection of the IHR from 1923 can be found at:

<https://journals.lib.unb.ca/index.php/ihr> or from the link in the IHO website.

50. **Recommendation.**

- Encourage NSHC hydrographic community to submit articles and notes to the IHR, in order to promote the achievements and developments in the region.

**Action Requested of NSHC:**

- a) **Note** this report
- b) **Consider** the recommendations on adaptation of their constitutional instruments as presented in **Paragraph 8**
- c) **Consider** the recommendations on the fifth Council as presented in **Paragraph 12**
- d) **Consider** the recommendations on the INT Chart and ENC Production Coordination in Region D as presented in **Paragraph 16**
- e) **Consider** the recommendations concerning the contributions to the activities of the WENDWG as presented in **Paragraph 21**
- f) **Consider** the recommendations on MSI Capabilities and Supportability as presented in **Paragraph 24**
- g) **Consider** the recommendation on Capacity Building in **Paragraph 28**
- h) **Consider** the recommendations on CSB, GEBCO and SB2030 in **Paragraph 36**
- i) **Review** entries related to IHO C-55 and P-5 (Yearbook) at least annually (**Paragraph 41**)
- j) **Consider** submitting papers for publication in the International Hydrographic Review (**Paragraph 50**)
- k) **Take any other actions** as considered appropriate