

International Hydrographic Organization (IHO)



Arctic Regional Hydrographic Commission (ARHC)

12th Meeting



St. John's Newfoundland, 13-16 September 2022

SUMMARY REPORT

(Version 01, 1 December 2022)

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MEETING SUMMARY

1. The 12th meeting of the Arctic Regional Hydrographic Commission (ARHC12) took place the week of 13-16 September 2022 at St. John's Newfoundland, CA. The week consisted of several events and was co-hosted by the Fisheries and Marine Institute (MI) of Memorial University of Newfoundland and Labrador (MUN). The c/ARHC extends her appreciation to Paul Brett of the MI for their generous time and support in hosting this event.

The week's events were configured as such:

SEPTEMBER 12	SEPTEMBER 13	SEPTEMBER 14	SEPTEMBER 15	SEPTEMBER 16
Evening Icebreaker Reception Crow's Nest Officers Club 88 Water Street St. John's NL	Open Forum: Challenges, Engagement, Innovation, and Beyond Navigation Signal Hill Campus, Memorial University, St. John's, NL	ARHC12 Meeting Day 1 (closed) Signal Hill Campus, Memorial University St. John's, NL Conference Dinner Hosted by Fisheries and Marine Institute of Memorial University, St. John's, NL	Innovation Science and Technology Demonstrations SmartICE; Kraken Robotics; The Launch, Fisheries and Marine Institute, Holyrood, NL	ARHC12 Meeting Day 2 Signal Hill Campus, Memorial University, St. John's, NL

2. ARHC12 was the first in-person meeting of the Commission since ARHC9 in Murmansk, RU in 2019. The 25 participants of this week (see Annex A) included ARHC members, associate members, an observer, and the IHO Secretary General.
3. In addition to the ARHC12 participants, the Open Forum attracted approximately another 25 invited speakers and guests to speak to and to discuss the themes of 'Challenges', 'Engagement', 'Innovation', and 'Beyond Hydrography', all within the Arctic context. The diverse list of participants included the representatives from ARHC hydrographic offices, Northern and Indigenous communities, academia, professional mariners, and other government departments and agencies.
The programme for the Open Forum can be found in Annex B.
The value of this outreach and engagement was acknowledged and very evident during the subsequent ARHC12 discussions.

ARHC12

4. The agenda for ARHC12 can be found in Annex C and the List of Recommendations, Decisions, and Actions is in Annex D. Note that all meeting documents may be found on the IHO ARHC12 web page at: <https://iho.int/en/arhc12-2022>

Opening and Administration

5. The c/ARHC and host of ARHC12, Dr. Geneviève Béchar, opened the meeting. She welcomed the participants and noted that with the Open Forum the day before had already illustrated the advantages of in-person meetings. The objectives of the meeting were outlined and, with 4 of the 5 full Members present, a quorum was established. It was reiterated that the meeting was conducted in accordance with Edition 3.0 of the ARHC Statutes that were adopted at ARHC11. The Associate Member States of Iceland, Finland, and Italy signed the new Statutes. IHO Secretary-General, Dr. Mathias Jonas added his words of welcome and commented that the Open Forum was very interesting which highlighted innovative and collaborative efforts in the Arctic. He encouraged ARHC12 participants to continue on in the same spirit collaboration and cooperation.
6. All Member States were encouraged to review the Status of Actions (*ARHC12-A4 Status of Actions from ARHC11*) and return any comments/updates to ARHC Secretariat.

IHO and National Reports

7. The IHO Secretary-General (S-G) presented the IHO Report. Related to upcoming events, he asked MS to prepare well for C-6, as it is significantly the last Council meeting before A-3. With respect to A-3 he noted the change of venue and the 3 planned thematic sessions on Ocean Mapping and GEBCO, Navigation Support, and Bridging to the UN Ocean Decade, which are hoped to be both educational and entertaining.
Of potential relevance and of interest to ARHC, it was reported that the HCA statutes call for all scientific data to be free and available and wondered if ARHC would consider a similar approach. The HCA will also establish a S-100 implementation WG and is proposing a new IHO resolution to recognize the 'Southern Ocean', which will be tabled at A-3.
He highlighted the recent IMO NCSR9 decisions especially the revised ECDISPS that will include references to S-98, S-100, and S-101 as well as a transition period: 1 Jan 2026 new installations must support S-101 and by 2029 all ships must support S-100. This creates an expectation that the S-101 specification will be stable, and that MS can deliver S-101 products with significant coverage by 2026. Regions need to prepare and coordinate. The US added that original equipment manufacturers (OEMs) will be demanding S-100 data in 2026 and that hydrographic offices (HOs) need to be prepared.
At the UN Oceans conference in Lisbon IHO had a presence for improved visibility and S-G was able to inject more hydrography into the conversation. The concept and phrase 'Digital Twin of the Ocean' is becoming more widely used and discussed; it will be advantageous for hydrographic offices to become part of that conversation.
The recent UNGGIM was attended by the S-G and others from the IHO bodies. IGIF and IGIF-H have well received and there is the possibility to make applications to WB for funding which could be significant for capacity building. Generally, IHO has a small voice at international for a and, therefore, must invest to make an impression.
It was reported that IHO fairly well positioned with work plans and budgets and that a more complete picture will be presented at C-6.
The S-G highlighted the growth of intense interest in Marine Protected Areas (MPAs) particularly advanced by the "30 by 30" initiative to designate 30% of the Earth's land and sea areas as protected. He suggests that the Arctic would be an excellent test area for S-122 (MPAs). Work in the region on S-411 and sea ice data services was also encouraged.
8. CA summarized its Arctic Survey program. CHS had 35 hydrographers in the Arctic this season. With this and past work, CHS is closing the ENC gaps, releasing 12 new ENCs and 18 new editions in the past year. It is notable that it is now possible to navigate the primary NWP entirely on CHS ENCs. Most hydrographic work in the Arctic by CHS is supported by the Canadian Coast Guard (CCG). In addition to the CHS launches carried by CCG assets, six of the CCG icebreakers are themselves equipped with multi-beam echosounders.
To further improve hydrographic data outside the main corridors, it is recognized that satellite-derived bathymetry (SBD) and crowd-sourced bathymetry (CSB) must be leveraged. Under the recently announced Ocean Protection Plan 2 (OPP2) CHS will receive 84M CAD over 9 years to collect modernize hydrography in the Arctic as well as to develop community-based hydrographic programs in Northern and other small communities in Canada.
9. The Danish Hydrographic Office is part of the Danish Geodata Agency (DGA), and its overall goals are to enhance the production and usage of hydrographic data, services, and products for both navigation and to support the production of other marine geospatial products for the benefit of the environment and the society.

The Danish Hydrographic Office represents the Kingdom of Denmark in the IHO and is responsible for production and development of nautical data, charts, and publications of both Danish and Greenlandic waters. They are about half finished the new charting in south-west Greenland and are releasing basic-content ENC's for the first phase of this project. Discussions are ongoing with users to help direct future priorities. Faroe Islands have taken over their own production.

The integration of two production systems (one for Denmark and one for Greenland) into one has been completed and output is ramping back up to previous levels, however, much data cleaning is still required.

There are funding pressures as much of the funding comes from the sale of products and only limited funding from the government. In addition, working around Greenland is expensive but sales there low. Demands for new surveys to support wind power, new shipping routes, etc. add to these pressures.

10. Norwegian Hydrographic Service (NHS) reported it is leading a national project for the digitization and standardization of port data. Version 3.0 of this standard has been approved and it takes into consideration the development of S-131. This project aims to reduce the amount of ship-shore communication requirements which now averages 117 e-mails for each port entry.

In addition to the NHS and PRIMAR/ECC S-100 demonstrator project they are also doing some S-129 UKCM operational test. All demos so far have realized significant savings. NO continues to collaborate closely with users as they are the best advocates that can help secure funding for this type of work.

11. USA provide updates on several areas of activity including its Arctic surveys. Three more surveys are planned for 2023 and they continue to use USVs in the region. NOAA is continuing its rescheming of its ENC portfolio and is moving forward rapidly with the production of paper charts directly from ENC's. Included in this move is the further development of the NOAA custom chart tool. NOAA plans to end its printing of paper charts by 2025 and there is a possibility that output from the custom chart tool could become 'official' at some point in the future.

It was reported that NGA's Global Marine Traffic Data Service (GMTDS) now supports polar projections and that this product has been incorporated in the IHO's INTGIS. Additionally, NGA has issued a new version of its world Port Index.

The US Arctic Report Card for 2022 is expected to be released in December 2022. There have been operational limitations due to the Covid 19 pandemic, but they are easing with one impact being the ability to continue engagement with Indigenous communities.

12. S-100 implementation is one of the main items of importance for Finland. For a period of transition S-101 and S-102 will be produced in parallel with S-57. All survey data is now being ingested and the bathymetric data is being fully populated. The data is also becoming more accessible with a 2m grid for non-navigation will soon be available for most parts of Finnish waters. Where demanded FI is producing S-57 ENC's with high-density contours (1m).

In Finland as in the rest of the Baltic there is still a great deal of support for paper charts, therefore Finland intends to continue the production of paper charts for some time.

Finnish Sailing Direction publications are free in PDF, and they can be updated by an automated process.

13. With a staff of 8, the hydrographic office of Iceland faces challenges in updating older charts and collecting new data for navigation (e.g., cruise ships) and non-navigation (e.g., aquaculture) interests. For the latter, the data is wanted for marine spatial planning. Interest in MSI and MSDI is also growing.

Typically, its single vessel will collect data in the summer and process it during the winter. It has been successful in updating some legacy charts and its efforts to survey all of the country's EEZ continues.

14. Italy was pleased to announce that its High North Campaign has been extended for another two years. Data from the 2021 campaign has already been uploaded to the IHO DCDB and is thus publicly available. The 2022 should be uploaded soon, as well.

The campaign, through the UN, has fostered early career development by having students and researchers on board. In the next 3-4 years Italy is hoping to have new ships at its disposal to increase its Arctic activities.

Report of the ARHC Working Groups and other Officers

15. Operational and Technical Working Group (OTWG) Report

US, as holders of the Chair of the OTWG, briefed out on several matters including asking MS about potential opportunities for collaborative mapping missions. The US experience with SAILDRONE in northern waters was shared with the group and the other MS were invited to share any similar experiences they have had with uncrewed survey vessels (USVs).

The OTWG is scheduled to update the Arctic Chart Adequacy Report in 2023. An email was sent out from OCS in August asking MS for data to complete this work. MS are to reply to Christy Fandel.

16. DK delivered a report on the IHO-EU Network activities. 2022 is the 10th anniversary of the IHO-EU WG. This group is relevant to ARHC as the EU does have an Arctic strategy. The EU is a powerful body that has recognized the value of hydrographic data. HOs and GEBCO have provided data to EMODNET, which has 7 hydro-related datasets.

Critically for some European HOs, the EU is considering if ENC's should fall under the Data Directive for high-value datasets which mandates these are made freely available. The EU is working on a definition, but it appears that they want to include depth data.

It was noted the call for the EU Horizon 2020 Green Deal project for maritime research and related topics with 1B euros to be spent on maritime research among other topics. It may be something HOs can tap into but the competition for funds is expected to be fierce.

DK agreed to continue to serve as the ARHC liaison to this group.

17. c/ARMSDIWG reported that the WG did not meet since ARHC11. The WG's revised TOR and Work Plan were approved by ARHC. MS were asked to re-commit to, and confirm participation in the ARMSDIWG, particularly, taking on the leadership for specific tasks or roles. At the same time MS were asked to consider what are the concrete outputs or deliverables from the WG that should be pursued. For instance, how can the ARHC-AC MOU be leveraged to stake claim to the Arctic marine domain.

All ARMSDIWG members have been invited to observe in the Federated Marine SDI-Pilot (FMSDI-Pilot) phase 3 which is being supported by NGA. It will focus on a use case for cruise ship grounding in the Arctic.

The relationship with Arctic SDI has not matured as that body has not demonstrated much interest in the maritime component. However, NHS has stated NO will be taking over the Chair of Arctic SDI next year, and they will talk to them to see if there are ways to collaborate better. This action may be delayed as the Arctic SDI has paused all meetings.

18. NO confirmed that it is willing to hold the Chair of the Arctic International Charting Coordination Working Group (AICCWG). It was agreed that the AICCWG will take on the role of the IHO S-100 implementation liaison and NO further agreed to be that liaison.

CA and US agreed to take a first cut the IGIF matrix and to forward this on to the AICCWG. The majority of the AICCWG report was a brief on the Arctic Grid Study project. This presentation was given by IIC Technologies. The idea of a standardized international (IHO-endorsed) grid has been around for a long time, but one has never taken form. However, there is a good opportunity to collaboration in Arctic as there is not that much data there, yet.

A pan-Arctic grid has links to broader domains e.g., UN-GGIM/IGIF-H, OGC, WENDWG, Arctic Council/PAME etc., and would have applications beyond ENCs. NIPWG for examples is talking about MPAs which are very important for all HOs and are a significant element of the work of AC/PAME.

IIC demonstrated two rectilinear and one equal area solutions. The later candidate was the OGC's Discrete Global Grid System (DGGS), which has some clear advantages for use in polar regions.

More detailed information can be found on the project website www.arcticgrids.com including test dataset for ENC (S-57; S-101) and S-122 (MPAs), which are available for download. MS were encouraged to investigate the website and were invited to submit data that could be applied to the various grids. It was suggested that S-111 could be another dataset to add.

These grids have been tested on existing navigation systems/ECDIS and in GIS and there appears to be no projection limitations or problems.

MS generally agreed that a pan-Arctic grid is an opportunity for ARHC to show leadership in taking a regional approach to gridding. It is a departure from traditional thinking, however, given the unique nature of polar waters, a change in the approach could be appropriate.

S-G noted that HCA facing the same challenge and it would be ideal to have similar approaches in both poles.

Outreach to the Arctic SDI, WENDWG, and other interested groups, was proposed.

19. ARHC GEBCO and Seabed 2030 Coordinator Report

This report was delivered by the ARHC coordinator, Paul Brett of Memorial University. Among the items reported on was the formation of a new GEBCO sub-committee on education and training. Mr. Brett has been selected as the chair of this sub-committee.

MS were reminded to respond to the IBCAO request for new data for the next version. It was also decided that MS should include Seabed 2030 activities in their annual ARHC reports.

Issues of Strategic Relevance

20. ARHC IHO Strategic Plan Gap Analysis

At ARHC11, the group agreed to set up a project team (PT) to direct the ARHC process for implementing the IHO SP including the reporting of strategic performance indicators (SPIs). The PT reported on its work to ARHC and delivered its results of the strategic plan gap analysis. A copy of this analysis can be found in Annex E.

The gap analysis was founded on the approach taken by the SWPHC and informed by the IRCC workshops on the strategic plan. An attempt was made to compile results for those SPIs which have been assigned to RHCs and individual member states. In the course of this exercise the PT made several observations and had many questions. These included such things as, uncertainty in interpreting coastal state indicators, and the need for a common understanding of the definitions and a standardized reporting process. The report concluded with a list of possible actions or work plan items for the ARHC.

For its presentation at ARHC12, the PT focused on 3 main points for discussion. These were: 1. What is the common understanding of SPI 1.3.1 "Ability and capability of Member States to meet the requirements and delivery phases of the S-100 implementation plan"?; 2. Does ARHC need a strategy and communications plan to accelerate and increase coverage to support increasing MSDI and/or improved appreciation of value of hydrographic data in the region?; and, 3. Consider whether ARHC wants a UN Decade of Ocean Science for Sustainable

Development (UNDoOS) engagement strategy and what that would look like. This could be related to the previous point and development of a regional MSDI.

Further to point two it was generally felt that a communication strategy would be a very good idea and NO noted that there will be an upcoming workshop on this subject. Similarly, a strategy for the UNDoOS would be beneficial for both MS and potential data users. One of the outstanding questions related to this point was what vehicle(s) would be used to convey or communicate these messages. Denmark will, as c/ARHC, make a presentation at the IMO Polar Maritime Seminar, November 1st, 2022, focusing on hydrography as support for safe navigation and knowledge of the Ocean.

S-G gave a short presentation on SPIs (Ref IHO CL 23/2022) to inform the discussion. He recommended that ARHC forge ahead with its ideas and plans for reporting and not wait for further clarification as this work will inform later decisions on SPIs. IRCC recommended the use of navigation bands 3-5 when reporting on 'navigationally significant' coverage. IRCC has also requested that RHCs take the lead in coordinating reporting. This highlighted the need for some sort of coordination so that there is not a duplication of efforts.

It is the intent of ARHC to carry out a SP gap analysis on an annual basis.

21. S-100 Implementation – WEND100-IGIF Matrix

The c/WENWG reported that the Integrated Geospatial Information Framework (IGIF) has been the main focus of the UN GGIM for the last few years. Its objective is to help create a standardized approach for all countries building geospatial data infrastructures using 9 basic strategic pathways.

IGIF-H is a subset of this approach which focuses on creating an operational framework for integrated marine geospatial information management.

The WENDWG has developed a matrix that will quantify a country's (or an RHC's) progress along each of these pathways. CA and the US made the initial effort to fill out the matrix for ARHC (and USCHC) and a copy of this spreadsheet will be made available on the ARHC web site under [ARHC → Basic Documents](#) → Miscellaneous.

22. The need for regional coordination of S-100 implementation

This was a general discussion stemming from IHO CL 31/2022 which stated, in part:

"IHO Member States should also note that IHO has now commitments towards IMO and other stakeholders to achieve operational status on the prioritized S-100 Product Specifications in accordance with the Roadmap for the S-100 Implementation Decade and Member States to achieve substantial coverage including robust distribution and update services for S-101 ENC's and related products by 1 January 2026".

It was recognized that some level of regional coordination will be necessary in terms of planning, production, and distribution of S-100 products and services.

Additionally, the idea of an S-100 strategy and roadmap for the Arctic was discussed.

No conclusions or actions arose out of this discussion, but it was agreed that ARHC needs to give this subject more serious consideration.

23. Items for C6 for discussion

ARHC discussed several of the topics due to be discussed at C-6. While ARHC did not adopt any formal position on these items, it was valuable to hear the perspectives on the items by the ARHC participants. The French paper on how to avoid ambiguities between navigational and non-navigational S-100 products and the US paper on guidelines for ENC-derived paper charts were the main items reviewed. These discussions were fruitful as they resulted in a better understanding of the issues being presented.

24. Arctic Council (PAME) – ARHC Joint Statement on Hydrography in the Arctic

ARHC11 endorsed the idea of a permanent ARHC point of contact (POC) for Arctic Council matters. The US generously offered to take on this role.

US will draft a letter of introduction to PAME prior to the next PAME meeting. A key message will be to inform PAME of the ARHC's intention to update its Arctic Charting Risk Assessment in 2023. Unfortunately, it is unclear when the activities of the Arctic Council will resume.

25. Observations and outcomes from the Open Forum and the Demonstration Day

ARHC dedicated a session to a review of the Open Forum and Demonstration Day events. MS concurred with the US when it said that the Open Forum was quite valuable. It exposed ARHC to the initiatives and work that are taking place in the region and helped focus ARHC again on the unique context of the Arctic. The Open Forum was a great way to "get the brains warmed up" and remember that the users in the Arctic have different needs and motivations than those in the South.

Engagement was a key take-away as was the need to find new ways to leverage innovation. Several were impressed with the integrated workflow from schooling through innovation and industry and found it inspiring to see the investments in North and in the Ocean. In addition, the innovation that was on display demonstrated the global reach of the local and regional industry.

S-G noted that citizen and community science is something that IHO and MS need to embrace, and it would be beneficial if what was heard could be shared to a much wider audience. The Ocean Decade was mentioned several times throughout the events, indicating that it is gaining momentum and is having impact.

Overall, it was agreed that these companion events were educational and positive, and without a doubt face-to-face interaction is so much more a richer and valuable experience for everyone.

Other Items of Interest

26. FAIR Principles -Application and accountability

Norway gave a presentation and led a discussion on tracking progress to achieving FAIR-ness. That is, how to measure and report in a transparent manner the degree to which datasets are adhering to the FAIR principles of Findable, Accessible, Interoperable, and Reusable.

It was demonstrated how an application in NO can show a 'score card' of how a particular dataset meets a set of predefined FAIR requirements. This is most useful for both the users of the data and the data providers and implementation of this would be quite suitable for an MSDI application.

27. Royal Canadian Navy Arctic program

The Royal Canadian Navy (RCN) provided an update on its Arctic activities and assets. RCN maintains a presence and operates in the Arctic to support safety, security, and sovereignty in the region. In recent years it has deployed 3 new Arctic & Offshore Patrol Vessels (AOPVs) and there are 3 more are under construction. These new assets will be able to provide platforms for a wide of missions which could include hydrographic and other scientific operations.

28. UKHO Brief-Future of Paper Overview

The UK representative presented a brief on the UKHO's investigations and research on the future of the paper chart and to understand the drivers, solutions, and enablers within the shipping industry. The results showed that there is a persistent decline in the use and demand for paper charts. As such, the UKHO is re-evaluating its long-term paper chart strategy.

29. Options and opportunities for the greening hydrographic activities, particularly in the Arctic

This topic was introduced by NO. who noted the growing awareness and interest in decarbonization in the shipping industry. Their presentation referenced a letter that was sent from the Norwegian Mapping Authority to the private sector soliciting ideas on the

incorporation of environmental and climate-related requirements into future seabed mapping services procurements.

ARHC12 participants were asked what they could do, and are doing, to reduce their carbon footprints. When evaluating survey contracts, for instance, could extra points or other incentives be given to those proposals that offer greener solutions.

As well, what can be done to highlight and promote decarbonization as an outcome of using hydrographic data, products, and services.

MS were invited to share any experiences they may have had in this area.

Coda

30. Confirmation of ARHC representative to Council for A3-A4 period

Following the process defined in the ARHC Statutes, Denmark was offered and agreed to be the ARHC representative to the next triennium of the IHO Council.

31. Confirmation of the rotation of Chair and Vice-Chair

In accordance with the Statutes, Denmark will assume the role of the Chair of ARHC and Norway the role of Vice-Chair at the conclusion of ARHC12

32. Next Meeting ARHC13

Denmark announced that it will be hosting ARHC13 in Nuuk, Greenland, 5-7 September 2023.

33. Closing Remarks and Observations

On behalf of the ARHC the Chair thanked the Fisheries and Marine Institute of Memorial University for its generous support in the planning and execution of 'Arctic Week'. All members and the Secretary-General agreed that it was a thoroughly engaging, interesting, relevant, and enjoyable week.

Annex A

ARHC12 Participants

12th Meeting of the Arctic Hydrographic Commission

Face-to-face, 12-Sep-2022 ~ 16-Sep-2022

No	Category	Country	Organization / Company	Name	Status	E-mail	Date
1	IHO Member State	Canada	CANADIAN HYDROGRAPHIC SERVICE	Douglas BRUNT	Member of delegation	douglas.brunt@dfo-mpo.gc.ca	2022-06-15
2	IHO Member State	Canada	CANADIAN HYDROGRAPHIC SERVICE	Geneviève BÉCHARD	Head of delegation	genevieve.becharde@dfo-mpo.gc.ca	2022-07-19
3	IHO Member State	Canada	CANADIAN HYDROGRAPHIC SERVICE	Chris MARSHALL	Member of delegation	CHRIS.MARSHALL@DFO-MPO.GC.CA	2022-08-18
4	IHO Member State	Canada	Royal Canadian Navy	Kray ROBICHAUD	Member of delegation	Kray.Robichaud@Forces.gc.ca	2022-08-10
5	IHO Member State	Denmark	DANISH GEODATA AGENCY - GEODATASTYRELSEN (GST)	Pia DAHL HØJGAARD	Head of delegation	pdh@gst.dk	2022-08-29
6	IHO Member State	Denmark	DANISH GEODATA AGENCY - GEODATASTYRELSEN (GST)	Lars HANSEN	Member of delegation	larsh@gst.dk	2022-08-26
7	IHO Member State	Denmark	DANISH GEODATA AGENCY - GEODATASTYRELSEN (GST)	Niels TVILLING LARSEN	Member of delegation	nitvi@gst.dk	2022-08-26
8	IHO Member State	Denmark	DANISH GEODATA AGENCY - GEODATASTYRELSEN (GST)	Hendrik Justus STANG	Member of delegation	hejus@gst.dk	2022-08-10
9	IHO Member State	Finland	FINNISH TRANSPORT AND COMMUNICATIONS AGENCY	Rainer MUSTANIEMI	Head of delegation	rainer.mustaniemi@traficom.fi	2022-08-08
10	IHO Member State	Finland	FINNISH TRANSPORT AND COMMUNICATIONS AGENCY	Seppo MAKINEN	Member of delegation	seppo.makinen@traficom.fi	2022-08-08
11	IHO Member State	Iceland	ICELANDIC COAST GUARD HYDROGRAPHIC DEPARTMENT (ICG-HD)	Niels FINSEN	Head of delegation	niels@lhg.is	2022-08-21
12	IHO Member State	Italy	ISTITUTO IDROGRAFICO DELLA MARINA	Maurizio DEMARTE	Member of delegation	maurizio.demarte@marina.difesa.it	2022-08-11
13	IHO Member State	Italy	ISTITUTO IDROGRAFICO DELLA MARINA	Massimiliano NANNINI	Head of delegation	massimiliano.nannini@marina.difesa.it	2022-08-11
14	IHO Member State	Norway	NORWEGIAN HYDROGRAPHIC SERVICE	Evert FLIER	Member of delegation	evert.flier@kartverket.no	2022-07-07
15	IHO Member State	Norway	NORWEGIAN HYDROGRAPHIC SERVICE	Birte BORREVIK	Head of delegation	borbir@kartverket.no	2022-07-07
16	IHO Member State	United Kingdom of Great Britain and Northern Ireland	UNITED KINGDOM HYDROGRAPHIC OFFICE	Simon HARDERN	Observer	simon.hardern@ukho.gov.uk	2022-08-29
17	IHO Member State	United States of America	National Oceanographic and Atmospheric Administration (NOAA)	John NYBERG	Member of delegation	john.nyberg@noaa.gov	2022-08-11
18	IHO Member State	United States of America	Office of Coast Survey / National Ocean Service (OCS/NOS)	Steven LOY	Member of delegation	steven.loy@noaa.gov	2022-08-09
19	IHO Member State	United States of America	NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY (NGA)	Michael BRADY	Member of delegation	michael.b.brady@nga.mil	2022-08-09
20	IHO Member State	United States of America	National Oceanographic and Atmospheric Administration (NOAA)	Jonathan JUSTI	Member of delegation	Jonathan.Justi@noaa.gov	2022-08-11

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21	IHO Member State	United States of America	NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY (NGA)	Sebastian CARISIO	Member of delegation	Sebastian.P.Carisio@nga.mil	2022-08-02
22	IHO Member State	United States of America	COMMANDER, NAVAL METEOROLOGY AND OCEANOGRAPHY COMMAND (CNMOC)	Matthew BORBASH	Member of delegation	matthew.borbash2.civ@us.navy.mil	2022-07-22
23	IHO Member State	United States of America	NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY (NGA)	John LOWELL	Member of delegation	john.e.lowell@nga.mil	2022-07-07
24	IHO Member State	United States of America	National Oceanographic and Atmospheric Administration (NOAA)	Ben EVANS	Member of delegation	benjamin.k.evans@noaa.gov	2022-09-06
25	IHO Secretariat	-	International Hydrographic Organization	Mathias JONAS	Head of delegation	mathias.jonas@iho.int	2022-08-22





Annex C

ARHC12 Agenda

International Hydrographic Organization (IHO)



Arctic Regional Hydrographic Commission (ARHC)
12th Meeting



ARCTIC WEEK AGENDA Overview	SEPTEMBER 12 Evening Icebreaker Reception Crow's Nest Officers Club 88 Water Street St. John's NL Time: 18h30	SEPTEMBER 13 Open Forum Challenges, Engagement, Innovation, and Beyond Navigation Signal Hill Campus, Memorial University, St. John's, NL	SEPTEMBER 14 ARHC12 Meeting Day 1 (closed) Signal Hill Campus, Memorial University St. John's, NL Conference Dinner Fisheries and Marine Institute of Memorial University, St. John's, NL	SEPTEMBER 15 Innovation Science and Technology Demonstrations The Launch, Fisheries and Marine Institute of Memorial University, Holyrood, NL Pick-up 08h30 Alt Hotel	SEPTEMBER 16 ARHC12 Meeting Day 2 in morning. CA-DK Chair Transition meeting in afternoon (closed) Signal Hill Campus, Memorial University, St. John's, NL
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				125 Water St. St. John's Evening Event (no-hosted) Christian's Bar 23 George St., St. John's Time: 18h00	
Notes:					
1. Non-Canadians travelling to Canada should check for any entry requirements . Most visitors will require an electronic travel authority (eTA) which can be obtained on-line.					
2. <i>In addition</i> , you must use the ArriveCAN to provide mandatory travel and public health information before and after your entry into Canada. For more information and to download the app click here .					
ARHC Open Forum - (Tuesday)					
ARHC12 DAY 1 (Wednesday)					
Agenda Item	Day/Time	Topic	Discussion Lead	Notes	
A. Opening and Administration					
A1	Day1 08h30	Welcome, Opening Remarks, and Participant Introductions <i>Meeting DOCs can be found here.</i> <i>DOC: ARHC12-A1 List of Participants</i>	Dr. Geneviève Béchar, Dr. Mathias Jonas. All	Establishment of a quorum.	
A2	08h45	Approval of the Agenda <i>DOC: ARHC12-A2 Agenda</i>	Dr. Geneviève Béchar		
A3	08h50	Context of meeting <ul style="list-style-type: none">Statutes in effectSignature of Associate Member States (AMS)Letter related to the suspension of ARHC activities with Russian FederationARHC representation at C6Recording of decisions and actions made at ARHC12 <i>Ref DOC: ARHC12-A3A Statutes in Effect</i> <i>Ref DOC: ARHC12-A3B ARHC Letter 01/2022</i>	Dr. Geneviève Béchar All	-Decision ARHC11-D05 ARHC approved ARHC Statutes Ed 3.0 and are in effect as of 2021-11-10. -AMS are invited to sign Statutes.	
A4	09h20	Review of Actions for ARHC	Doug Brunt		

		DOC: ARHC11 Summary Report DOC: <i>ARHC12-A4 Status of Actions from ARHC11</i>	Jonathan Justi	Actions related to C6 will be covered under Agenda Item D
B. IHO and National Reports				
B1	09h35	IHO Secretariat's Report to ARHC DOC: ARHC12-B1 IHO Report DOC: <i>ARHC12-B1 IHO Report -Presentation</i>	Dr. Mathias Jonas	
B2	09h50	National Report -Canada DOC: ARHC12-B2 Canada National Report DOC: <i>ARHC12-B2 Canada National Report - Presentation</i>	Chris Marshall	
B3	10h00	National Report -Denmark DOC: ARHC12-B3 Denmark National Report DOC: <i>ARHC12-B3 Denmark National Report - Presentation</i>		
B4	10h10	National Report -Norway DOC: ARHC12-B4 Norway National Report		
	10h30	Break		
B6	10h45	National Report –United States of America DOC: ARHC12-B6 United States National Report DOC: ARHC12-B6 United States National Report - Presentation		
B7	10h55	National Report -Finland DOC: ARHC12-B7 Finland National Report		
B8	11h05	National Report -Iceland DOC: <i>ARHC12-B8 Iceland National Report</i>		
B9	11h15	National Report -Italy DOC: ARHC12-B9 Italy National Report DOC: ARHC12-B9A Italy High North Campaign - Presentation		
C. Reports of the ARHC Working Groups and other Officers				
C1	11h25	Operational and Technical Working Group (OTWG) Report DOC: <i>ARHC12-C1 OTWG Report</i>	c/OTWG	
C3	11h45	Report of the IHO-EU Network	DK	

		DOC: ARHC12-C3 Report of the IHO-EU Network – Report DOC: ARHC12-C3 Report of the IHO-EU Network – Report -Presentation		
	12h05	lunch		
C4	13h15	Arctic Regional Marine Spatial Data Infrastructure Working Group (ARMSDIWG) Report DOC: ARHC12-C4A ARMSDIWG -Report DOC: ARHC12-C4B ARMSDIWG -Report -Presentation DOC: ARHC12-C4C ARMSDIWG Work Plan 2021 2026 vOCT21 DOC: ARMSDIWG_ToR_vOCT21	c/ARMSDIWG	
E. Other Items of Interest (part 1)				
E1	13h35	FAIR Principles -Application and accountability	NO	Tracking progress to achieving FAIR-ness
E2	13h55	Royal Canadian Navy Arctic program	Kray Robichaud	
D. Issues of Strategic Relevance				
D5	14h15	Arctic Council (PAME) – ARHC Joint Statement on Hydrography in the Arctic -Report on past or planned activities. -ARHC report to PAME DOC: ARHC12-D5A Update on the PAME-ARHC MOU DOC: ARHC12-D5B ASTD Access -Attachment 1 DOC: ARHC12-D5C ASTD Access -Attachment 2	US	Decision ARHC11-D04 ARHC endorsed the idea of a permanent ARHC point of contact (POC) for AC matters. [US volunteered.]
	14h30	Break		
D1	14h45	ARHC IHO Strategic Plan Gap Analysis DOC: ARHC12-D1A ARHC SP Gap Analysis DOC: ARHC12-D1B ARHC SP Gap Analysis Takeaways -Presentation Reference DOC: C6-04.2-Annex C IRCC Chair		

		<u>Proposal regarding SPI allocated to IRCC</u>		
D2	15h15	S-100 Implementation – WEND100-IGIF Matrix DOC: <u>ARHC12-D2 WEND100-IGIF Matrix Presentation</u> DOC: <u>WENDWG CL 02/2022</u> DOC: ARHC12-D2 WEND100-IGIF Product Matrix_v1_10Aug2022.xlsx (see <u>WENDWG Repository</u>)	c/WENDWG	
D3	15h45	The need for regional coordination of S-100 implementation -Including production and distribution -An S-100 strategy and roadmap for the Arctic? Reference DOC: <i>Guidelines on the Implementation of the WEND-100 Principles, version 1.0, April 2022</i> Reference DOC: <u>Roadmap for the S-100 Implementation Decade (2020 – 2030) Version 2.0, 16 December 2021</u> DOC: <u>IHO CL 31/2022 Outcome of NCSR 9 – Revision of the ECDIS Guidance for Good Practice and Revision of the ECDIS Performance Standard</u>	Open discussion	This item will also be on the BSHC agenda IHO CL 31/2022 para 8: “IHO Member States should also note that IHO has now commitments towards IMO and other stakeholders to achieve operational status on the prioritized S-100 Product Specifications in accordance with the Roadmap for the S-100 Implementation Decade and Member States to achieve substantial coverage including robust distribution and update services for S-101 ENC and related products by 1 January 2026”.
D4	16h30	Items for C6 for discussion Examples: <u>-C6-04.2B Avoid any ambiguity for S-100 based products that do contribute to navigation, by clearly distinguishing them from products using the same data format with a content for other purposes</u> <u>-C6-04.1B Guidelines for ENC-derived Paper Charts</u> <u>-C6-7.6A INF Information (ROK, Canada): Establishment of a National S-100 Committee</u>	Open discussion, introduced by c/Council	ARHC Members invited to suggest other C6 items for discussion. Does ARHC wish to establish a position on any of these items?

	17h00	End of Day 1		
	18h00	Conference Dinner		
Innovation Science and Technology Demonstrations (Thursday)				
ARHC12 DAY 2 (Friday)				
D6	Day 2 08h30	Observations and outcomes from the Open Forum and the Demonstration Day	All	
C2	09h00	Arctic International Charting Coordination Working Group (AICCCWG) Report <i>DOC: ARHC12-C2 AICCCWG –Report</i> Arctic Grid Study Report <i>DOC: ARHC12-C2A Arctic Grid Project report</i>	c/AICCCWG Doug Brunt Laura Colombe (VTC), Jonathan Pritchard-IIC (VTC)	
C5	09h40	ARHC GEBCO and Seabed 2030 Coordinator Report -Data Contribution Request for IBCAO 5.0 <i>DOC: ARHC12-C5 ARHC GEBCO-Seabed 2030 - Report</i> <i>DOC: ARHC12-C5 Data Contribution Request for IBCAO 5.0</i>	Paul Brett (CA rep to GGC) Evert Flier	
E. Other Items of Interest (part 2)				
E3	09h55	UKHO Brief-Future of Paper Overview <i>DOC: ARHC12-E3 UKHO Future of Paper Overview</i>	Simon Hardern	
E4	10h15	Options and opportunities for the greening hydrographic activities, particularly in the Arctic <i>Ref DOC: ARHC12-E4 Market dialogue - Identify environmental requirements for procurement within seabed mapping</i>	Open discussion, introduced by NO	
	10h30	Break		
F. Coda				
F1	10h50	Confirmation of ARHC representative to Council for A3-A4 period		

F2	11h00	Next Meeting ARHC13 <i>DOC:</i> ARHC12-F2ARHC13 Teaser	Pia Dahl Højgaard	
F3	11h10	Confirmation of Chair and Vice-Chair	All	
F4	11h20	Summary of Actions -In the next 60 days ARHC will... <i>DOC:</i>	CA, DK	
F5	11h35	Closing Remarks and Observations	Dr. Geneviève Béchar Dr. Mathias Jonas	
	11h45	Closure of Meeting	Dr. Geneviève Béchar	Taxis will be waiting at 12h00 to transport participants who need to get to the airport.

Annex D**List of Recommendations, Decisions, and Actions****ARHC Actions, Decisions, and Recommendations****From ARHC12 (12-16 September 2022)**

[Gold=Action; Green=Decision; Blue=Recommendation]

Updated 2022-11-21

Ref # A=Action D=Decision R=Recommendation	Agenda Item	Actions	For	Deadline	Status
ARHC12-A01	A1	Delegations are requested to review the list of participants and report any errors or omissions to Doug at douglas.brunt@dfo-mpo.gc.ca	All	2022-11-01	Complete
ARHC12-D01	A1	ARHC Full Member states present agreed that a quorum had been established for this meeting.	n/a	n/a	n/a
ARHC12-D02	A1	ARHC Full Member states re-affirmed and stated that the ARHC Statutes Ed 03 are in effect as of 2021-11-10 as per ARHC11-D05.	n/a	n/a	n/a
ARHC12-A02	A3	ARHC Associate Member States Finland, Iceland, and Italy were invited to physically sign the ARHC Statutes Ed 03. Signed document to be uploaded to ARHC web page.	Finland, Iceland, and Italy	2022-09-13	Complete
ARHC12-A03	A4	MS were encouraged to review the Status of Actions (<i>ARHC12-A4 Status of Actions from ARHC11</i>) and return any comments/updates to ARHC Secretariat.	All	2022-11-01	Complete
ARHC12-B1	B1	IHO Secretary-General encouraged	All	n/a	n/a

R01		ARHC member states to prepare for C6 and A3, particularly noting the change of date and venue for A3.			
ARHC12-R02	B1	IHO Secretary-General, supported by the c/WENDWG, recommended further development of MSDI in the region e.g., for MPAs (S-122), for new ice services (S-411), and for national/regional/IHO-level outreach for the Ocean Decade. c/ARMSDIWG to incorporate into workplan.	All; ARMSDIWG	n/a	n/a
ARHC12-A04	C1	ARHC MS to respond as soon as possible to NOAA e-mail from Christy Fandel (25 July 2022) requesting CATZOC data and other information in order to commence the OTWG's 2023 Chart Adequacy Assessment exercise.	All; OTWG	2022-11-15	Ongoing
ARHC12-D03	C1	ARHC accepted US offer to continue to chair the OTWG	n/a	n/a	n/a
ARHC12-D04	C2	NO will continue as c/AICCWG	n/a	n/a	n/a
ARHC12-D05	C2	c/AICCWG will additionally take on the role of the S-100 Implementation Coordinator.	n/a	n/a	n/a
ARHC12-A05	C2/D2	CA and US will initiate filling out the IGIF matrix and forward on to the AICCWG.	CA, US	2022-09-30	Done. Results to be posted on ARHC web page
ARHC12-A06	C2	AICCWG to report on the readiness to produce and availability of S-101 data within the region.	All; AICCWG	ARHC13	Ongoing
ARHC12-A07	C2	MS encouraged to review the Arctic Grid Study report and investigate the offerings on the www.arcticgrids.com website which include more information on the grids themselves and the opportunity to create test datasets	All	2022-11-15	Ongoing

		using the 3 recommended grids for the purposes and report any questions/comments to the Arctic Grid Study Project Team (AGSPT (CA)).			
ARHC12-A08	C2	NO to establish contact with Arctic SDI	NO	n/a	Ongoing
ARHC12-A09	C2	MS to provide comments on ASDI policy paper to NO. Suggest c/ARMSDIWG add this to workplan on data policy issues regarding SDI	All	2022-11-15	Ongoing
ARHC12-A10	C2	Arctic Grid Study Project Team to prepare a presentation to WENDWG	AGSPT	2022-12-01	Ongoing
ARHC12-A11	C2	MS to consider options to continue to fund the work of the AGSPT and to consider ongoing participation in the PT	All	2022-12-01	Ongoing
ARHC12-D06	C3	ARHC accepted DK's offer to continue as ARHC liaison to the IHO-EU Network Working Group	n/a	n/a	n/a
ARHC12-D07	C4	ARHC endorsed the ARMSDIWG revised Terms of Reference (TOR)	n/a	n/a	n/a
ARHC12-D08	C4	ARHC approved the ARMSDIWG revised work plan	n/a	n/a	n/a
ARHC12-D09	C4	ARHC thanked and accepted US offer to continue as chair of ARMSDIWG	n/a	n/a	n/a
ARHC12-A12	C4	NO to reach out to Norwegian Chair of the Arctic SDI	NO	ARHC13	Ongoing
ARHC12-A13	C4	MS asked to confirm or reconfirm their participation in ARMSDIWG, including a willingness to take the lead on specific tasks, and inform the c/ARMSDIWG	All	2022-10-15	Ongoing
ARHC12-A14	C4	Based on ARHC12 discussions, ARMSDIWG to substantiate work plan items and to assign roles to	Chair ARMSDIWG	2022-12-01	Ongoing

		ARMSDIWG MS for specific tasks.			
ARHC12-A15	C5	MS to include update on GEBCO/Seabed 2030 activities in National Report	All	ARHC13	Ongoing
ARHC12-A16	C5	MS encourage to respond to the Data Contribution Request for IBCAO 5.0	All	2022-11-01	Ongoing
ARHC12-D10	D1	It was decided that ARHC requires both a strategy and a communications plan to accelerate and increase coverage of S-100 products and services. Follow-up action(s) to be determined, however, NO noted there will be workshop on this subject later. US noted this could be assigned to the AICCWG	n/a	n/a	n/a
ARHC12-A17	D1	For communication purposes, MS to submit to the ARHC Secretariat projects that have been endorsed by the UN Ocean Decade.	All	As soon as practically possible.	Ongoing
ARHC12-A18	DI	MS invited to read the ARHC IHO Strategic Plan Gap Analysis document (ARHC12-D1A ARHC SP Gap Analysis).	All	As soon as practically possible.	Ongoing
ARHC12-A19	D1	Member States are invited to share talking points with Pia for her presentation to the IMO Polar Maritime Seminar. [The Seminar is 30 Oct – 1 Nov with the deadline to submit presentations 15 Oct.]	All	2022-10-10	Ongoing
ARHC12-R03	D1	IHO SG recommended that ARHC report on SPI 1.2.2 as per CL23/2022 and the discussions held at IRCC14 concerning 'navigationally significant areas'	All; ARHC Secretariat	C7	Ongoing
ARHC12-D11	D5	US-OCS agreed to continue as the liaison/POC under the ARHC-PAME MOU.	n/a	n/a	n/a

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ARHC12-A20	D5	A letter of introduction to PAME will be drafted and circulated to ARHC for comment and endorsement.	J. Justi	For next PAME meeting	Ongoing
ARHC12-A21	D6	ARHC12 participants thanked Paul Brett and the Fisheries and Marine Institute of Memorial University of Newfoundland for their organization of the Open Forum, the Innovation Science and Technology Demonstrations, and for the general support of ARHC12.	All	n/a	Complete
ARHC12-A22	E4	ARHC members are invited to share experiences with respect to options and opportunities for the greening of hydrographic activities.	All	ARHC13	Ongoing
ARHC12-D12	F1	DK confirmed as ARHC representative to Council for A3-A4 period	n/a	n/a	n/a
ARHC12-D13	F3	Denmark confirmed as c/ARHC and Norway as vc/ARHC.	n/a	n/a	n/a

Annex E: ARHC Gap Analysis

GOAL 1	Target	Current State	Gap	Actions
Goal 1: Evolving the hydrographic support for safety and efficiency of maritime navigation, undergoing profound transformation	<p>1.1 Deliver standards for hydrographic data and specifications of hydrographic products; support their regular production; and coordinate regional and global services for their provision</p> <p>1.2 Develop standards, specifications and guidelines in the areas of data assurance, including cyber security and data quality assessment</p> <p>1.3 Use capacity building and training to develop and increase the ability of Member States to support safety and efficiency of maritime navigation</p>	n/a	n/a	<p>Highlights/observations:</p> <ul style="list-style-type: none"> -Most ARHC Member States (MS) are active in IHO bodies which are responsible for the development of standards, specifications, and guidelines for products, services, and data quality. -They work with each other, participate in the IHO WENDWG and/or are members of RENCs in an effort to coordinate the production and the secure delivery of quality national, regional and global products and services. -All MS are capable of supporting safe and efficient navigation in most of their waters, however, in many Arctic areas, there still exist shortcomings in the quality and coverage of hydrographic data. -MS are generally well advanced with respect to their capacities for deliver hydrographic services. Several MS are actively support capacity building (CB) efforts both in terms of the IHO 3-phase CB Strategy and other CB-related projects such as e-learning development and the IHO project on <i>Empowering Women in Hydrography</i>. -Training (in-person and on-line) is an ongoing activity in all ARHC MS. -Ultimately, a dashboard indicating the progress of all SPIs in the Strategic Plan should be developed. -MS are promoting the use of S-xxx to other potential data providers.
Strategic Performance Indicators 1.1.1	Percentage of Member States having operationalized production and distribution of hydrographic data products and services based on IHO Universal Hydrographic Data Model (S-100), under an implementation framework of coordination and agreed timelines (2026: 100%)	40%	60%	<p>Highlights/observations:</p> <ul style="list-style-type: none"> -This SPI requires a better definition (see Questions below). -Most MS have done some preliminary development on products and services for the 'First Step' noted in the <i>Roadmap for the S-100 Implementation Decade, Annex 2</i> plan and most are confident they will achieve this goal. -Not all products/services in the Roadmap fall under the authority of the hydrographic offices. -S-101 ENC's will be the highest priority for all MS HO's. -S-102 (bathymetric surface) production will be targeted for selected waterways and areas. -One ARHC MS is regularly

			<p>producing and distributing S-102 data, and two are producing S-111 (surface currents) data.</p> <p>-Some MS are taking the opportunity to improve/review the content of ENC's e.g., CATZOC, uncertainty values, etc.</p> <p>ARHC outstanding challenge(s):</p> <p>-Having adequate coverage with S-100 products/services will be critical to the end users' demand. S-101 alone will not likely be enough to convince users to upgrade their systems.</p> <p>-Not all the specifications in the 'First Step' have been completed and fully tested for production environments.</p> <p>-The implementation of S-128, in particular, needs to be better understood.</p> <p>-The line between route monitoring and route planning can be fuzzy and mariners may demand more those planning product/services prior to 2026.</p> <p>-Dual-fuel and backward/forward conversion issues are still being sorted out.</p> <p>-In most MS, domestic inter-agency coordination and collaboration will be required to deliver the entire suite of the S-100 products/services in the Roadmap.</p> <p>ARHC outstanding question(s):</p> <p>-As previously stated, this SPI needs a defined and applied consistently across all MS. For example, the numbers given for the 'Current State' is 40% because 2 of the 5 MS are producing some (2) products/services. Is this meaningful? If all 5 MS produce only S-101, does this constitute 100%?</p> <p>-Does 'operational' mean through a RENC, or does any delivery mechanism count?</p> <p>-How can the SPI be modified to capture the 'package' of First Step S-100 products and services?</p> <p>-How can the aspect of coverage be measured?</p> <p>-Is more than one measure required?</p> <p>-Could the IHO on-line catalogue/INToGIS leveraged to generate these measures?</p> <p>-Can the calculation of this SPI be done automatically?</p> <p>ARHC outstanding action(s):</p> <p>-Redefine this SPI. This should be coordinated with other RHCs, MS,</p>
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				and HSSC. -MS to report annually on this measure.
1.1.2	Number of hydrographic data products and services based on the Universal Hydrographic Data Model that cater for the new requirements: autonomous shipping, reduction of emissions	TBD	100%	<p>Highlights/observations:</p> <ul style="list-style-type: none"> -IHO has stood up a MASS project team (PT). Four of five ARHC MS participate on this PT. -S-111 data is available globally at small scale. S-102 is available in selected, dynamic, and high-traffic areas, and S-104 data should become available in similar areas beginning in 2022. -This information should be collected and reported by HSSC. HSSC -It is unclear which subset of the Roadmap elements are tied to autonomous shipping and the reduction of emissions. -SPI 1.1.2 is quite similar to SPI 1.2.1 -HSSC (HSSC12 2021 4.3A) indicates that the 7 product specifications of 'Step 1' should be included in this count. <p>ARHC outstanding challenge(s):</p> <ul style="list-style-type: none"> -The S-xxx products and services required for MASS and the reduction of emissions have not been defined and the timeframe for doing this has not been determined. -MASS will require a massive, coordinated approach between many domestic and international entities; this includes regulations. The knowledge and understanding of how this system will work is still developing. -A positive business case for implementing a S-100-based system has not been widely acknowledged. -The amount of HO resources required to support these new products and services remains unknown. <p>ARHC outstanding question(s):</p> <ul style="list-style-type: none"> -How are these requirements to be defined? -Does the 'number' refer to the types of data, e.g., S-101, S-102 etc., or the number of datasets for each type of data? -Can the calculation of this SPI be done automatically? <p>ARHC outstanding action(s):</p> <ul style="list-style-type: none"> -ARHC to begin preliminary work

				on determining which routes in the region may be used by autonomous vessels.
1.2.1	Percentage of hydrographic data products and services based on the S-100 model that are covered by IHO standards, specifications and guidelines on cyber security (2026: 100%)	TBD	100%	<p>Highlights/observations:</p> <ul style="list-style-type: none"> -This information should be collected and reported by HSSC. -For several ARHC MS, the implementation of cyber-security will be done at the RENC/VAR level. -HSSC (HSSC12 2021 4.3A) notes, "7 Product Specifications includes cyber security and data quality assessment". <p>ARHC outstanding challenge(s):</p> <ul style="list-style-type: none"> -Establishing cybersecurity measures on all parts of the value chain, including those outside the control of the HO. <p>ARHC outstanding question(s):</p> <ul style="list-style-type: none"> -Have the cyber-security specifications been finalized? -How is the denominator in this equation calculated? -What is the difference between SPI 1.1.2 and SPI 1.2.1? -Does 'covered' mean that the data [during transfer] is supposed to be encrypted? -Do all S-xxx datasets have to be encrypted? -What if an HO (e.g., US) does not wish to encrypt its products and services? Will this measure for them always be 0%? <p>ARHC outstanding action(s):</p> <ul style="list-style-type: none"> -None
1.2.2	Percentage of navigational significant areas (e.g., charted traffic separation schemes, anchorages, channels) for which the adequacy of the hydrographic knowledge is assessed through the use of appropriate quality indicators (2026: 100%)	25-100 (TBBD*)	75-0	<p>Highlights/observations:</p> <ul style="list-style-type: none"> -The IRCC direction with respect to this SPI is to, "Derive one estimate figure for the RHC in %" (IRCC CL 01/2021 Annex A). -All MS report that the products that they provide have been assessed for adequacy in some systematic way with quality indicators. -For some areas e.g., CA Arctic and Greenland, many of these products may be at a small (offshore) scale. -These factors lead to a wide range in this SPI. (* TBBD -To be better determined.) -The area (km²) of navigational significant areas needs to be calculated for some MS. -For MS with large EEZs in the Arctic like CA and DK, the percentages will not be high, e.g., the EEZ of Greenland is approximately 2 000 000 km², and the EEZ can include areas permanently

				<p>covered with ice.</p> <p>-US & FI (100%) and NO (90%) are at or very close to this target.</p> <p>-In many areas in the Arctic demand for products is user-driven, so the target may keep moving.</p> <p>-This determination of this measure will be supported by HSSC - DQWG/ENCWG/HSWG- CATZOC/Quality of Bathymetry (HSSC12 2021 4.3A).</p> <p>ARHC outstanding challenge(s):</p> <p>-In C-55 the coverage of charts is categorized by usage (i.e., Offshore passage/landfall and coastal passage/approaches and ports) and not by navigational significance. That requires some further data distilling to arrive at this SPI. For example, NOAA does have a "hydrohealth model" that governs its assessment of navigationally significant areas.</p> <p>ARHC outstanding question(s):</p> <p>-Could this measure be considered a subset of the SPI 2.2.1?</p> <p>-Are there any areas of the high seas that are considered navigationally significant?</p> <p>-Would the IHO consider adding the layer(s) of navigationally significant areas to INTogIS? This could pave the way to using INTogIS to generate this measure.</p> <p>ARHC outstanding action(s):</p> <p>-ARHC to come to a common definition of 'navigationally significant', which also considers the IMO definition, if it exists.</p> <p>-Task OTWG to calculate this SPI based on this definition and using any information e.g., CATZOC already captured in INTogIS, if possible.</p>
1.3.1	Ability and capability of Member States to meet the requirements and delivery phases of the S-100 implementation plan (2026: 50%)	80	20	<p>Highlights/observations:</p> <p>-From IRCC, "Derive a figure for each region of the percentage of MS, that are capable to provide S-101 and S-102 products data".</p> <p>-It is assumed that the distinction from SPI 1.1.1 that is being sought by this measure relates to the technical capacity to produce as opposed to actual production and delivery.</p> <p>-Four of the five MS of the ARHC report this ability and capability and are confident about meeting the Roadmap timelines.</p> <p>-Most ARHC MS are active in the IHO</p>

			<p>bodies working on developing the standards, abilities, and capabilities required meet the Roadmap timelines.</p> <p>-References to the <i>Roadmap for the S-100 Implementation Decade (2020-2030)</i> should be clear, unambiguous, and consistently applied. For example, this SPI refers to the “delivery phases” of the S-100 implementation, but that phrase does not appear in the document itself. Related, it is suggested the Roadmap document be more readily available and easier to find on the IHO web page.</p> <p>ARHC outstanding challenge(s): -As mentioned previously, the production of some of the S-xxx products and services are the remit of the HOs; inter-agency coordination will be needed to meet the requirements.</p> <p>ARHC outstanding question(s): -Is S-101 data converted from S-57 considered sufficient or must this be native S-101 production? -How is the element of geographic coverage to be reported or integrated into this measure?</p> <p>ARHC outstanding action(s): -Ask remaining MS to report on this item.</p>
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GOAL 2	Target	Current State	Gap	Actions
Goal 2: Increasing the use of hydrographic data for the benefit of society	<ul style="list-style-type: none"> Build a portal to support and promote regional and international cooperation in marine spatial data infrastructures (MSDI) Promote new tools and methods to accelerate and increase coverage, consistency, quality of surveys in poorly surveyed areas Apply UN shared guiding principles for geospatial information management in order to ensure interoperability and extended use of hydrographic data in combination with other marine-related data 	n/a	n/a	<p>Highlights/observations:</p> <ul style="list-style-type: none"> -The scope and governance of any portal must be clearly defined. -The majority of ARHC MS are active internationally in the areas of spatial data infrastructures e.g., IHO MSDIWG, and the management geospatial data e.g., UN-GGIM. See also SPI 2.3.1. -The majority of ARHC MS are actively testing new technologies, e.g., uncrewed survey vessels (USVs), and methods, e.g., crowd-sourced bathymetry to in data coverage and data quality. <p>ARHC outstanding challenge(s):</p> <ul style="list-style-type: none"> -Due to varying business models, the accessibility to data is challenging to harmonize across agencies and countries. -HOs require IT professionals to implement some of these changes, putting additional stress on resources. -Implications and opportunities of the 'S-100 World' not fully understood, yet. -Building a portal is only one part of the equation. Communicating its existence and usefulness to the rest of society is another, equally important part. <p>ARHC outstanding question(s):</p> <ul style="list-style-type: none"> -Does ARHC need strategy (including communications) particular for the Arctic, "...to accelerate and increase coverage..."? -Is ARHC making significant efforts in outreach to Indigenous peoples and Northern communities in the region?
2.1.1	Number of hits downloading data/information from the portal	In progress	TBD	<p>Highlights/observations:</p> <ul style="list-style-type: none"> -IRCC proposed that the MSDIWG provide a procedure of the development of the portal at the IHO Secretariat. -Currently, there is no regional 'portals'. -Several ARHCMS do have well-developed data/information portal(s) with significant offerings. -Any approach to a portal must be standards-based and the FAIR principles should be applied. <p>ARHC outstanding challenge(s):</p> <ul style="list-style-type: none"> -The design, standing-up, and

				<p>maintenance of the portal(s) represent a further resource commitment.</p> <p>-There may be technical and policy issues related to consolidated or federated portals e.g., access to, and sharing of, national data.</p> <p>ARHC outstanding questions:</p> <p>-Does portal = MSDI in this situation?</p> <p>-What is the scope of the data and the information to be provided to and accessed by or through the portal?</p> <p>-Who (i.e., which MS) will 'own' this portal?</p> <p>-Is this portal to be linked to the IHO e.g., to the IHO online catalogue?</p> <p>-What is the timeline for this SDI? Yearly, would be appropriate.</p> <p>-What analytics should be employed?</p> <p>ARHC outstanding action(s):</p> <p>-ARHC to make a concerted effort to develop federated and/or consolidated MSDI(s)/portal(s) for the region.</p>
2.2.1	Percentage of adequately surveyed area per coastal state	In progress	TBD	<p>Highlights/observations:</p> <p>-It is assumed that 'adequately surveyed' equates to the measure described in C-55.</p> <p>-With the exception of Norway, the percentage of adequately surveyed areas in Region N, as reported in C-55, is low.</p> <p>-There may be some elements of this SPI that may complement the bathymetric data gap analysis (see 3.2.3).</p> <p>-It is interesting to note that while most MS report excellent chart coverage in the area, adequately surveyed area percentages are generally lower.</p> <p>-IRCC suggested that, using C-55 status of surveys data, areas where the value is less than 50% (33%) [?], be the focus and that the CBSC "derive rough figures from current C-55 and implement a routine procedure to derive percentage per coastal state in a simple manner, using also CATZOV information...".</p> <p>ARHC outstanding challenge(s):</p> <p>-The Arctic is a vast area and challenging environment to work in. This means the collection of bathymetric data by traditional</p>

			<p>hydrographic methods is slow and expensive.</p> <ul style="list-style-type: none"> -Not all ARHC MS have reported this information to C-55, so regional analysis is not possible. -The methodology for computing adequacy is not the same between HOs. E.g., CA uses the methodology proposed by UKHO and SHOM (Document CBSC16-08.3B (2016)). -Both Seabed 2030 (see SPI 3.2.3) and C-55 request information about 'adequately surveyed' areas, but the parameters for each differ both technically and geographically, which makes the collection of this information quite demanding for HOs. <p>ARHC outstanding questions:</p> <ul style="list-style-type: none"> -Currently, C-55 information is broken down by depth (greater and less than 200m) and quality of coverage (adequate, re-survey required, and never systematically surveyed) so what is the best method to calculate the overall 'percentage'? -Should the SPI be divided into one element for data suitable for navigation and one element suitable for non-navigation uses e.g., Seabed 2030? -Could some C-55 information be captured in INTOGIS to facilitate the extraction of this data? <p>ARHC outstanding action(s):</p> <ul style="list-style-type: none"> -ARHC to agree upon a common methodology for determining 'adequacy'. -Engage with CBSC on this endeavour. -Ensure all ARHC MS provide or update adequately surveyed area data for Region N in C-55 as soon as possible.
2.2.2	Number of new applications of the new version of Standards for Hydrographic Surveys (S-44)	TBD	<p>TBD Highlights/observations:</p> <ul style="list-style-type: none"> -All ARHC MS conduct hydrographic surveys in accordance with, or rely heavily on, the S-44 specifications. Surveys contracted by the HOs must also meet this standard, depending on the purpose of the survey. -S-44 is referenced on MS web sites. -New methods, technologies, and operations for hydrographic surveying are being tested and deployed with the expectation that these innovations will be able to deliver outputs that conform to the S-44 specifications.

				<p>-HSSC (HSSC12 20214.3A) indicated that the HSWG should monitor and report on this measure.</p> <p>ARHC outstanding challenge(s):</p> <p>-Continuing to improve the awareness of S-44 throughout the hydrographic communities.</p> <p>-Setting up mechanisms within HO's to track and/or identify data sources and systems that conform to the 'new' S-44 specification.</p> <p>ARHC outstanding questions:</p> <p>- What is the connection between this SPI and Target 2.2 "<i>Promote new tools and methods to accelerate and increase coverage, consistency, quality of surveys in poorly surveyed areas</i>"?</p> <p>-What is meant by 'new applications'? Is this <u>data</u> that has been collected to the specifications or <u>systems</u> (hardware, software, or procedures) that utilize S-44 in some way?</p> <p>-Is there a metadata element that could be utilized to assist in this counting?</p> <p>-What is the timeframe for this measure?</p> <p>-Is there a target number?</p> <p>-How would the counting of any of these elements be conducted and who would be responsible for collecting this data?</p> <p>-Does the download of the S-44 standards document constitute an application of the new/current standards? Would this type of counting be done by the IHO Secretariat?</p> <p>-Does 'new version' = 'current version'?</p> <p>ARHC outstanding action(s):</p> <p>-Ask HSSC for clarification on this SPI and work with the HSWG, as required</p>
2.3.1	Number of HO's reporting success applying the principles in their national contexts (2026: 70%)	80% (of ARHC MS)	20%	<p>Highlights/observations:</p> <p>-The majority of ARHC MS report success in their national contexts with respect to the applications UN shared guiding principles for geospatial information management.</p> <p>-European MS have also leveraged the INSPIRE principles.</p> <p>-ARHC MS participate in UN-GGIM MDWG.</p> <p>-IRCC proposed way forward is for MSDI WG and UN GGIM HWG to set up definition of what application means. Possibly providing information documents, and that MS (via RHCs) to report figures to IRCC and then to IHO</p>

			<p>Secretariat annually.</p> <ul style="list-style-type: none"> -Most MS have implemented some type of open data policy. -The Global Maritime Traffic Density Service (GMTDS) and the World Port Index (WPI) from US-NGA are examples of applied FAIR principles. The latter also allows for the crowdsourcing of some ports-related data. These products are, or soon will be available via the IHO. <p>ARHC outstanding challenge(s):</p> <ul style="list-style-type: none"> -To communicate in a cohesive and understandable manner to the general public, how the UN principles across the Region are being applied. -Integrating the IGIF concepts into existing national hydrographic and topographic structures. <p>ARHC outstanding action(s):</p> <ul style="list-style-type: none"> -Ensure all ARHC MS report on this item and determine the reporting schedule (i.e., report by what date each year). -Follow the work of the MSDI WG and UN GGIM HWG concerning the definition of this measure and engage as required. -Create an ARHC web presence.
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GOAL 3	Target	Current State	Gap	Actions
Goal 3: Participating actively in international initiatives related to the knowledge and the sustainable use of the Ocean	<ul style="list-style-type: none"> Collaborate with other bodies who deliver capacity-building and training to improve effectiveness of capacity-building activities and programs Improve knowledge of the world's seafloors Implement a comprehensive IHO digital communication strategy in order to enhance its visibility and accessibility to its work 	n/a	n/a	Highlights/observations: -ARHC has a standing Seabed 2030 and a Crowd-sourced Bathymetry (CSB) coordinator (both NO). -80% of the ARHC Full Members participate in the IHO CSBWG and several have their own national initiatives related to CSB and other data gathering, including engagement with northern communities. -ARHC has a MOU with the PAME working group of the Arctic Council to work collaboratively on matters of mutual interest. ARHC outstanding challenge(s): -The provision of data via a consolidated or federated MSDI e.g., Arctic Voyage Planning Guide (AVPG) has yet to be achieved. -ARHC has not developed a strategic plan to engage in the UN Decade of Ocean Science for Sustainable Development (UNDOOS).
Strategic Performance Indicators 3.1.1	Percentage of Coastal States that are capable to provide marine safety information (MSI) according to the joint IMO/IHO/WMO manual on MSI (2026: 90%)	100%	0%	Highlights/observations: -All ARHC MS are capable of providing MSI according to the IMO/IHO/IMO manual on MSI. -In some MS the promulgation of MSI is not the responsibility of the hydrographic offices. -The WWNWS should report this annually to IRCC. ARHC outstanding question(s): -Could C-55 and INTGIS be redesigned to allow MSI-related status to be drawn automatically from those sources? ARHC outstanding action(s): -None

3.2.1	Amount of data received per year by the IHO Data Centre for Digital Bathymetry (DCDB).	Not applicable to ARHC	N/A	<p>Highlights/observations: ARHC believes that this SPI should be reported on by the DCDB.</p> <p>ARHC outstanding question(s): -Could SPI 3.2.2 be rolled up under this SPI using the same timeframe and providing a breakdown in contributions and contributors in the ways suggested below for 3.2.2. This may be more suitable for analysis by the RHCs.</p> <p>ARHC outstanding action(s): -None</p>
3.2.2	Number of contributors to DCDB who are not hydrographic offices	Not applicable to ARHC	N/A	<p>Highlights/observations: ARHC believes that this SPI should be reported on by the DCDB.</p> <p>ARHC outstanding question(s): -What is the timeframe for this measure? E.g., year-over-year; last 10 years; since inception? Suggest using the same timeframe as 3.2.1 -What are the parameters of this measure: E.g., single-beam; multi-beam; all bathy data? -Is there a way for contributions to be broken down geographically, that is, by RHC areas? This would be more relevant to RHCs. -Is there value in knowing amount of data delivered to the DCDB from ARHC national HOs? -Is the volume of data received from a contributor relevant?</p> <p>ARHC outstanding action(s): -None</p>
3.2.3	Percentage of total sea area that is Seabed 2030 compliant for incorporation into the GEBCO dataset and services	In progress	TBD	<p>Highlights/observations: -ARHC MS are at varying stages of evaluating their coverage vis-à-vis the Seabed 2030 specifications. Those that are not finished the analysis hope to complete the task this year. -NO reported that it has 67% compliance, but only 33% of that is publicly available. -It is assumed that the reporting of this measure will be coordinated by the GEBCO GC.</p> <p>ARHC outstanding question(s):</p>

				<p>-Could more precision be given to the definition of 'Seabed 2030 compliant'?</p> <p>-Could more precision be given to the definition of 'total sea area'? That is, does this mean within coastal state EEZ or within the limits of the RHC limits? What about the high seas within the RHC? Is this the realm of the RDACCs?</p> <p>-Is there any value in the better coordination of the activities of the RHCs and the RDACCs vis-à-vis Seabed 2020 activities.</p> <p>-Should the measure differentiate between what is publicly available and overall coverage?</p> <p>ARHC outstanding action(s):</p> <p>-ARHC MS to complete the evaluation of their bathymetric data coverages vis-à-vis the Seabed 2030 specifications in time to report to C6/A3.</p>
3.3.1	Number of visits, likes, re-postings, etc. associated with the IHO social media sites	Not applicable to ARHC		<p>Highlights/observations:</p> <p>ARHC understands that this SPI, and SPI 3.3.2, are the responsibility of the IHO Secretariat and that the Secretariat will employ the analytical tool(s) that best derive the information desired.</p> <p>ARHC outstanding question(s):</p> <p>-What are the goals or objectives of these measures and how do they inform the success of the Strategic Plan? In other words, will this information be used to make adjustments to the implementation of the Strategic Plan? If not, why collect it.</p> <p>-Could the data be broken down into Regional (e.g., ARHC) pieces, so that the RHCs could use this information to influence their work plans?</p> <p>ARHC outstanding action(s):</p> <p>-None</p>
3.3.2	Volume downloaded from the IHO website and Geographical Information System (GIS)	Not applicable to ARHC		<p>Highlights/observations:</p> <p>-ARHC understands that this SPI, and SPI 3.3.1, are the responsibility of the IHO Secretariat and that the Secretariat will employ the analytical tool(s) that best derive the information desired.</p>

				<p>ARHC outstanding question(s): -What is the breadth and depth of information for which the IHO Secretariat is considering assuming the role of data provider, particularly from the IHO GIS? Can this be done with the same level of IHO resources? -What are the expectations of MS with respect to contributing data to the IHO GIS? -What are the goals or objectives of these measures and how do they inform the success of the Strategic Plan? In other words, will this information be used to make adjustments to the implementation of the Strategic Plan? If not, why collect it? -Could the data be broken down into Regional (e.g., ARHC) pieces, so that the RHCs could use this information to influence their work plans?</p> <p>ARHC outstanding action(s): -None</p>
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ANNEX A

ARHC actions identified as part of the IHO Strategic Plan gap analysis.

1. GENERAL

1.1 Develop a schedule or calendar for reporting dates/cycles on SPI by MS to ARHC and for ARHC to IRCC.

GOAL 1 Actions

G1a. Redefine SPI 1.1.1*. This should be coordinated with other RHCs, MS, and HSSC.

** Percentage of Member States having operationalized production and distribution of hydrographic data products and services based on IHO Universal Hydrographic Data Model (S-100), under an implementation framework of coordination and agreed timelines.*

G1b. ARHC to begin preliminary work on determining which routes in the region may be used by autonomous vessels. (In support of SPI 1.1.2.)

G1c. ARHC to come to a common definition of 'navigationally significant', which also considers the IMO definition, if it exists. (1.2.2)

G1d. Task OTWG to calculate this SPI based on this definition and using any information e.g., CATZOC already captured in INTOGIS, if possible. (1.2.2)

G1e. Ask remaining MS to report on SPI 1.3.1: *Ability and capability of Member States to meet the requirements and delivery phases of the S-100 implementation plan.*

GOAL 2 Actions

G2a. ARHC to agree upon a common methodology for determining 'adequacy' for SPI 2.2.1 and engage with CBSC on this endeavour.

G2b. Ensure all ARHC MS provide or update adequately surveyed area data for Region N in C-55 as soon as possible.

G2c. Ask HSSC for clarification on SPI 2.2.2 (*Number of new applications of the new version of Standards for Hydrographic Surveys (S-44)*)

and work with the HSWG, as required.

G2d. ARHC to make a concerted effort to develop federated and/or consolidated MSDIs for the region.

G2e. ARHC to create a web presence to better communicate its activities and the data available from MS that could be of value to society.

G2f. Follow the work of the MSDI WG and UN GGIM HWG concerning the definition of SPI 2.3.1 *Number of HOs reporting success applying the principles in their national contexts* and engage as required.

G2g. Discuss the need for an ARHC strategy (including communications) particular for the Arctic, "...to accelerate and increase coverage..." of hydrographic data.

G2h. Consider adding 'Outreach to Indigenous peoples and Northern communities in the region' as a standing ARHC agenda item as part of the efforts to amplify use of hydrographic data for the benefit of society.

GOAL 3 Actions

G3a. ARHC MS will complete their Seabed 2030 data gap analysis, broken down into publicly and non-publicly available data, working with the RDACCs if possible/practical in time to report to C6/A3.

G3b. ARHC to work with PAME to deliver tangible results under the ARHC-PAME MOU. For example, assist PAME in developing an S-122 layer for marine protected areas (MPAs)

G3c. ARHC to consider if it wants a UNDoOS engagement strategy and what that would look like. This could be related to the previous point and development of a regional MSDI.