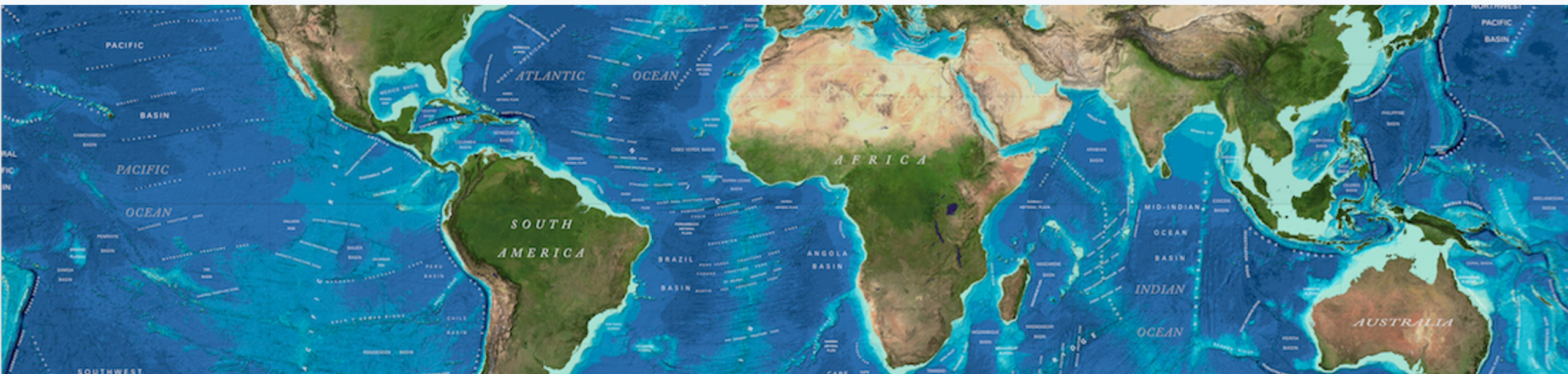


The IHO Crowdsourced Bathymetry Working Group 14

Welcome, Opening Remarks & Report to IRCC



International Hydrographic Organization
Organisation Hydrographique Internationale

16th - 18th August 2023
Stavanger, Norway

IHO CSB Working Group 14



IHO

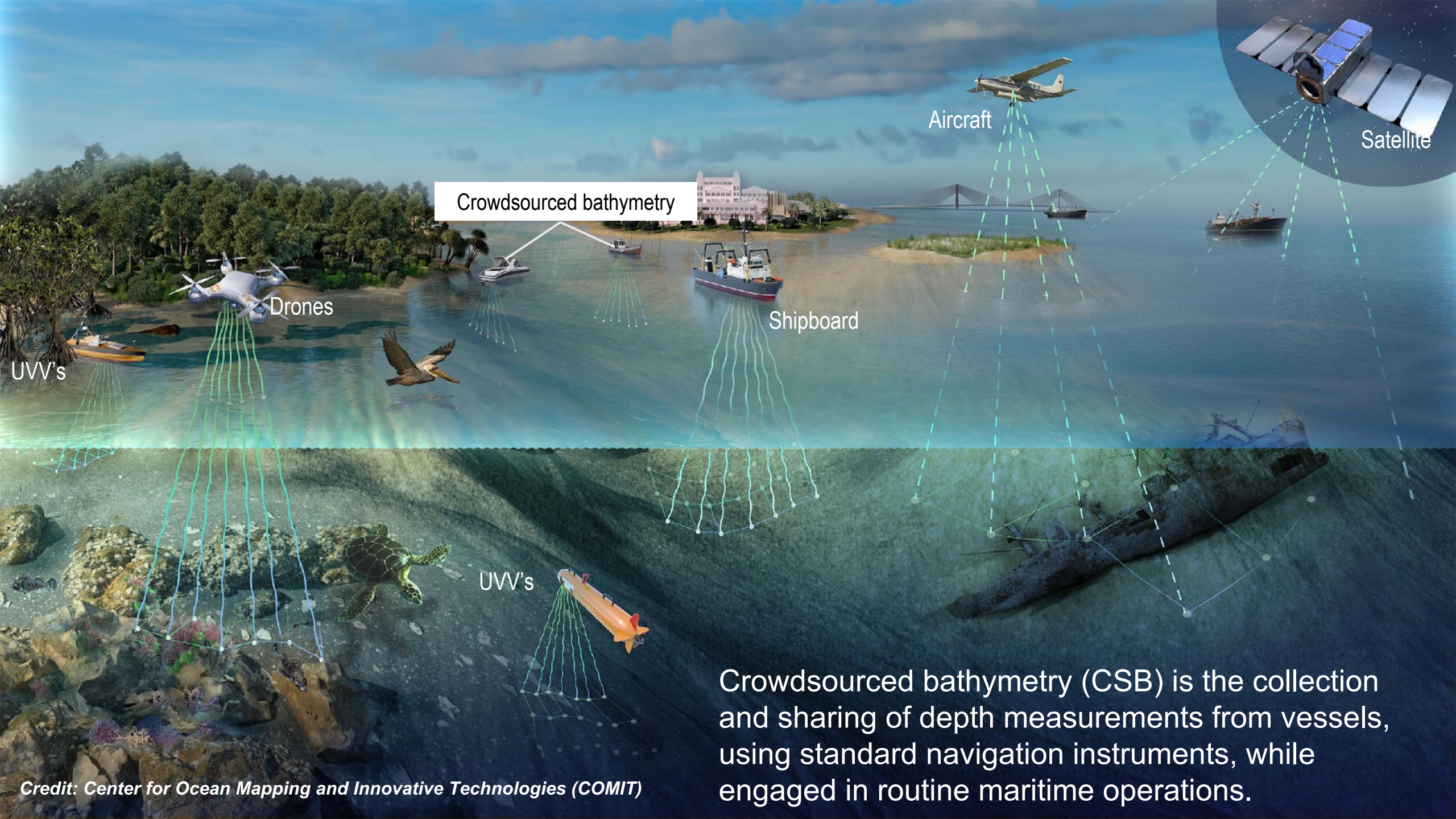
IHO Crowdsourced Bathymetry Initiative

International
Hydrographic
Organization

In 2014, the International Hydrographic Organization (IHO) initiated a collaborative project to encourage mariners to collect and contribute “crowdsourced bathymetry”.

A Working Group was formed and tasked to develop B-12 IHO Guidance on Crowdsourced Bathymetry that states the IHO’s policy towards, and best practices for, the collection and contribution of CSB.





Crowdsourced bathymetry

Aircraft

Satellite

Drones

Shipboard

UUV's

UUV's

Crowdsourced bathymetry (CSB) is the collection and sharing of depth measurements from vessels, using standard navigation instruments, while engaged in routine maritime operations.

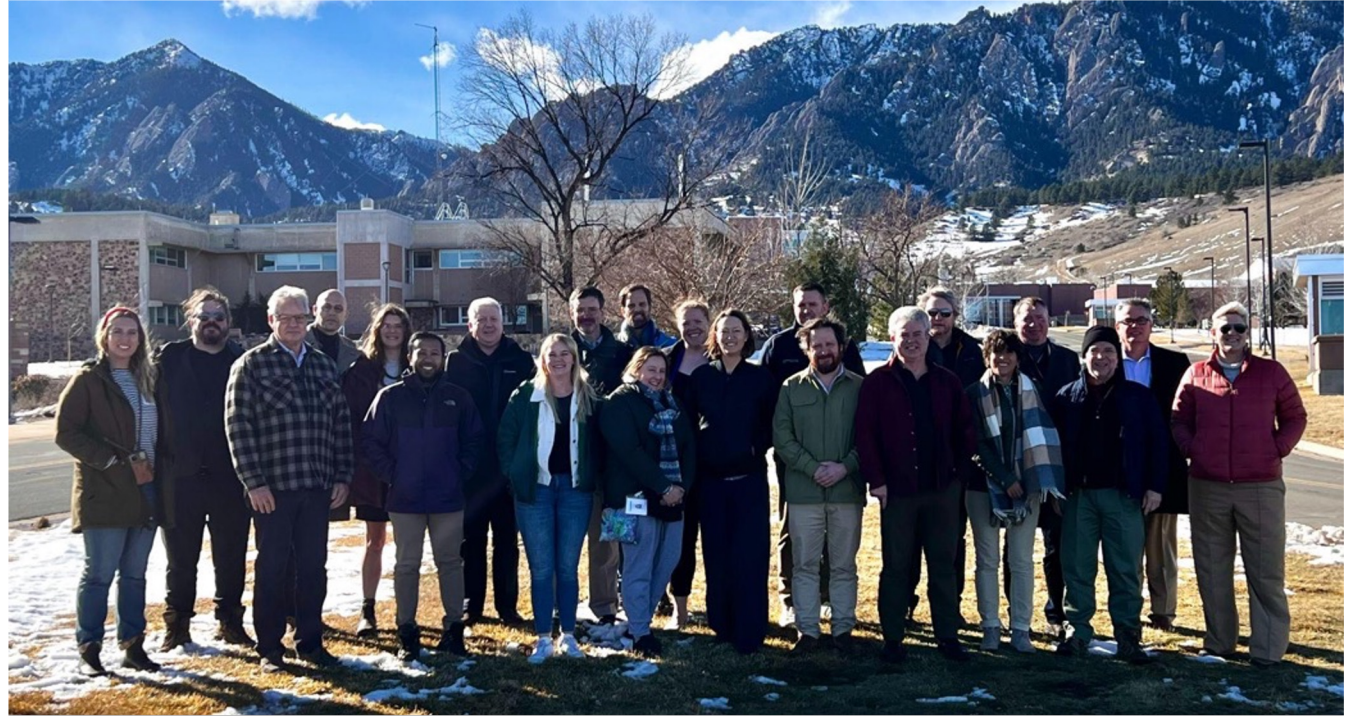


IHO

International
Hydrographic
Organization

CSB Working Group

- **Chair:** Jennifer Jencks, USA; **Vice Chair:** Peter Wills, Canada
- **Representatives from 18 Member States:** Canada, China, Denmark, France, Germany, India, Italy, Lebanon, Mexico, Netherlands, New Zealand, Norway, Portugal, South Africa, Sweden, UK, Uruguay, USA
- **IHO Secretariat:** IHO Assistant Director Sam Harper, IHO Director Luigi Sinapi



CSBWG13 - Boulder, Colorado USA
25 in person; ~30 virtual

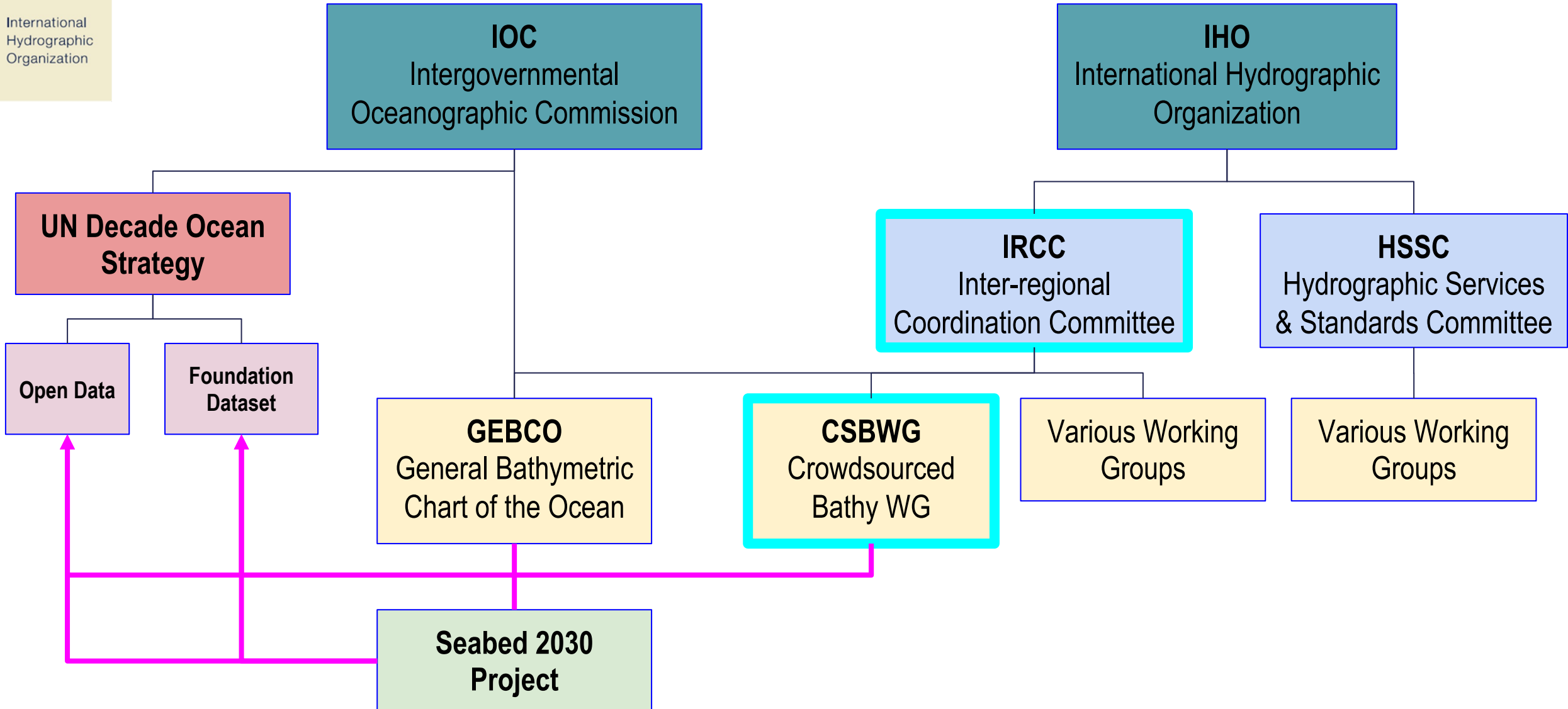
- **Observers and expert contributors:** CCOM-JHC, CIDCO, CIRES, Da Gama Maritime Ltd, Dongseo U, Dock Tech, ECC AS, ESRI, FarSounder, FLIR Systems AB, Fugro, GMATEK, Inc., Great Lakes Observing System (GLOS), H2i, James Cook U, JAMSTEC, Navico/C-Map, ONE Data Tech Co., Orange Force Marine, PYA, Seabed 2030, Sea-ID, SevenCs/ChartWorld, Teledyne CARIS, World Maritime University, and World Ocean Council



IHO

Governance

International
Hydrographic
Organization





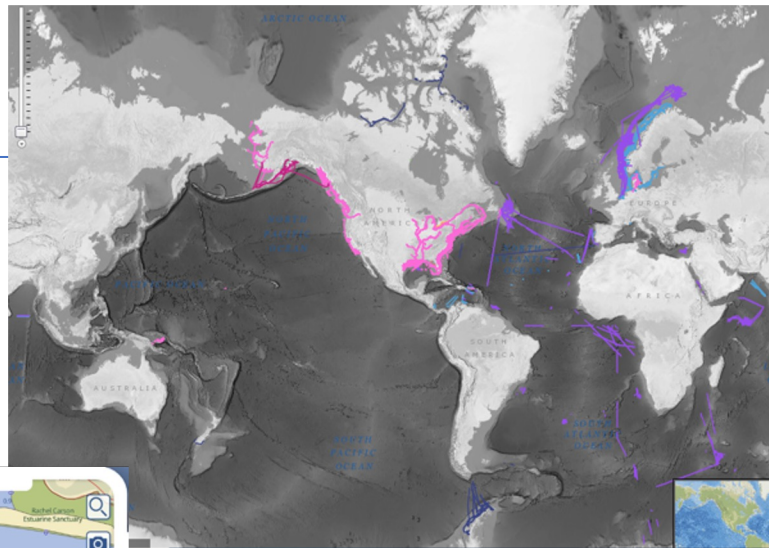
IHO

CSBWG Highlights: 2016-Present

A Recap

International
Hydrographic
Organization

- B-12 Ed. 3.0.0 (and a growing number of ancillary supporting documentation)
- 13 CSBWG meetings, 1 Industry Forum
- A robust IHO DCDB-hosted CSB data infrastructure
- An ever-growing interest from industry and academia to participate
- CSB/Seabed 2030 Coordinators from **most** RHCs
- Informational flyers encouraging participation from the greater community
- 10 Trusted Nodes (aka: data providers) and growing



International
Hydrographic
Organization





International
Hydrographic
Organization



© Pixabay

CITIZEN SOURCED DATA

HELP REVEAL THE DEEP AND SHARE YOUR DATA

CROWDSOURCED DEPTH INFORMATION

Commercially owned ships can participate in increasing our knowledge of the ocean by sharing depth measurements from navigation instruments while out at sea. Known as Crowdsourced Bathymetry (CSB), this information can help identify uncharted features such as seamounts and canyons, verify charted information, and help fill the gaps where no data exists.

CRUISE SHIPS

Many expedition cruise ships explore the world's oceans, often in areas where data is sparse, non-existent, or of poor quality. These are exactly the places where contributions to global seafloor mapping efforts can have the greatest impact.

To minimise effort on the part of the ship's crew, data collection and contribution of data can occur by using either built-in navigation software systems that are participating in the CSB initiative, or through a small hardware data logger that can be interfaced to the ship's NMEA data bus. Routinely measured parameters such as under keel depth and position, can then be stored, uploaded and contributed to local and global mapping initiatives. These contributions can also benefit navigational safety, detect unknown hazards, and aid other mariners and ocean scientists.

By contributing data, cruise ships can help avoid accidents, environmental damage and make the oceans a safer place for all. Additionally, participation in this global effort can be included in the cruise line's marketing materials highlighting the various ways they contribute to scientific endeavors.



© IC03 © Brigham Boren



IHO

CSBWG Highlights: **Today**

International
Hydrographic
Organization

- The amount of effort given by CSBWG members has been incredible
- The initiative has reached a level of maturity and is picking up momentum rapidly
- In recent years, we have started to see a change in the way many coastal States view CSB, with France, Australia and Palau as the most recent supporters
- We also know that anecdotally, other nations are currently on the complicated journey of getting approval through their legislative processes



To date, 34 coastal States (green) have replied positively to IHO CL 01/2020 & IRCC CL 21/2020

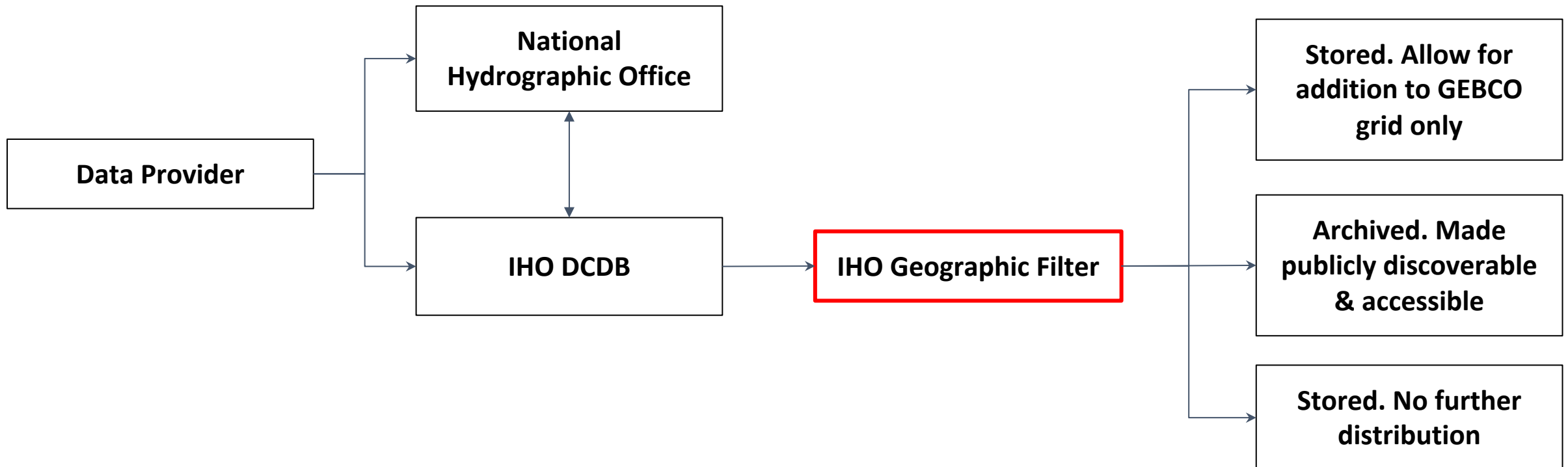


IHO

Geographic Filtering

International
Hydrographic
Organization

In response to feedback provided to the IHO, the DCDB implemented (and continues to update) a geographic filter for incoming data to take into account coastal countries' positions on the distribution of CSB collected in their areas of jurisdiction.

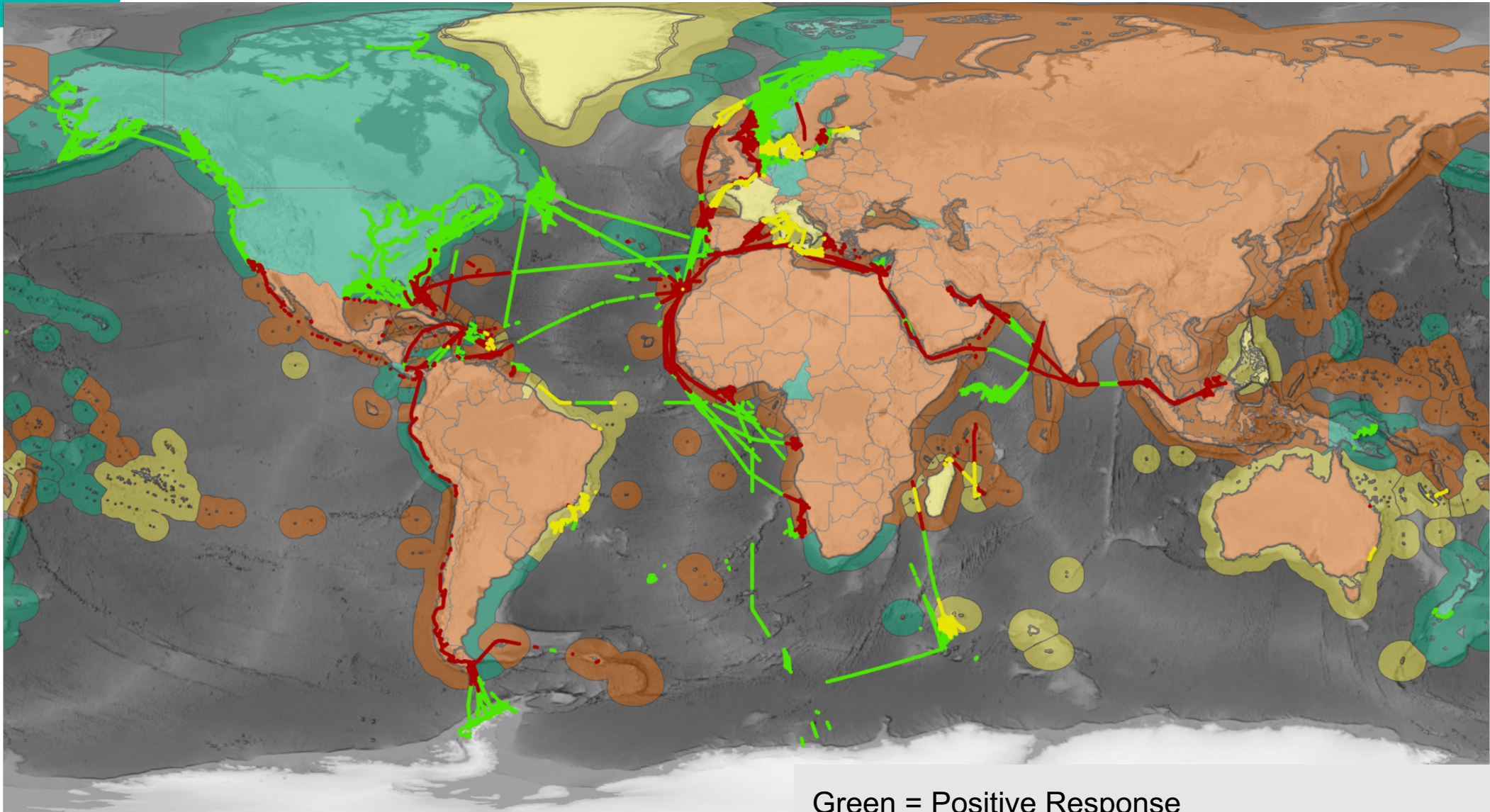




IHO

Geographic Filtering

International
Hydrographic
Organization



Green = Positive Response

Yellow = Positive Response w/ caveats unable to adhere to

Red = Negative Response, No Response

Map for illustrative purposes only. (Credit: Marine Regions)

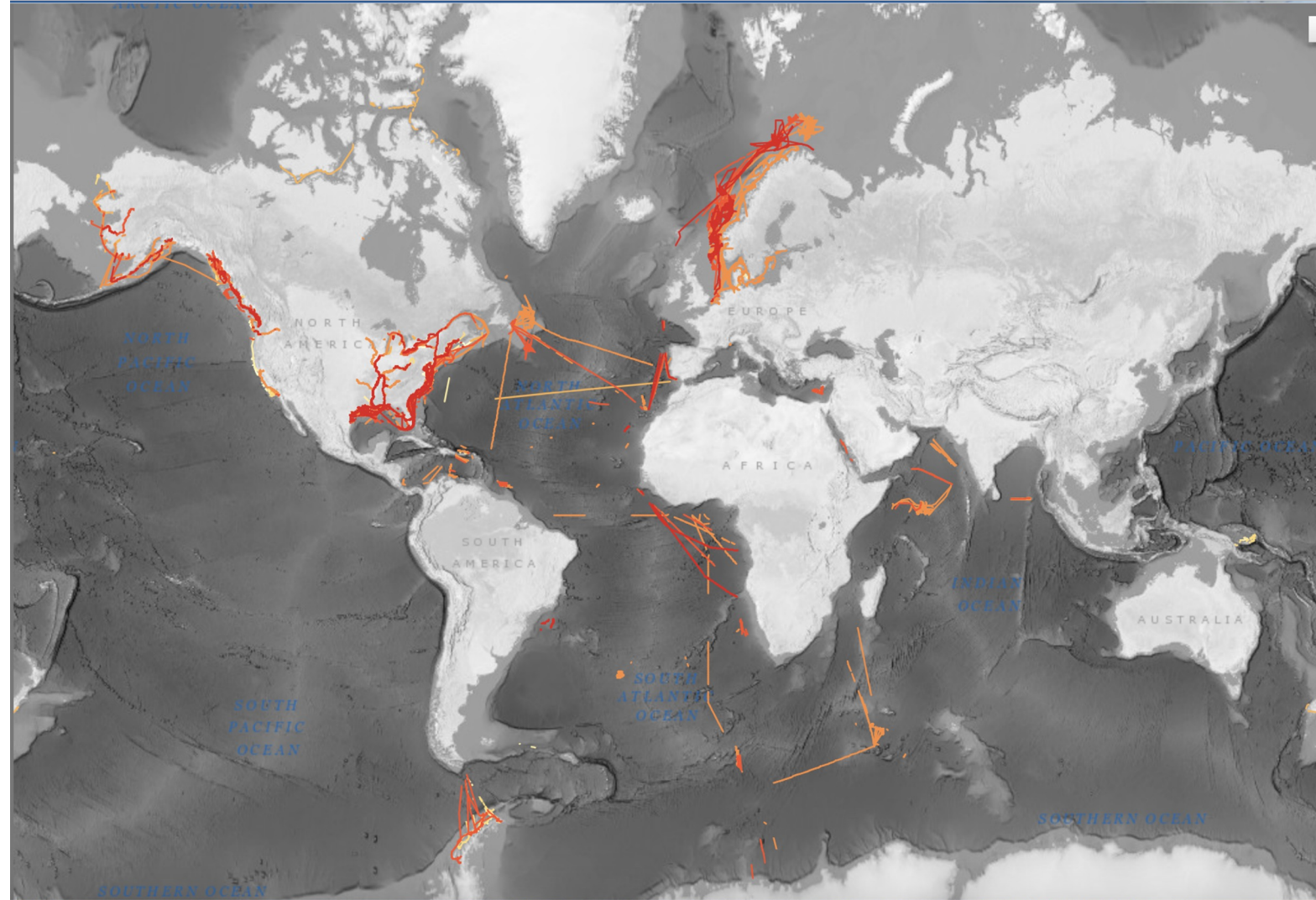


IHO

CSB Data Holdings - Statistics

International
Hydrographic
Organization

- 25GB+ from 10 Trusted Nodes (data providers) currently publicly accessible
- 257 vessels total, including 'Anonymous'
- Additional 3GB filtered based on responses to IHO C/L



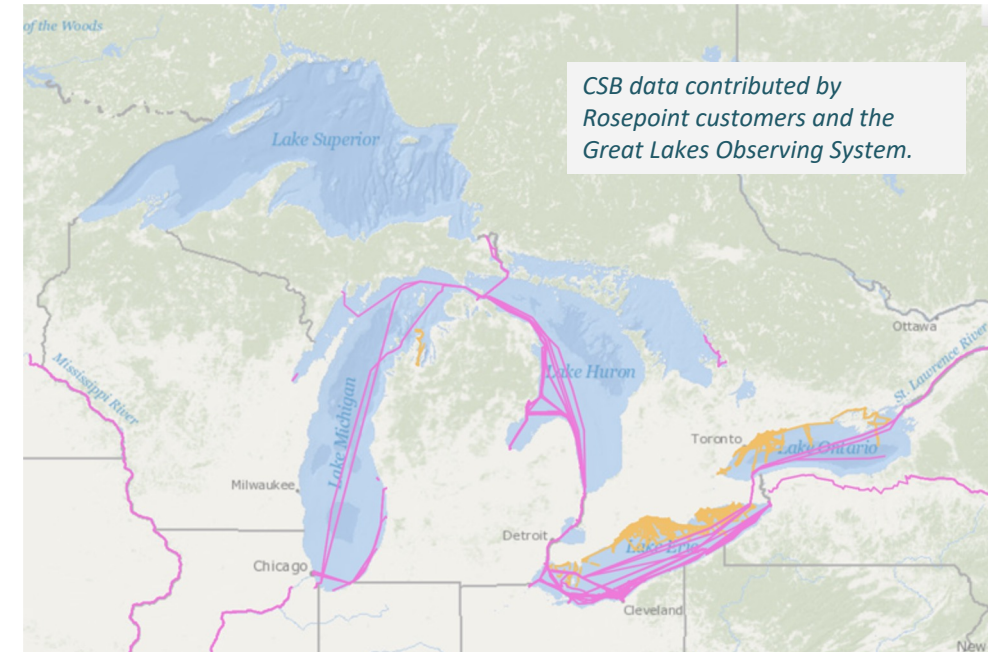
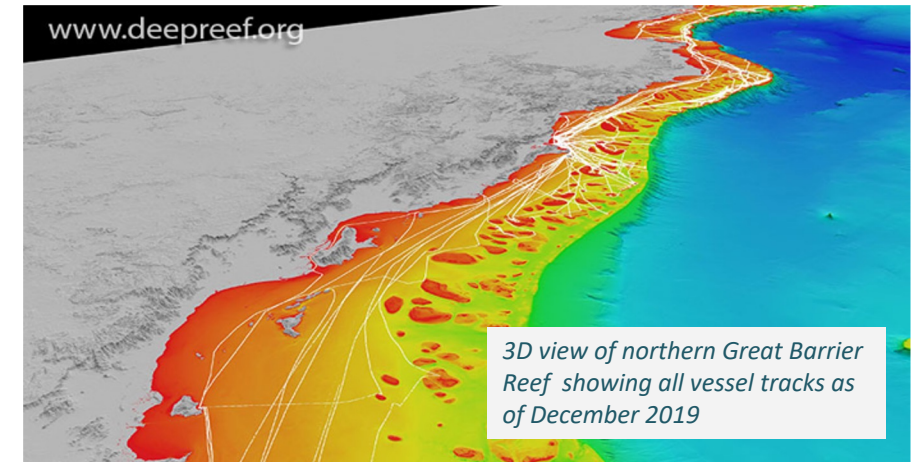


IHO

International
Hydrographic
Organization

CSBWG Highlights: **Today**

- Are we ready? Can we cope with the ever-increasing number of parties saying they want to get involved?
- How do respond to demand? How do we manage expectations?
- This is a GREAT problem to have, but we need to be careful.
- We do not have the personal capacity and are not organized in a way to scale and support and grow.





IHO

CSBWG Highlights: Strategic Planning

International
Hydrographic
Organization

Following the publication of B-12 Ed. 3.0.0 (which has been the major focus of the CSBWG for the last three years), CSBWG13 focused on a critical review of our operating mandate, as set out in the **ToRs and RoPs**.

B-12 Edition 3.0.0



INTERNATIONAL HYDROGRAPHIC ORGANIZATION

Guidance to CROWDSOURCED BATHYMETRY



IHO



International
Hydrographic
Organization

Published by the
International Hydrographic Organization
40 quai Antoine 1^{er}
Principauté de Monaco
Tel: (377) 93.10.81.00
Fax: (377) 93.10.81.40
info@iho.int
www.iho.int



IHO

CSBWG Highlights: Strategic Planning

- Purpose of CSBWG13: Design a work plan and determine our direction forward.
- **FOUR DAYS**, ~50 attendees, reviewing the evidence, workshopping a strategy and agreeing with the outcome

What's Worked

B12 developed	Joint efforts describing how you can contribute	good job building the infrastructure (dcdb pipelines, initial trusted nodes, b-12)
a consistent applied effort to include all relevant stake holders (HOs, industry, academia, etc). Very committed and involved members.	Flyers created	Establishment of CSB Coordinators for RHQs; CSB is a standing item on RHQ annual reports/agendas
Circular letters about acceptance of CSB raised the subject, got it discussed and has formalised the standpoint of MS	success in demonstrating how a successful project can be done (eg Rob Beaman)	It has been demonstrated that data collected can be done inexpensively (ie: WBL)
demonstrated through SB2030 that in certain regions that this can be done	VTCs involved many more contributions to B12 - more transparent & inclusive!	

What's has NOT Worked...yet

the sensitivity of how CSB is regarded has put limitations on how we define it;	national positions have been applied globally	7 years in and we're still struggling to get the word out there and the number of vessels to grow in data gathering	putting a proof of concept out there to show other HO's how to put CSB on the chart	Getting CSB through HO validations processes
A best practices still doesn't exist	Covid slowed our roll	Inclusion of MBES and other valid sources of bathymetric data.	Expanding beyond the single branch leader (eg: Fugro, PGS, Carnival)	Many coastal states still believe this data is proprietary.
The answer to the question, "how can I participate in CSB gathering/contributing?" is still too difficult to answer.	Have not been able to tell the story of how we're going to use all of this data...what this data will actually be used for.	Providing feedback (including DATA) to contributors describing positive impact	Still haven't written the story to clearly answer "why is CSB important"	Cooperation needs to improve b/w CSBWG, GEBCO, SB2030
Buy in is one thing, once loggers have been installed, the interest and/or technical know-how is not always continuous.	Continuous feedback support and interest is often not maintained	have we discussed/brainstormed providing some kinds of incentives to data contributors to at least generate enthusiasm?	Do we need to revisit whether to use the phrase "citizen science" more widely as well as "CSB" to promote? Would people find this more relatable?	Many MS look to their PCA for guidance/assistance. Focus has not been directed to the PCA.

Driven by local voluntary efforts,

Low cost, easy to execute (collect and provide), easy to maintain (maximizing automation), sustainable operation.

Easy to deliver data and request a bare minimum of metadata.

People know about it and talk about it

Data is used and those who collected it can see it being used

generates regular data gathering from a growing number of vessels

Where Data Collection is well-known and easy to implement.

Accessibility of data for the larger community.

exchange of data provides benefits for all involved parties.

providing an easy to use viewer of the contributed data,

Notable improvement in bathy data of our oceans, which can be shared without political boundaries and liability issues.

Buy-in from all Maritime segments to bring it together.

Routine feedback of data back to the collectors

All MB and SB data collectors from non HO's of the world are sending systematically and easily

Awareness of the procedure, benefits, and final goals

Guidance (As B12) and inculcate CSB data for possible other standards (S44 and S 100 series)

a community of users feels invested; becomes the ownership of a (hopefully very large) group of people.

Seamless flow of CSB data between stake holders via DCDB

Gets positive publicity from major news outlets

Engagement done through the coordination of existing networks and communities,

Free data loggers for all! +1

#1 – What does a successful CSB initiative look like?

Barrier #6 – Unclear/Lack of Rewards/Incentives

Certification/Badge given to Trusted Nodes that highlights they are "special" to the project. Could also be provided to individual contributors as well.	Publicly recognize the value and contribution of sea time contributed	Vessel owner league table for data contribution	IHO to have a "wall of contributors"	Provide guidance to TN on how they could provide feedback/ basic statistics of the data provider. Might be a TN activity to provide these metrics.	Pursue endorsement of the UN Decade	Take care not to dissuade those who may perceive there to be a competitive element to rewards - ensure that we incentivise all and provide a clear progression path
This is one main concern to join sharing since it has to be clear what is the benefit and how we can leverage from that.	Explore the pros and cons of fiscal reward opportunities	For TN, create categories for awards (eg: innovation, outreach, collaboration, low carbon)	Medal of the OCEAN (MOTO), Order of the SEA (OOTS)	Survey current TNs to see what incentives they might be interested in to gather preliminary feedback	NFTs	Concerted effort in developing what a feedback process may look like
U.S. centric, but we can promote CSB contributions (eg: new bathy and trends) when we update the annual Progress Report on Unmapped U.S. waters.	Do we try to maximise the size of the Youth Club relationship to launch a "youth club" at the next show (Sept) and get the prize to say something to get it going, then watch we					



IHO

CSBWG Highlights: **Proposed Changes to ToRs**

International
Hydrographic
Organization

- A. Maintain the IHO publication B-12 through periodic reviews and updates identified by Member States;
- B. Engage with HOs and IHO Member States on matters relating to CSB uses, including but not limited to Nautical Cartography;
- C. Monitor Member State and Regional Hydrographic Commission progress regarding development of best practices and CSB initiatives and incorporate into B-12 as appropriate;
- D. Investigate ways to foster and facilitate data providers (i.e.: Trusted Nodes), increase data contributions and identify incentives on how and why mariners should become involved;
- E. Investigate and promote greater end use of CSB data in and outside the hydrographic community;



IHO

CSBWG Highlights: **Proposed Changes to ToRs**

International
Hydrographic
Organization

- G. Provide guidance on data quality and standards for CSB in liaison with appropriate IHO Working Groups;
- H. Liaise with other relevant IHO and allied bodies involved with CSB data to improve coordination and promote its use and development;
- I. Liaise closely with the IHO Data Centre for Digital Bathymetry (DCDB) as it continues to develop technology to collect, display and distribute CSB data to the public;
- J. Encourage and support all aspects of the CSB data life cycle from acquisition through archival to discovery and distribution, emphasizing automation and efficiency whenever possible; and
- K. Encourage and expand scholarly discourse regarding the benefits of CSB to support U.N. Decade on Ocean Science and GEBCO objectives by encouraging contributions to scientific, legal, and policy literature.



IHO

CSBWG Highlights: **New Work Items**

- A. Maintain and update IHO CSB Guidance Document (B-12)
- B. Submit IHO CSB initiative as a UN Decade Action
- C. Gather, prioritize and respond to HO-specific issues/opportunities regarding national policy/regulations related to CSB
- D. Gather and prioritize HO-specific issues relating to CSB data, including but not limited to Nautical Cartography
- E. Support CSB/SB2030 Coordinators in their RHC engagement
- F. Discuss and propose potential software tool support for HOs
- G. Clarify support identified by current Trusted Nodes needed for current and future Trusted Nodes.
- H. Clarify all aspects of the CSB data cycle and capture known issues, requirements and suggested enhancements.
- I. Develop a communication plan in coordination and collaboration with related efforts (SB2030, GEBCO, etc)
- J. Develop a recognition & incentive strategy plan



IHO

Problems Encountered

International
Hydrographic
Organization

While industry and NGO participation in the CSBWG continue to grow, IHO Member State participation has not.

At the same time, as noted earlier, more MS are signing on in support of CSB and new work items have been established to focus solely on HO needs, issues and concerns.

Participation by coastal States would provide an opportunity to participate, learn, ask questions, and express concerns about CSB, allowing for the meeting attendees to share this information within their HOs.



IHO

Conclusions and Recommended Actions

International
Hydrographic
Organization

As the latest edition of IHO CSB Guidance Document (B-12) Edition 3.0.0 has been successfully completed and endorsed, the CSBWG would like to refocus some of its efforts. These new and updated efforts are captured in our proposed new Terms of Reference and associated work plan. ***IRCC are requested to review and approve these ToR.***

It is challenging to understand coastal State concerns regarding CSB if they do not participate in the CSBWG. ***IRCC are requested to encourage more participation*** so coastal States can learn about CSB activities and provide representation of their viewpoints.



IHO

Other Items of Note

International
Hydrographic
Organization

The CSBWG intends to hold in-person (hybrid if able to) meetings every 8 months.

The justification for the higher frequency is that CSB technology and participation are rapidly evolving.

CSB data also plays a significant role in the GEBCO-NF Seabed 2030 Project that has a quickly approaching deadline of 2030.



IHO

Actions Requested of IRCC

- a) Note the contents of this report;
- b) **Approve new Terms of Reference** (Annex A)
- c) **Encourage more CSBWG participation by coastal States**
- d) **Acknowledge the CSBWG meeting regime of every 8 months**
- e) Encourage all Member States to review IHO CL 21/2020 and, if possible, offer a positive response, even if qualified, to enable provision of CSB data into the public domain collected from ships within waters subject to their national jurisdiction.
- f) Encourage all coastal states to review IRCC CL 1/2020 and, if possible, offer a positive response, even if qualified, to enable provision of CSB data into the public domain collected from ships within waters subject to their national jurisdiction.
- g) Encourage Member States to release datasets or subsets into the public domain via the IHO DCDB;
- h) Encourage Member States to support the CSB initiative with positive actions, such as requiring all research vessels to collect bathymetric data for late uploading, when on passage or when it does not interfere with other research activities;
- i) Take what other action is deemed necessary.



IHO

Actions Requested of IRCC

- a) Note the contents of this report;
- b) **Approve new Terms of Reference** (Annex A) - **Approved**
- c) **Encourage more CSBWG participation by coastal States** - **Approved**
- d) **Acknowledge the CSBWG meeting regime of every 8 months** - **NOT Approved**
- e) ~~Encourage all Member States to review IHO CL 21/2020 and, if possible, offer a positive response, even~~
IRCC tasked the CSBWG in liaison with the IHO Secretariat to organize an online IRCC workshop on the benefit of Crowdsourced Bathymetry and how to expand data contribution
~~subject to their national jurisdiction.~~
- g) ~~Encourage Member States to release datasets or subsets into the public domain via the IHO DCDB;~~
- h) ~~Encourage Member States to support the CSB initiative with positive actions, such as requiring all research vessels to collect bathymetric data for late uploading, when on passage or when it does not interfere with other research activities;~~
- i) Take what other action is deemed necessary.



IHO

International
Hydrographic
Organization

Questions?



IHO

International
Hydrographic
Organization

CSBWG14

	Work Item	Lead	Team
A	Maintain and update IHO CSB Guidance Document (B-12)	Guillaume	Georgie Zelenak, Idris Salaudeen
B	Submit IHO CSB initiative as a UN Decade Action	Evert	Jenn, Sam, David
C	Gather, prioritize and respond to HO-specific issues/opportunities regarding national policy/ regulations related to CSB	Jenn	Evert, Steve K, Chandana, Denis
D	Gather and prioritize HO-specific issues relating to CSB data, including but not limited to Nautical Cartography	Pete	Giuseppe, Anthony, Hans, Andy, Akim
E	Support CSB/SB2030 Coordinators in their RHC engagement	Jenn	Belen, Evert, Anthony, Denis
F	Discuss and propose potential software tool support for HOs	Anders	Emma, Meredith, Mathieu
G	Clarify support identified by current Trusted Nodes needed for current and future Trusted Nodes.	Guillaume	Matt, Linden, Brian, Colin
H	Clarify all aspects of the CSB data cycle and capture known issues, requirements and suggested enhancements.	Brian	Shaul, Colin, Giuseppe, Guillaume Georgie
I	Develop a communication plan in coordination and collaboration with related efforts (SB2030, GEBCO, etc)	Tim	Steve M., Meredith, Akim, David, Derek
J	Develop a recognition & incentive strategy plan	David	Matt, Linden, Bill