12th MEETING OF THE IHO INTER-REGIONAL COORDINATION COMMITTEE
IHO-IRCC12
VTC, 6-7 October 2020

Report of the MSDI Working Group

Submitted by:	Chair, MSDI Working Group
Related Documents:	C-17. Spatial Data Infrastructures: "The Marine Dimension" - Guidance for Hydrographic Offices, Edition 2.0.0, January 2017. Development of Spatial Data Infrastructures for Marine Data Management, OGC-IHO MSDI Concept Development Study (MSDI-CDS). UN-GGIM. Integrated Geospatial Information Framework. A strategic guide to develop and strengthen national geospatial information management. UN-GGIM. Future trends in geospatial information management: the five to ten year vision. Second edition.
Related Projects:	MSDI Concept Development Study (MSDI-CDS) http://www.opengeospatial.org/projects/initiatives/msdi-cds-2018

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	see Annex A for full details

1. Meetings Held During Reporting Period

Dates and venues of meetings held during the reporting period.

The MSDIWG11 meeting of IHO Marine Spatial Data Infrastructures Working Group (MSDIWG) took place in Rostock-Warnemünde, Germany, 24 - 25 February 2020. The meeting was followed by the OGC Marine DWG Meeting, 26 February 2020 and the UN-GGIM Working Group on Marine Geospatial Information (WGMGI2) Meeting, 26 – 28 February 2020.

The joint meeting sessions proved beneficial, avoided the duplication of agenda items, promoted better understanding and consider matters importance to the MSDI and marine geospatial information community.

At the meeting the MSDIWG11 focused on 8 topics seen as important from a HO and MSDI perspective and 8 different working groups were established:

1. MSDI training material, the need for adjustments and updates.
2. Development of use cases for the WGMGI
3. IHO-OGC MSDI Concept Development Study and how to proceed
4. Expectations of the "new" WENDWG from a MSDI perspective
5. Updating of C-17
6. UN Sustainable Development Goals (SDGs) and how a MSDI can support the SDGs
7. MSDI Governances, e.g. Data policies, funding/financial models
8. MSP with relation to MSDI and how to proceed with MSP from a IHO MSDIWG perspective

On day 2 all working groups gave a report to the MSDIWG11 on their findings and their recommendations.

Fig.1. The IHO MSDIWG.

Members of the MSDIWG have represented the MSDIWG at other IHO WG meetings e.g. HSSC, SPRWG, CSBWG, CBSC and in several Regional Hydrographic Commission meetings.

Dates and venue for next meeting.
The IHO/MSDIWG plan is to arrange the MSDIWG12 meeting in Singapore with an integrated OGC Marine Domain WG part and a UN-GGIM WGMGI3 rd meeting, 12 to 17 April 2021. The meetings will be back-to-back with the Singapore Maritime Week 2021. Alternatively the MSDIWG12 meeting will be arranged as an online meeting the same week.
Logistics and meeting details will be available at: www.iho.int/msdiwg

2. Work Program (2018 – 2021)

The Work Programme was discussed and evaluated at the MSDIWG11 based on recent achieved results with a focus on MSDI from an international, regional and national perspective. In order to deliver this Work Programme, eight MSDI Tasks have been established. The work programme can be found ot the above link and in Annex B of this report.

The IHO/MSDIWG will continue to facilitate a MSDI Open Forum which would allow non-MSDIWG stakeholders (e.g. Regional Hydrographic Commission (RHC) Members, government, academia, industry, funding agencies and NGOs) to attend and identify what the MSDIWG and the commercial partners can offer. Attendees at the Open Forum would then be encouraged to stay on for the MSDIWG12 meeting. This approach is being developed in consultation with the hosts.

The Open Forum meeting will be followed by the two or three-day-long MSDIWG12 meeting at the same venue and the meeting will include WG Work Plan task group break-out sessions. The MSDIWG will investigate the possibility of arranging the meeting as a back-to-back meeting with OGC and the UN-GGIM WGMGI3 rd meeting.

The key interest for the IHO is enabling Member States to ensure MSDI provides a framework for the provision of hydrographic information beyond the traditional field of surface navigation. The MSDIWG is using the UN-GGIM Shared Guiding Principles for Geospatial Information Management

as a framework and these principles are incorporated in the existing work program for the MSDIWG. The Shared Guiding Principles for Geospatial Information Management are available at the MSDIWG web page at: www.iho.int/msdiwg → Body of Knowledge

3. Progress on IRCC Action Items

MSDI Ambassadors.

IRCC9/18 (*RHC Chairs to encourage Member States in the region to nominate RHC MSDI Ambassadors to promote MSDI and to help Member States to prepare the national reports with respect to the status of MSDI*). A vital element of this work is to collect and collate responses from Member States on MSDI prior to each RHC meeting.

A majority of RHCs have already, or are in the process of establishing, RHC MSDIWGs. At the IHO MSDIWG11 meeting several RHCs gave regional presentations of their work and challenges from a regional perspective.

As seen from a MSDI perspective it is important that RHC consider having MSDI as a standing RHC agenda item and that National Reports should incorporate the status of MSDI, plans for involvement in MSDI and challenges facing the HO.

In order to create a common MSDI framework and an update on national status with relation to SDI and MSDI implementation, it is recommended that the National Reports include topics in relation to the key successes and challenges within the four pillars from the IHO publication C-17. (*ref. C-17, 2.1. Policy and Governance, Technical standards, Information systems and Geographic content*).

Education and Learning.

IRCC10/10 (*MSDIWG to develop basic MSDI training material in order to allow RHCs to deliver trainings with their own personnel*). MSDI has been highlighted as an important component of the future development of hydrographic offices. It was concluded that there is either no, or very little, basic teaching material available for MSDI training that is free of charge for IHO Member States. IRCC therefore decided to task the IHO MSDIWG to establish basic MSDI training material, in order for IHO Member States and the RHCs to conduct basic MSDI education/training. The MSDI training material is now freely available on IHO webpage under MSDIWG Body of Knowledge https://iho.int/en/body-of-knowledge.

There are two main uses of these documents in conjunction with the course slides themselves.
1. A participant who wants to download and self-learn from the materials provided.
2. A participant who wishes to deliver the materials in a group setting with stakeholders.

It is possible to access the MSDI training in different ways and also to tailor the training material with relation to the specific needs of the organisation and the employee's level of knowledge.

To access the training material through the Body of Knowledge:

- Download from the IHO website (link above)
- Download via Dropbox
- Use the interactive material in YouTube

The MSDI training material, including the teaching material, is divided into two parts:

Part 1. MSDI orientation. The training material is aimed at students who are marine-focused, but have very little experience of MSDI concepts or practice.

Part 2. Fundamentals of a Marine Spatial Data Infrastructure. The training material is aimed at students who are marine geospatial professionals but who have very little experience of MSDI.

The MSDI teaching material is based on the publication C-17 Spatial Data Infrastructures "The Marine Dimension", including Annex 1. Syllabus for Educational and Training Programs for Marine Spatial Data Infrastructures. There should be a focus on the content specified in the two introductory teaching courses 1) MSDI orientation and 2) Fundamentals of Marine Spatial Data Infrastructure (MSDI). The result/deliverables in this phase will be the actual MSDI training material and the teaching material for use by e.g. internal "teachers" in the hydrographic offices.

A MSDI e-learning program has also been developed to enabled access to MSDI teaching externally and receive the teaching on-line. The MSDI teaching material is also available on the IHO's website for free. The e-learning interactive material can be downloaded or used on YouTube.

Evaluation of the MSDI training material.
The training material has now been used and tested by RHC MSDIWG's and the MSDIWG has received positive feedback about the MSDI training material. At the MSDIWG11 the MSDI training material was also evaluated and some of the key points raised are listed below:

1. Better guidance in the landing page about how to "use" the materials. The current landing page on the IHO site is quite basic, with only an image and links. It should also explain the difference between the "static" materials (the presentations and booklets) and the "dynamic" material in the form of the eLearning course and its modules
2. Working from examples is better than deriving from theory – The Fundamentals and the Orientation both start with a detailed explanation of the "theory" of MSDI before illustrating it with concrete examples. Starting with simple examples is more accessible for many users.
3. The message of the MSDI training should reinforce that MSDI is all about information rather than products. Need to refine this concept and bring it out earlier and more explicitly. This is currently explained in the examples but quite far into the material and only within the hydrographic office example. The idea about information and the difference between information/data services and dedicated products should be explained as one of the fundamentals.
4. Better definition of the "M" within the MSDI concept – the "M", both maritime and marine should be defined and explained a bit more, also why it is defined differently to SDI and some of the background surrounding it.
5. Review of the English used in both the material and the eLearning course to make sure it's accessible to non-English speakers. Some guidelines on this should be established (and tested)
6. These are only suggestions but we should try to split up the interactive session into segments no longer than 30 minutes (and possibly shorter in some cases). We should keep the interactive content and provide the parts as a sequence so users can advance from one to the next. The landing page should provide support materials for each one and cross-reference against the "static" training materials for download.

The MSDIWG will now investigate the possibility of updating and restructuring the MSDI training material by taking the different comments from the MSDIWG and IHO MS into consideration.

4. Problems Encountered

The main challenges for the MSDIWG is to raise awareness of the importance of MSDI, and to provide training and education to support MSDI development at the Member State and RHC levels. These challenges are being addressed with the training material (in development), the planned upgrade of IHO C-17 and the establishment of MSDI Ambassadors at RHCs.

Considering the development of the UN-GGIM's Integrated Geospatial Information Framework (IGIF) it seems important that there is a need for a better alignment and integration with IGIF and other UN-GGIM structures/publications as this will bring land and sea together. There are numerous common elements within IGIF and MSDIWG and simple connections could be made which would bring the definitions section up to date. As a consequence there is a need for updating/modifying the IHO publication C-17 in response to the IGIF initiatives. The focus in a new version of C-17 could be on how Hydrographic Offices can act in response to IGIF and its broader global perspective and could be a chance to really focus C-17 on some of the working issues, like data consistency, data quality, multiple-use best practices, business models etc. leaving IGIF to define some of the broader use cases.

5. Other Items of Note

UN-GGIM WORKING GROUP ON MARINE GEOSPATIAL INFORMATION (WGMGI)

Second expert meeting of the Working Group on Marine Geospatial Information, 2020.

Fig.2. The UN-GGIM WGMGI.

The UN-GGIM expert meeting was held at the Leibniz-Institute for Baltic Sea Research Warnemünde in Rostock-Warnemünde, Germany from 24 - 28 February 2020.

The meeting considered both substantive and administrative matters before the working group. This included, but not limited to, reviewing and revising the work plan for the period 2021 - 2022 at a later date; the application of marine geospatial information to support the management of coastal zones, including the preparation of management plans. In addressing the land and sea interface, the need to collaborate across the marine, terrestrial and cadastral domains was stressed. The meeting considered issues and challenges with regards to the collection, storage, management and sharing of geospatial information as relate to inland water bodies and waterways. In addressing geospatial information issues and challenges for inland water bodies and waterways and the land and sea interface, the working group will consider integrated geospatial data management approach including in support of integrated ecosystems-based management. The working group in recognizing that marine geospatial information must be made available, accessible and discoverable for a multiplicity of applications and purposes, continue to advance its efforts and work plan, including working towards a reference document on the implementation of the United Nations Integrated Geospatial Information Framework for the marine domain - for the administration, management and governance of oceans and seas, coastal zones and deltas, inland water bodies and waterways.

OGC - Marine Domain Working Group (OGCMWG)

The OGC MDWG meetings held alongside MSDIWG are longer than the normal OGC MDWG meetings held at the regular OGC Technical committee meeting and are designed to allow a broader range of stakeholders' access to the updates and activities within the OGC. The meeting in Rostock was divided into following distinct categories:

1. OGC Action updates
2. Specific projects of interest being undertaken by the OGC
3. An update on general OGC activities
4. Other business

The main items covered during the meeting in Rostock were:

- An overview of the different vehicles possible for OGC projects ranging from simple concept development through to full pilot studies. Examples were given of some of the current and past OGC projects and their outcomes along with the participants they include and the role of the OGC

in their management. The link with MSDI was highlighted, particularly the association of SDI and MSDI with OGC web services.
- An update on the MSDI Concept Development Study presented by NGA. This long-standing action item has reached the end of its development with the report published, reviewed and updated. From the OGC perspective the next logical step for this activity is a full MSDI Pilot project and the OGC has constructed a proposal for this which is being circulated and is looking for sponsoring organisations.
- A Presentation on the OGC Maritime Limits and Boundaries project, sponsored by Canada, UK and Australia. This project, soon to be completed represents a major effort by the participants to form a bridge between IHO standards (namely S-100 and IHO S-121) with OGC web services and standards (GML and existing OGC web services CSW, WMS and WFS) The presentation also covered some of the broader implications of the pilot project and its inputs back to the IHO and OGC. A wider ranging set of possibilities for integrating IHO S-100 with OGC standards (current and future) were demonstrated by showing UNCLOS limits and boundaries expressed as S-121 format co-existing with MSP data for Oil and Gas and Fisheries.
- A brief description of the MDWG guide to standards for marine geospatial data. This activity, currently unfunded, represents an attempt to more formally define how OGC web services and IHO S-100 can be made interoperable for the future. This activity is ongoing and will receive some conceptual support from ongoing IGIF developments within the UN-GGIM.

In the OGC activities update to the meeting the following was presented:
- An overview of the MDWG meetings and activities during the year along with a description of the OGC's TC structure and broad range of working groups.
- An update on the OGC's architecture, particularly the next generation of web services standards which potentially have a large impact on MSDI activities. The next generation of standards are far less prescriptive and have a great potential for future interoperability with IHO standards, particularly S-100 and a close eye on their development is encouraged by the chairs.
- Update on IHO S-100 and how input can be sought from both IHO and OGC stakeholders to form the next edition of S-100. This could encompass interoperability, metadata, encodings, web services and persistent unique identifiers.

MSDI Concept Development Study (MSDI-CDS)/ Federated Marine SDI Demonstration Pilot: FMSDI

During the IHO MSDIWG8 meeting in Vancouver 2017, the idea was formed to create an OGC study that could establish the framework for future development of MSDI. The MSDI-CDS was organized by the Open Geospatial Consortium (OGC) and supported by the National Geospatial-Intelligence Agency (NGA) on behalf of the International Hydrographic Organization (IHO) and the MSDIWG.

The MSDI-CDS study was presented at the IRCC11 meeting. As part of the Study, OGC brought the key stakeholders across the diverse marine community together in order to assess the current state of data and product exchange technologies, defining the future of MSDI, and developing the foundations for a potential follow-on pilot.

As recommended by the successful OGC-IHO MSDI Concept Development Study (CDS), and as evidenced by the success of the OGC-IHO collaboration in the on-going OGC-IHO Maritime Limits and Boundaries pilot, OGC and the MSDIWG are seeking support to initiate a full-scale Pilot to demonstrate a multi-country, federated MSDI under a land/sea boundary use case. This Pilot will show how the value of MSDI can unlock data and information for use beyond traditional providers and consumers of hydrographic data, across borders, and across domains inclusive of improved connections between the terrestrial and marine foundational communities.

Based on the recommendations from the OGC-IHO MSDI CDS, the Pilot will include one or more land/sea interface scenarios, potentially focused on the Arctic, European Coastal Waters, and South East Asia. A land/sea boundary/interface scenario would exercise an MSDI for multiple scenarios

including, for example, coastal zone protection, shoreline management, transboundary Marine Spatial Planning (MSP), Marine Protected Areas (MPAs), Maritime Limits and Boundaries modeling and the creation of multiple domain coastal zone data based on the categories identified in the MSDI CDS.

Benefits for sponsoring organizations include:
- Improve discovery and sharing of data within your organization and other related government departments
- Ensure the results of the pilot are fit for purpose for your organization
- Builds on best-of-breed standards and conventions for sponsoring and participating organizations in a highly collaborative environment.
- Experience how automated techniques reduce labour-intensive/manual tasks and increase staff productivity
- Include new, current and historical spatial data assets
- Maximize return on investment by collaborating with other sponsors
- Sponsor an agile, adaptive, well-governed process inclusive of new data sources and technologies
- Support for open standards, policy and improved information sharing with international partners.

For more information see Annex D.

Data security and integrity
At the MSDIWG11 the requirement for robust and comprehensive measures in the context of MSDI was discussed. During the meeting discussion centered around a concrete statement of the problem and a common need for measures to protect both originating data producers and end users from the impacts of misuse and/or data corruption. It was recognized that marine geospatial data carries a large quantity of liability and impacts in the event of mistaken use or corruption. Because of this MSDI has a focus on the "authoritative" nature of data and UN-GGIM's IGIF recognizes this as an implicit "custodianship" concept.

There is, therefore, a need within the IHO community for the ability to define "authoritative" in digital terms as an integral part of data itself rather than something which sits alongside it and which can (potentially) be separated from the data content.

The meeting noted the existence within the revised S-100 of Part 15 which provides both data encryption and digital signatures as separate modules within the scope of the IHO data protection scheme and recognises that this at least partly addresses the situation. The meeting also noted that recent developments in the S-100WG further address the problem and could help by adding data integrity measures to realtime data supply and web services as well as standalone vector datasets. These measures do not wholly address the needs of the MSDI community though and the all-important area of data transformation requires further insights and work to come up with tangible, practical solutions. The MSDIWG will continue to focus on data security and integrity from a MSDI perspective.

Marine Spatial Data Infrastructures (MSDI) questionnaire. Cl 56/2019.
In 2015 a MSDI survey, was conducted by the Canadian Hydrographic Service (CHS) with the support from the IHO MSDIWG. The aim of the survey was to inform the IHO on the worldwide status of MSDI. The results of the survey were presented IRCC8 in 2016.
The IRCC11 approved amendments to the MSDIWG ToR and RoP, tasking the MSDIWG to support the MSDI and Marine Spatial Planning (MSP) related activities of the IHO. The MSDIWG is expected to monitor national SDI activities and trends and follow the development in MSP implementation worldwide. In order to implement these tasks through an update on the worldwide status, the MSDIWG sent out a questionnaire at the end of 2019 in order to survey the maturity level of Member States with respect to MSDI and MSP and to collect other relevant information.

41 answers were received, currently national MSDI are established in 28 countries and of these13 national HO's are responsible for the national MSDI.

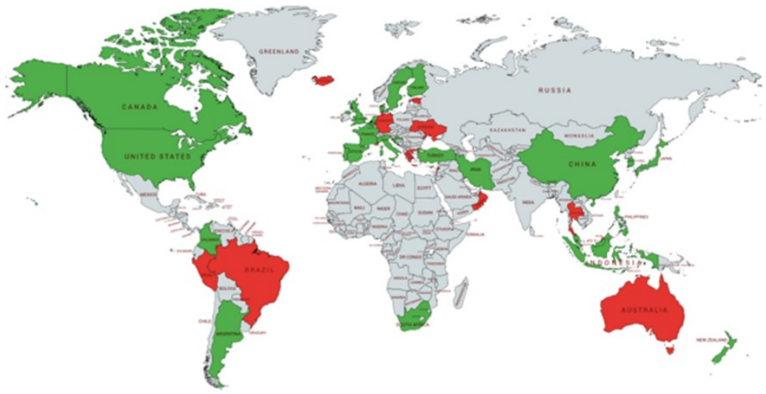

Fig.3. Identification of the Marine Spatial Data Infrastructures.

A total of 28 countries have established a national MSDI. The following statistics illustrates, in which way the countries have established their MSDI. *(As a result of the opportunity to submit multiple answers the total of answers received exceeds 28.)*

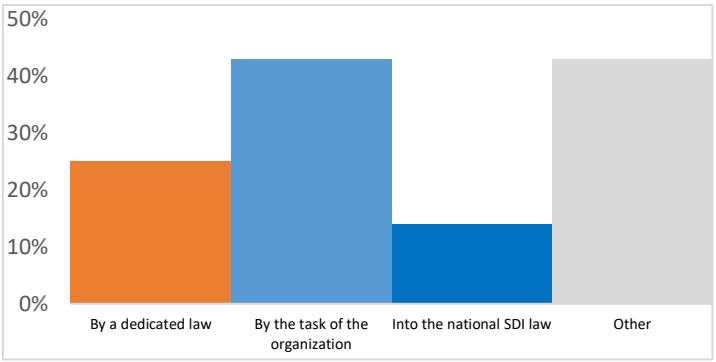

Fig.4. If a MSDI is established, please describe in which way it is established.

41 answers about MSP were received. Currently national MSP is established in 27 countries, only 4 national HO's have the responsibility for the national MSP

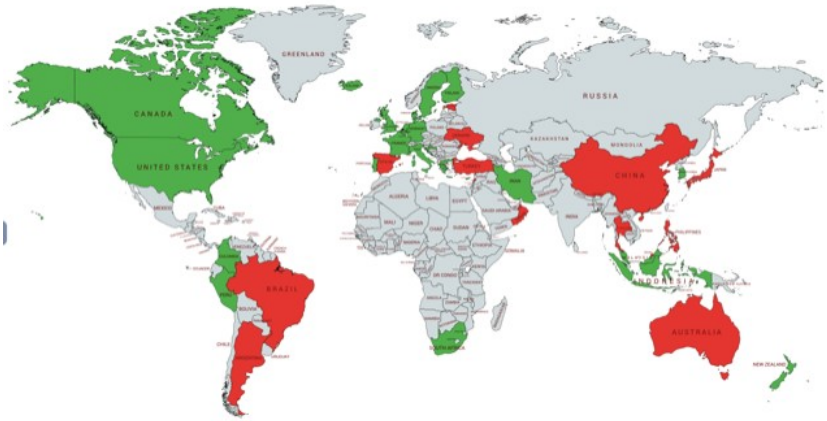

Fig.5. Identification of the Marine Spatial Planning Infrastructures.

A total of 27 countries have established a MSP. The following statistics illustrates in which way the MSP is established. *(As a result of the opportunity to submit multiple answers the total of answers received exceeds 27.)*

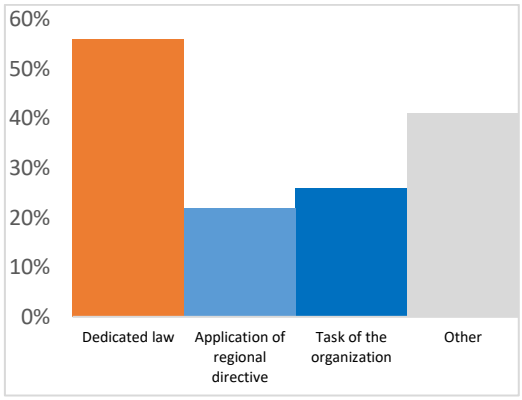

Fig.6. If a MSP is established, please describe in which way it is established.

For more information about the results of the MSDI/MSP questionnaire see annex E.

6. Conclusions and Recommended Actions

There is a need to update the publication C-17 in order to align it with UN-GGIM, Integrated Geospatial Information Framework (IGIF). A closer alignment and presentation on how IGIF can/will work in a marine/maritime perspective would help to set the scene better for IHO MS.

The goal of the proposed joint OGC/ IHO Pilot is to show the value of interoperability and to demonstrate the benefits of standards through pilot(s) and demonstrations. This will be done by piloting a recommended SDI architecture to support a Marine SDI and developing demonstrations. This recommendation would allow MSDIWG members to access tangible results from the MSDI-CDS and assist members who are interested in supporting a MSDI follow-on Pilot initiative.

7. Justification and Impacts

The work in the MSDIWG is progressing well and a supporting Action Plan has been established. The Work Programme creates the framework for the WG, in order to cope with the challenges in a forward-looking perspective.

The creation of regional MSDIWGs will give the Member States the direct possibility to actively participate in the development of a well-functioning MSDI within the region's hydrographic domain and its surroundings. Additionally, regional MSDIWGs benefit from both national and regional SDI activities in order to lead and address MSDI matters for the countries in the region.

The proposed joint OGC/IHO Pilot will result in three main outcomes:

1. Demonstration - A practical technology demonstration from global community experts showcasing federated MSDI for the Land/Sea use case. The demonstration will show how using OGC, IHO and other open standards, enables the community's ability to find, obtain, utilize, share, interoperate and reuse data.
2. Impact on OGC Standards - Lessons learned, gaps, and the need for changes to the OGC standards baseline, will be summarized in an Engineering Report which informs the OGC standard program.
3. Impact on IHO Standards - Practical testing of relevant S-100 based IHO standards helps accelerate the process for adoption and implementation of IHO standards. The engineering report helps to inform the work of the IHO HSSCs Working Groups and will provide inputs to those groups to enhance the framework and its component standards

Action Required of IRCC

The IRCC is invited to:

a. note the report
b. take note of the proposed joint OGC/ IHO Pilot and give guidance on the way ahead
c. discuss any item with relevance to SDI/MSDI/MSP and to take appropriate actions.

Annex A

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Annex B

MSDIWG Proposed Work Plan - 2018 - 2021

MSDI Tasks

A	Communication and dissemination
B	Operational - Data sharing and management
C	Policies and governances – RHC. (Ensure that MSDI is a standing agenda item for RHCs' meetings (IHO Res 2/1997, as amended, refers))
D	Standards (OGC and HSSC)
E	Innovation – Future perspectives (2021 - 2030)
F	Training and education
G	Maintain and extend the publication IHO MSDI C-17 (IHO Task 3.9.2.1 refers)
H	Conduct annual meetings of MSDIWG, arranged back to back with 1-day MSDI Open Forum (IHO Task 3.9.1 refers)

No	Work item	Priority H-high M-med L-low	Milestones	Start Date	End Date	Status P-planned O-ongoing C-completed	Responsible / contact person(s)	Related Pubs / Standard	Remarks
A.1	Implement MSDI Maturity Assessments (national and regional) to enable consistent reporting from MS through RHC to IRCC.	H	1. Design template(s) 2. Assessment templates in place 3. Assessment templates in use	Jun 17	Jan 19	C	Denmark, OceanWise		Items 2 & 3 OceanWise send templates to WG MS for comment
A.2	Identify definitions, appropriate and relevant standards and components of (M)SDI. Ref: D1 and D2	H	1. Provide a consolidated list of definitions, components, standards	Jan 17	Jan 18	C	Malaysia		
A.3	Develop and provide guidelines on MSDI implementation.	M	1. Guidelines in place based on outputs from tasks B1-3: C2	2017	2021	O	IIC OceanWise Canada		
A.4	Develop MS or RHC relevant Case Studies. Ref: C2	M	1. Arctic Region 2. Baltic Region 3. Brazil 4. East Asia Region	2017 2017 2018 2018	2021 2021 2021 2021	P	USA Denmark Brazil Korea		Template available on BOK
A.5	Create video recording of MSDI for HO and wider marine community .	M	1. Develop content: a. Messages from C-17 b. Key points of MSDI c. Role of MSDIWG 2. Edit 3. Record 4. Edit 5. Approve	Mar 17	Jan 19	C	Korea		Video now available in English, French and Spanish
B.1	Create an implementation "roadmap" template for MSDI (at national and/or regional level)	H	1. Gather information 2. Compile information	Mar 17	Dec 2020	O	IIC Esri		USA NGA comment req'd

			3. Publish template for implementation				USA		
B.2	Identify core data for input to MSDI to support multiple applications [Ref: B1]	M	1. Marine Cadastre 2. Emergency Response 3. Coastal Zone Management	Mar 17	2020	O	IIC Germany Canada OceanWise		OceanWise to circulate
B.3	Identify wider user requirements for bathymetry data	H	1. Develop primary use case for Arctic Bathymetry SDI 2. Update concept development study 3. Propose test-bed 4. Build test-bed	2017	2018	O	OGC USA (NGA)		
C.1	Draft data policy statements for MSDI (Ref:A3)	M	1. Define relevant statements 2. Compile compendium of Data Policy statements	2017	2020	P	USA OceanWise		
C.2	Develop a conceptual architecture for MSDI	M	1. Develop architecture(s) 2. Compile compendium of MSDI architectures	2017	2018	C	Malaysia		
C.3	Develop a governance model for MSDI	M	1. Deliver best practice governance models to BoK (Ref: B3)	2017	2019	C	Denmark USA (NGA)		
C.4	Data Sharing and Publishing Licence	M	1. Provide licensing models and templates as 'best practice' to MSDI BoK	2018	2019	C	NZ, USA, OceanWise, Indonesia, Malaysia Esri		
D.1	Identify relevant standards to support MSDI implementation and operation.	H	2. Provide annual reports to IRCC and HSSC 3. DGGS (Ref: B3)	Jun 17	Jan 21	O	OGC Marine DWG		
D.2	Assess the suitability and shortcomings of standards in supporting data interoperability.	M	1. Identify standards relevant to bathymetry (Ref: B3) 2. Marine Cadastre 3. Oceanography	2018	2021	O	OGC Marine DWG (inc: Portugal)		
E.1	Identify and report on the future trends affecting MSDI e.g. autonomous platforms, standards, big data, cloud, internet of things and artificial intelligence.	M	1. Information gathering (Horizon Scanning) 2. Publish White Paper (inc: PPP)	2018	2019	C	Esri OceanWise USA Portugal Caris		
E.2	Establish an IHO MSDI Vision for 2030.	L	1. Prepare draft Position Paper ("think piece") to include technologies, methodologies, sustainability 2. Align with other Visions	2018	2021	O	OceanWise UK US (NGA)		
F.1	Develop and maintain training syllabi	M	1. Review and update in line with relevant developments, methods and content	2018	2020	C	Denmark OceanWise		
F.2	Support development and delivery of e-learning platforms	L	1. Coordinate activities with East Asia (KHOA) 2. Compile list of existing e-learning modules relevant to MSDI	2018	2020	O	Esri OceanWise KHOA		MSDI training material delivered as e-learning
F.3	Develop a MSDI communications plan for MSDI BoK	M	1. Identify the need, audience and focus 2. Report findings 3. Deliver Plan	2018	2020	P	IHO NZ(LINZ) Netherlands		

							US (NOAA)		
G.1	Maintain IHO publication C-17 to reflect developments in ICT, Content, Standards and Governance of MSDI	H	1. Manage on-line dynamic content 2. Create a Wiki 3. Request IRCC remove document from IHO Res: 2/2007	2017	2020	C	OceanWise Esri USA Denmark Germany Portugal		V2.0 now approved by IRCC
H.1	Conduct 2019 -21 meetings of MSDIWG, arranged back to back with 1-day MSDI Open Forum and OGC Marine DWG	H	1. Date and venue defined 2. Logistics in place 3. Open Forum programme defined 4. Develop content for DWG workshops	2017	2021	C	MSDIWG Management Group (Chair/Vice Chair, Sec, IHB)		2021 - Singapore

Annex C

MARINE SPATIAL DATA INFRASTRUCTURES WORKING GROUP (MSDIWG)
Terms of Reference and Rules of Procedure

References:
a) HSSC1 Meeting, Singapore, October 2009
b) HSSC5 Meeting, Shanghai, China, November 2013
c) HSSC6 Meeting, Valparaiso, Chile, November 2014
d) IRCC7 Meeting, Mexico City, Mexico, June 2015
e) IRCC11 Meeting, Genoa, Italy, June 2019

TERMS OF REFERENCE

1. Objective: support the activities of the IHO related to Spatial Data Infrastructures (SDI) and/or Marine Spatial Data Infrastructures (MSDI) and/or Marine Spatial Planning (MSP), as far as marine data is involved.

2. Authority: this Working Group (WG) is a subsidiary body of the Inter-Regional Coordination Committee (IRCC). Its work is subject to IRCC approval.

3. The WG should:
- 3.1 Monitor national, regional and international SDI activities and trends, and present information on those activities to IRCC members by correspondence and at the annual meeting.
- 3.2 Promote the use of IHO standards and member state marine data in SDI activities.
- 3.3 Liaise, as appropriate, with other relevant bodies to increase the visibility of marine spatial data.
- 3.4 Identify actions, procedures and resolutions that the IHO might take to contribute to the development of SDI and/or MSDI in support of Member States.
- 3.5 Determine any actions that the IHO and individual Member State might take to forge links with other bodies (e.g. OGC, ISO TC211, IOC) to ensure Member States are best placed to meet the developing challenges associated with data management and governance.
- 3.6 Identify and recommend possible solutions to any significant technical issues related to interoperability between maritime and land-based inputs to SDI, and in particular:
  - a) Datum issues.
  - b) S-100 interoperability with SDI.
  - c) S-100 interoperability with oceanographic, marine biological, geological and geophysical data structures.
- 3.7 Identify any IHO capacity building requirements related to MSDI.
- 3.8 Develop a syllabus for MSDI familiarization.
- 3.9 Follow the development in MSP implementation worldwide.
- 3.10 Establish a list of relevant MS National MSP Data Contact Points and contact persons.
- 3.11 Establish a list of additional relevant institutions, contact person/data experts.
- 3.12 Study the most relevant MSP issues in a cross-border / trans-boundary context in relation to data and information seen from a MS perspective.
- 3.13 Compile minimum requirements for Hydrographic data for Maritime Spatial Plan Data and recommendations of distribution/sharing of this data.
- 3.14 Provide an overview on (national / regional) MSP best practice.
- 3.15 Establish MSP on the IHO website under body of knowledge.

RULES OF PROCEDURE

1. WG shall comprise representatives of Member States, Expert Contributors and Accredited NGIO Observers, all of whom have expressed their willingness to participate. Membership is open to all Member States of the IHO.

2. Member States, Expert Contributors and Accredited NGIO Observers may indicate their willingness to participate at any time. A membership list shall be maintained and confirmed annually.

3. The Chair and Vice-Chair shall be a representative of a Member State. The election of the Chair and Vice-Chair should normally be decided at the first meeting after each ordinary session of the Assembly and, in such case, shall be determined by vote of the Member States present and voting. If the Chair is unable to carry out the duties of the office, the Vice-Chair shall assume the Chair with the same powers and duties.

4. The Chair shall have a seat in the IRCC and shall report on the activities of the WG to the IRCC meetings and to the IRCC Chair for further report to each ordinary session of the Assembly through the Council.

5. The WG should work by correspondence, and use group meetings, workshops or symposia only if required. When meetings are scheduled, and in order to allow any WG submissions and reports to be submitted to IRCC on time, WG meetings should not normally occur later than nine weeks before a meeting of the IRCC.

6. Decisions should generally be made by consensus. If votes are required on issues or to endorse proposals presented to the WG, only Member States may cast a vote. Votes shall be on the basis of one vote per Member States represented. In the event that votes are required between meetings or in the absence of meetings, including for elections of the Chair and Vice Chair, this shall be achieved through a postal ballot of those Member States on the current membership list.

7. If a secretary is required it should normally be drawn from a member of the WG. The draft minutes of meetings shall normally be distributed by the Secretary within six weeks of the end of meetings and member comments should be returned within three weeks. Final minutes should be distributed and posted on the IHO website within three months after a meeting.

8. Expert Contributor membership is open to entities and organizations that can provide a relevant and constructive contribution to the work of the WG. Expert Contributors shall seek approval of membership from the Chair. Expert Contributor membership may be withdrawn in the event that a majority of the Member States represented in the WG agrees that an Expert Contributor's continued participation is irrelevant or unconstructive to the work of the WG.

9. All members shall inform the Chair in advance of their intention to attend any meetings of the WG. In the event that a large number of Expert Contributor members seek to attend a meeting, the Chair may restrict attendance by inviting Expert Contributors to act through one or more collective representatives.

10. The working language of the WG shall be English.