13th MEETING OF THE IHO INTER-REGIONAL COORDINATION COMMITTEE
IHO-IRCC13
VTC, 23-25 June 2021

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

The Online part of the 12th Meeting of the IHO Marine Spatial Data Infrastructures Working Group (MSDIWG) took place via VTC from 17 to 18 of March 2021. Due to the format of the meeting and the time limitations, it was necessary to only focus on the most important items having in consideration that it was expected to have a face to face meeting in Singapore in October.

Some of the important items was to focus on the new IHO Strategic Plan, that was approved by A-2, and especially GOAL 2, and Target 2.3, that highlights the importance of sharing the UN guiding principles for geospatial information management in order to ensure interoperability and combination with other marine-related data. Furthermore there was a focus on the importance of the active involvement with the RHCs, to ensure the link between the two levels of Spatial Data Infrastructure, the global approach under the UNGGIM principles, and the National/regional level by involvement of RHC.

Focus areas of the online MSDI meeting March 2021:

- Status and presentations from Internal and External stakeholders
- IHO MSDIWG Draft Work plan 2021 - 2024 and Action list
- Presentations from OGC MDWG, OGC pilot, UN-GGIM MWG and UN-GGIM IGIF
- Information about IHO-Singapore Innovation and Technology Laboratory and how the MSDI community could be involved in the IHO - Singapore Innovation and Technology Laboratory and provide some ideas
- Presentation about the use of S-100 with relation to MSDI/MSP,
- Election of new Chair and Vice Chair

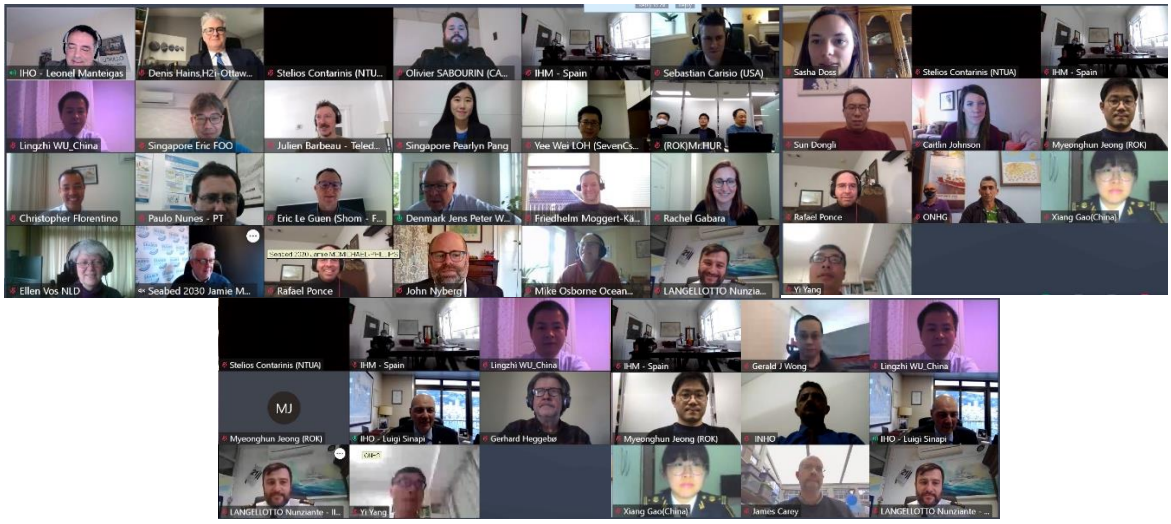

Fig.1. The IHO MSDIWG.

Dates and venue for next meeting.

The MSDIWG plans to arrange the next IHO MSDI WG meeting ideally back-to-back with the next UN-GGIM WG MGI and OGC Marine Domain WG meetings, and a jointly organized international seminar on marine geospatial information. The meetings and international seminar originally planned for October 2021 has been postponed to when the global situation permits in-person global events. The three groups and Singapore (host) are exploring jointly organizing and delivering a virtual webinar(s) during 25 – 29 October 2021 as a lead up to the in-person meetings and international seminar. Logistics and meeting details will be available at: www.iho.int/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.

2. Work Program

The existing Work Programme was discussed and evaluated at the online MSDIWG meeting based on recent achieved results with a focus on MSDI from an international, regional and national perspective. In relation to the work program 2018-2021, most of the work items have been achieved but some work items still remain. At the online MSDIWG meeting the need to adjust them was discussed.
Relevant work items were transferred to the draft work program 2021-2024. In order to deliver this Work Programme, eight MSDI Tasks have been established. The new draft work programme can be found on the above link and in Annex B of this report
In relation to the List of Actions, it was agreed to postpone this item to the MSDIWG meeting in October as most of the actions have a deadline at the MSDIWG12, the meeting that is expected to take place in October 2021 in Singapore.

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 to 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 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 working with 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 would be to collect and collate responses from Member States on MSDI prior to each RHC meeting.

A majority of RHCs have now, or are in the progress of, establishing RHC MSDIWGs. At the IHO MSDIWG12 online meeting several RHCs gave regional presentations of the work and challenges from a regional perspective.

As seen from a MSDI perspective it is important that RHCs consider taking MSDI as a 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 with 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).

At the MSDIWG online meeting there was a presentation about the Arctic SDI. The Arctic SDI is a collaborative effort of the National Mapping Agencies of the Arctic and described the respective objectives. In relation to the new 2020-2025 Arctic SDI Strategy, the main objectives were presented including the new concept of Multidimensional Digital Arctic which combines information from different domains: marine, land and atmosphere. The Web platform was presented, as well as the Geoportal and the functionalities.

From a Regional MSDI perspective the Artic SDI Governance model can be used for SDI/MSDI on a regional basis. The governance documents are now available on the MSDI website where the following relevant links are available:

- Arctic SDI: https://arctic-sdi.org/
- Arctic SDI Strategic Documents (MoU, manuals, guidelines, governance, working groups,...): https://arctic-sdi.org/documents/strategic-documents/
- Board Meetings - Minutes: https://arctic-sdi.org/documents/meetings/

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 free available on IHO webpage under MSDIWG Body of Knowledge https://iho.int/en/body-of-knowledge.

A MSDI e-learning program has also been developed to enable people access to MSDI teaching externally and even 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.

The MSDIWG will now investigate the possibility to update and restructure the MSDI training material taking the different comments from the MSDIWG and IHO MS into consideration. The MSDI e-learning material will be available for the CBSC e-learning Project Team.

Strategic Performance Indicators
At the IHO Assembly, the IHO Strategic Plan 2021-26 was approved including, the three Strategic Performance Indicators (SPI). The following SPI has special relevance for the MSDIWG, the SPI 2.1 (Build a portal to support and promote regional and international cooperation in marine spatial data infrastructures (MSDI)) and SPI 2.3 (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) of Goal 2 and SPI 3.1 (Collaborate with other bodies who deliver capacity building and training to improve effectiveness of capacity building activities and programmes) of Goal 3. With relation to Goal 2.1 the MSDIWG has included this goal in the Draft work plan in order to deliver on this goal.

4. Problems Encountered

From a MSDI/MSP perspective there is a need to focus on S-100 beyond the traditional safety at Sea /SOLAS perspective in order to serve multiple users with presentation systems different from ECDIS. In order to focus on the use of S-100 from a MSDI/MSP perspective , the HSSC 13 meeting noted the forthcoming intention from MSDIWG to engage directly with HSSC and its WGs in the future development of guidelines/recommendations for supporting S-100 MSDI activities in view of monitoring/contributing the Roadmap for the S-100 Implementation Decade

5. Any Other Items of Note

UN-GGIM WORKING GROUP ON MARINE GEOSPATIAL INFORMATION (WGMGI)
The UN-GGIM-WG on Marine Geospatial Information held its eighth online meeting on 25 March 2021. During the meeting, the WG discussed its current iteration of the IGIF for the water domain. The document is currently in a working draft and has been shared with WG members. The next phase of review will likely be through an implementation lens, possibly by MS preparing IGIF country-level action plans and including academic institutions. The WG expects to work closely with the MSDIWG and OGC moving forward. The WG also released an updated version of its work plan and anticipates another meeting in June to prepare for the August GGIM Committee of Experts meeting report. The third in-person WG meeting, originally planned for October 2021 in conjunction with the MSDIWG has been moved to early 2022.

IHO MSDI WG contribution and participation in the production of UNGGIM Standards Guide Ed.3
In support of the UN Global Geospatial Information Management (UN-GGIM) program, the IHO Secretariat invited MSDIWG members to participate in the joint Standards Developing Organizations' (SDO) (i.e. ISO/TC211, OGC and IHO) revision of the UN-GGIM Role of Standards Guide and Companion Document. The MSDIWG members involved in the drafting team actively contributed to drafting the chapters and provided key inputs such as the inclusion of the S-100 framework, the IHO standards as well as best practices where international standards and frameworks were successfully applied (e.g. MSDIs). The Standards Guide Edition 3 draft was produced by the joint SDO drafting team and circulated to MSDI WG for comment (Action 13/2021).

IHO MSDI WG participation in the Joint IHO-Singapore Innovation and Technology Laboratory

MSDI was proposed and approved as one of the potential research and development (R&D) areas for the Joint IHO-Singapore Innovation and Technology Laboratory (A2_2020_PRO-2.4) whereby IHO Member States, the MSDI WG and industry stakeholders could participate as partners. Following the approval and endorsement of the laboratory at C-4 and A-2, respectively, the MSDI WG outlined three ways forward to participate in the laboratory: projects, data, and procedure. It was proposed that the MSDIWG go through the action lists and identify potential projects that could be explored via the Laboratory, particularly pilot projects which addresses IHO Strategic Goals 2 and 3 and the use of hydrographic data beyond SOLAS.

S-100 from a MSDI perspective

S-100 potentially offers an opportunity to the MSDI community. The rollout of S-100, during the decade of implementation is very focused on the establishment of S-100 within the ECDIS community. There are also elements of the S-100 world which could benefit MSDI implementation and offer opportunities for Hydrographic Offices. The MSDIWG community is in a position to take a greater part in this rollout and work alongside the HSSC groups to look at which elements of S-100 could be emphasized or broadened in order to enable greater expressivity for MSDI use cases.

In order to achieve the best utilization and greatest benefit from the implementation of the S-100, it is therefore important that the MSDI community becomes more involved in the S-100 rollout as edition 5.0.0 is currently being developed and many elements are directly relevant to MSDI use cases.

1. More streamlined product specification definition
2. Improved data streaming guidance
3. Improved conformance with ISO frameworks
4. Tighter integration between Models, feature catalogues and GML encodings

S-100 is defined as the Universal Hydrographic Model. Although MSDI is not a single use case in itself, but is a bridge to broader, cross-thematic uses and to other communities. But to be truly universal S-100 should be able to model, encode and interchange data equally for these other use cases.

Examples of MSDI use cases are Marine Spatial Planning, Coastal Zone Management and Search and Rescue. Data to support these use cases are often predicated on data elements such as administrative areas, marine protected areas, named sea areas and regions, dense bathymetry, coastline and many others are already defined and bound in existing product specifications. S-100 defines a powerful mechanism for creating cross-thematic data products within a rigorous framework by reusing these features in multiple product specifications, creating the capacity for reuse within the data producer's own infrastructure.

OGC Federated MSDI Pilot. FMSDI

The Federated MSDI Pilot is a multi-country, Federated Marine Spatial Data Infrastructure (SDI) under land/sea interface use-cases, its respective goals, and that the expected outcomes are practical technology demonstrations on how using OGC, IHO, and other open standards could enable the community's ability to find, obtain, use, share, interoperate, and reuse data.

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 modelling and the creation of multiple domain coastal zone data based on the categories identified in the MSDI CDS.

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.

6. Conclusions and Recommended Actions

The work in the MSDIWG is progressing well and a new supporting draft 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.
Seen from a regional MSDI perspective the establishment and operation of the Arctic SDI can be used as a good example of establishing and running a regional MSDI.

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 the C-17 and the establishment of MSDI Ambassadors at RHCs.

Taken the development of UN-GGIM, Integrated Geospatial Information Framework (IGIF) and IGIF Water in consideration it seems important that there is a need for a better alignment and integration with IGIF and IGIF Water as this will ensure a uniform approach to data management between land and sea and avoid overlaps. 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 two IGIF initiatives. The focus in a new version of C-17 could be on how Hydrographic Offices can act in response to IGIF and the broader global perspective and could be a chance to really focus it 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.

7. Justification and Impacts

There is a need to update the publication C-17 in order to align it with UN-GGIM, Integrated Geospatial Information Framework (IGIF) and with IGIF for Water. A closer alignment and presentation on how IGIF/ IGIF for Water 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. The above recommendations would allow MSDIWG members to access the results from the MSDI-CDS and assist members who are interested in supporting a MSDI follow-on Pilot initiative.

Two activities with relation to S-100 from a MSDI perspective are envisaged, one to oversee and influence how S-100 is able to express data relevant to MSDI applications, for instance richer coordinate reference systems, modelling of complex relationships and encodings configured for marine geospatial

data. The other activity is to actually define MSDI models of features within one or more MSDI-specific product specifications. The goals, therefore, are twofold:

1. Ensure end users are able to reuse data better by optimizing the S-100 framework for broader MSDI use cases
2. Provide the opportunity for data producers to address entire classes of use case with S-100 based product specifications.

Ensuring MSDI is considered in existing product specifications could also benefit many MSDI stakeholders. S-102, S-104, S-111, for instance all have great potential for broader use and a closer working relationship with the S-100 working groups defining their content could help shape these important product specifications. Recent developments within the S-102 community have highlighted the importance of ensuring that scientific and non-navigational use cases are provided for and other product specifications will likely follow suit.

S-100 is certainly capable of being leveraged in this way and it is not hard to see the possibilities for defining MSDI product specifications for specific use cases proactively. The IHO geospatial registry is a unique asset, defining all major marine geospatial features within a number of domains. Product specifications then bind together networks of features, attributes and relationships and key use cases in MSDI could drive definitions of product specifications in the MSDI domain. Consideration should be given to whether MSDI requires its own domain or not and this should be discussed with the S-100 community.

If S-100 is better addressed by the MSDI community then IHO C-17 could include specific guidance in respect of S-100, specifically:

1. Using C-17 as a "Meta-Standard", guiding implementers showing how S-100 data can be defined, re-used and made interoperable with external data frameworks.
2. Detailing specific use cases addressed by future MSDI product specifications within the S-100 framework
3. Defining better the relationships between the IGIF/IGIF-W and MSDI communities.

IGIF is concerned with the institutional arrangements within any SDI. MSDI and IGIF are complementary activities. MSDI and C-17 approaches cross-thematic data reuse from the perspective of participating hydrographic offices whereas the UN-GGIM's IGIF starts out from a cross-thematic standpoint, and is relevant to hydrographic offices as well as the other elements of a national SDI infrastructure. So, the emergence of the IGIF for Water (IGIF-W) offers specific advice to marine geospatial agencies for implementation of the IGIF. Implementation, and a focus on hydrographic offices using S-100 as the broad framework could reside within C-17.

A summary of suggested initiatives, with relation to S-100 from a MSDI perspective is:

1. Investigate, in discussion with the S-100WG and IHO Registry Manager whether a proposal for an MSDI domain in the registry is required
2. Assess the potential for MSDI-specific products using S-100 addressing key use cases.
3. Prepare, through stakeholder input, proposals for revision of C-17 in respect of S-100 implementation.
4. Continue to re-orient C-17 and MSDIWG activities to reflect the respective approaches of the UN-GGIM/IGIF and IHO communities.

8. Action Required of IRCC

The IRCC is invited to:

a. note the report

b. approve the draft work plan 2021-2024

c. take note of the proposed initiative's and give guidance on way ahead

d. discuss any item with relevance to SDI/MSDI/MSP and to take appropriate actions.

Annex A

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Annex B

DRAFT WORK PLAN 2021–2024

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 and MSP Maturity Assessments (national and regional) to enable consistent reporting from MS through RHC to IRCC.	H	1. Evaluate available template's 2. Decide on template. 3. Promote template to use. 4. Send out template to MS for national Maturity Assessments	2021	2023	P	USA (NGA) Chair		
A.2	IHO Strategy Goal 2.1. Build a portal to support and promote regional and international cooperation in marine spatial data infrastructures (MSDI).	H	1. Investigate the different possibilities 2. Gather information and evaluate IHO MS user needs 3. Prepare a proposal for IRCC approval 4. Build a portal	2021	2024	P	IHO Sec. Chair Vice Chair NGA Norway		
A.3	Develop MS or RHC relevant Case Studies. Ref: C2 (Investigate if it is possible to engage the RHC MSDI ambassadors)	M	1. Baltic Region 2. Brazil 3. East Asia Region	2021	2023	P	Denmark Brazil Korea		
B.1	Create an implementation guide "roadmap" template for MSDI, at national and/or	H	1. Gather information 2. Compile information	2021	2023	O	USA, (NGA) IIC		

	regional level. (IGIF Implementation Guide, Strategic Pathway 1 to be considered.)		3. Publish template for implementation				ESRI H2i		
B.2	Identify core data for input to MSDI to support multiple applications [Ref: B1] Ref. to IGIF and IGIF W. and OGC Concept development study.	M	1. Marine Cadastre 2. Emergency Response 3. Coastal Zone Management	Mar 17	2023	O	Chair/V. Chair		
C.1	Alignment with UN-GGIM IGIF and IHO MSDI C-17	H	1. Compare the two foundation concepts 2. Define the HO perspective 3. Propose changes to C-17	2021	2022	P	Chair/V. Chair NGA Norway		
C.2	Cooperation with RHC MSDIWG	H	1. Identify and list RHC MSDIWG MS, Chairs RHC MSDIWG and MSDI RHC Ambassadors 2. Create procedures for cooperation	2021	2024	P	Chair IHO Sec.		
C.3	Develop a governance model for MSDI	M	1. Deliver best practice governance models to BoK (Ref: B1) 2. IGIF Implementation Guide, Strategic Pathway 1 to be considered.	2017	2023	O	Denmark USA (NGA)		
C.4	Data Sharing and Publishing Licence	M	1. Provide updated licensing models and templates as 'best practice' to MSDI BoK	2018	2024	O	NZ, USA, OceanWise, Indonesia, Malaysia ESRI		
D.1	Identify relevant standards to support MSDI implementation and operation. Ref: B1.	H	1. Provide annual reports to IRCC and HSSC	2021	2024	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: D1) 2. Marine Cadastre 3. Oceanography 4. Opportunities with HSSC/S-100 during decade of implementation. (To identify	2018	2024	O	OGC Marine DWG Portugal Chair		

			the best opportunities to use S-100 in MSDI as well as interoperability with OGC API Standards.)						
D.3	Cooperate with the OGC MSDI Pilot	M	1. Participate in and Promote the OGC Pilot Project 2. Assess output from the OGC Pilot 3. Evaluate relevance and implications from a HO perspective 4. Take (appropriate actions as necessary	2021	2023	O	Chair		
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	2024	O	ESRI OceanWise USA Portugal Caris H2i		
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 3. Align with IHO Strategic Roadmap for S-100	2018	2023	O	Chair IHO Sec. OceanWise UK US (NGA)		
E.3	Identify challenges, options and solutions in relation to data security and integrity from a HO MSDI perspective	M	1. Information gathering (Horizon Scanning) 2. Reporting to IHO MSDIWG 3. Evaluate input to C-17 and IHO bodies/WG 4. Investigate possibilities with Blockchain based system for assuring data integrity. 5. Take appropriate actions as necessary	2021	2023	P	Chair V. Chair IIC		

E.4	Corporation with IHO-Singapore Innovation and Technology Laboratory	M	1. Identify the different IHO MS user needs with relation to future trends affecting MSDI (E.1) 2. Discuss how IHO MS can participate in the work of IHO innovation lab 3. Report back to IHO MS	2021	2024	O	V. Chair IHO Sec.		
F.1	Develop and maintain training syllabi	M	1. Review and update in line with relevant developments, methods and content	2018	2022	O	Denmark IIC		
F.2	Support development and delivery of e-learning platforms	L	1. Coordinate activities with East Asia (KHOA) 2. Coordinate with E-learning PT. 3. Compile list of existing e-learning modules relevant to MSDI	2018	2023	O	Esri OceanWise KHOA Chair IHO Sec.		
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	2022	P	IHO Sec. NZ(LINZ) Netherlands US (NOAA)		
G.1	Maintain IHO publication C-17 to reflect developments in ICT, Content, Standards and Governance of MSDI. V2.0 now approved by IRCC	H	1. Manage content 2. Create a Wiki 3. Request IRCC remove document from IHO Res: 2/2007 4. On-line dynamic content	2017	2022	O	OceanWise ESRI USA/NGA Denmark Germany Portugal		
G.2	Update C-17 in accordance with BX (UN-GGIM/IGIF)	H	1. Create a C-17 drafting team 2. Identify the need for changes 3. Evaluate the structure of C-17 with IHO MSDIWG members. 4. To send out a questionnaire to IHO MS and RHC's. 5. Update C-17.	2021	2023	P	Chair NGA		
H.1	Conduct 2019 -21 meetings of MSDIWG, arranged back to back with MSDI Open	H	1. Date and venue defined 2. Logistics in place	2017	2024	O	MSDIWG Management		

	Forum, OGC Marine DWG and UN-GGIM MGI WG meeting. 2021 – Singapore 2022 -? 2023 -? 2024 -?		3. Open Forum program defined 4. Develop content for DWG workshops				Group (Chair/Vice Chair, IHO Sec.)		

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.