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Integrated marine geospatial information

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Note by the Secretariat

Summary

The present paper contains the report of the Working Group on Marine Geospatial Information for consideration by the Committee of Experts on Global Geospatial Information Management.

At its fourteenth session, held from 7 to 9 August 2024, the Committee of Experts adopted decision 14/111, in which it welcomed the report of the working group and its leadership in continuing to raise awareness, provide guidance and encourage the availability, accessibility and integration of marine geospatial information for the benefit of society, the environment and the economy, and urged sustained efforts to provide practical guidance and to support the implementation of the Operational Framework for Integrated Marine Geospatial Information Management in accordance with national circumstances. The Committee also welcomed and supported the proposal for the working group on marine geospatial information and the International Hydrographic Organization marine spatial data infrastructures working group to deepen their collaboration and cooperation and optimize resourcing through the formation of a single unified global work group, and requested the working group on marine geospatial information to initiate that process by updating its current working modality and procedures.

The Committee acknowledged the importance of and encouraged a coordinated, cross-cutting and holistic approach in addressing the integration of the terrestrial, maritime, built and cadastral domains, noting its implications for addressing climate challenges, coastal resilience, sustainable coastal communities and the blue economy, among others, and the need to tackle the technical complexities of the land -sea interface and the vertical reference frame, as well as considering cross-cutting perspectives such as institutional, legal, regulatory and policy aspects and governance arrangements.

The report provides an outline of activities undertaken by the working group during the reporting period. In it, the working group highlights its updated workplan for 2025–2026 and its collaboration with international partners, including the International Hydrographic Organization, technical committee 211 of the International Organization for Standardization, the Open Geospatial Consortium and the United Nations Global Geodetic Centre of Excellence. It also promotes the use of innovation and emerging technologies, including artificial intelligence, to facilitate the integration and implementation of marine geospatial information management efforts.

In the report, the working group highlights three priority areas of focus: (a) advancing the integration of terrestrial, maritime, built and cadastral domains, including the convening of the forum on the integration of those domains held in August 2024 and the development of a reference guide aligned with the strategic pathways of the United Nations Integrated Geospatial Information Framework; (b) promoting and facilitating the implementation of the Operational Framework for Integrated Marine Geospatial Information Management at the national level; and (c) strengthening collaboration with the marine spatial data infrastructures working group

of the International Hydrographic Organization by updating working modalities and procedures. With regard to advancing the integration of terrestrial, maritime, built and cadastral domains, the reference guide is being developed in collaboration with the expert group on land administration and management, supported by innovation and experimentation through the Joint International Hydrographic Organization-Singapore Innovation and Technology Laboratory, including the application of artificial intelligence. In support of that work, the working group and the expert group on land administration and management jointly developed a questionnaire to compile use cases and perspectives on domain integration and on ways in which the United Nations Integrated Geospatial Information Framework and the Operational Framework for Integrated Marine Geospatial Information Management can support integration efforts. The questionnaire received 47 responses from 38 Member States, the insights of which are informing the development of the reference guide.

The report also provides a summary of the international workshop entitled “Joining land and sea”, held in December 2024 in Bogor, Indonesia, which brought together experts from the Committee of Experts, the expert group on land administration and management, the working group on marine geospatial information, the working group on policy and legal frameworks for geospatial information management, the Subcommittee on Geodesy, the International Hydrographic Organization, the Open Geospatial Consortium and the United Nations Global Geodetic Centre of Excellence. Participants explored the use of integrated geodetic information and reference systems to address global challenges, including measuring sea level rise and assessing the impacts of floods on freshwater aquifers.

The report provides several suggestions for enhancing collaboration and integration for the consideration of the Committee of Experts. The working group reaffirms its commitment to promoting the implementation of the Operational Framework for Integrated Marine Geospatial Information Management in alignment with the United Nations Integrated Geospatial Information Framework and to advancing integrated marine geospatial information management to support coordinated, sustainable and resilient responses to climate impacts and ocean-related challenges. In the report, the working group also notes its commitment to strengthening cross-cutting initiatives across terrestrial, maritime, built and cadastral domains through continued engagement with stakeholders in land management, geodesy and the International Hydrographic Organization, within and beyond the United Nations system. These activities serve as recognition of the importance of coordinated action to deliver sustainable and integrated solutions that contribute to broader societal, environmental, and economic benefits.

I. Introduction

1. Approximately seventy percent of the Earth's surface is covered by water, encompassing lakes, rivers, coastal zones, seas, and oceans. Marine environments are vital for socio-economic development, food and energy production (including renewable energy), ecosystem health, and human well-being. The oceans are central to climate change adaptation and connect society, the environment, and the global economy. For example, over 4 billion people rely on fish as a primary protein source, and an estimated 90% of global trade is conducted via the oceans. Marine geospatial information is integral to achieving all of the Sustainable Development Goals (SDGs).

2. At its fourteenth session, held from 7 to 9 August 2024, the Committee of Experts adopted decision 14/111, in which it welcomed the working group's report and leadership, and urged continued efforts to raise awareness and provide guidance to improve the availability, accessibility, and integration of marine geospatial information. The Committee emphasized support for the Operational Framework for Integrated Marine Geospatial Information Management (UN-IGIF-Hydro), in accordance with national circumstances.

3. The Committee supported the supported the proposal for the working group and the International Hydrographic Organization Marine Spatial Data Infrastructures Working Group (IHO-MSDIWG) to deepen their collaboration and cooperation and optimize resourcing through the formation of a single unified global work group, and requested the working group to initiate that process by updating its current working modality and procedures in coordination with the Marine Spatial Data Infrastructures Working Group

4. The Committee also encouraged deeper collaboration among regional UN-GGIM regional committees, thematic networks, the International Hydrographic Organization (IHO), and other international organizations to address challenges such as sea-level monitoring, the land–sea interface, sustainable and resilient coastal communities, and the development of the blue economy. The Committee further requested that integrated marine geospatial information management, including the integration of terrestrial, maritime, built, and cadastral domains, be included within its proposed UN-GGIM strategic framework for 2025–2030.

5. The Committee acknowledged the need for a holistic approach to domain integration, including addressing technical challenges at the land–sea interface and vertical reference frame, and considering institutional, legal, regulatory, and governance aspects. It further requested that relevant provisions of the United Nations Convention on the Law of the Sea's Agreement on Marine Biodiversity Beyond National Jurisdiction (BBNJ) be taken into account.

6. Member States were also urged to contribute to the Working Group's activities and to strengthen partnerships, ensuring that the UN-IGIF-Hydro meets countries' operational requirements, particularly for Small Island Developing States.

7. The Working Group underscored the importance of promoting awareness of the United Nations Integrated Geospatial Information Framework (UN-IGIF) and the Operational Framework for Integrated Marine Geospatial Information Management (UN-IGIF-Hydro). The Committee emphasized that UN-IGIF-Hydro must remain a living document, continuously evolving to remain relevant for national marine geospatial and hydrographic initiatives. This report provides updates on the working group's progress and activities during the reporting period, including efforts to advance the development and implementation of the UN-IGIF-Hydro at the national level.

8. As reliance on marine resources continues to grow, timely and reliable access to marine geospatial data becomes increasingly essential for evidence-based management of coastal and marine areas. Knowing where people, ecosystems, activities, and assets are – and how they relate – is critical for informed policy and decision-making. The timeliness of such data is equally important. Access to real-time marine geospatial information is necessary for effective emergency preparedness and response to crises and disasters. The working group encouraged national efforts to improve marine geospatial data availability and accessibility, including through the repurposing of existing data and the development

and implementation of open marine geospatial data and metadata standards at the national level.

9. The Committee of Experts is invited to express its views on the working group's progress in guiding and promoting the availability, accessibility, and integration of marine geospatial information in support of sustainable development, climate resilience, and broader environmental and economic benefits. Points for discussion and decision are outlined in paragraph 22.

II. Meetings and Activities

10. The working group continued its work during the intersessional period, holding virtual meetings and collaborating with international partners to advance its objectives. It held four virtual meetings, during which it continued its consideration of the UN-IGIF-Hydro, delivered work plan items, and collaborated with the IHO, the International Organization for Standardization (ISO), and the Open Geospatial Consortium (OGC) to ensure synergy and avoid duplication.

Integration of terrestrial, marine, built, and cadastral domains

11. A key priority of the working group has been the integration of terrestrial, marine, built, and cadastral domains. In 2023, the working group, in collaboration with the Expert Group on Land Administration and Management (EG-LAM), continued its joint efforts to produce a Compilation report synthesizing good practices and lessons learned in domain integration. The report addresses key challenges such as vertical referencing, data interoperability, metadata standards, and explores how integration supports climate resilience, coastal development, and disaster management. The working group acknowledged EG-LAM's leadership in advancing this important work.

12. The Working Group on Policy and Legal Frameworks and the IHO–Singapore Innovation and Technology Laboratory (IHO-Singapore Lab) have also joined the initiative, contributing technical expertise and piloting innovative solutions, including AI-based approaches. To inform the Compilation report, a joint questionnaire was issued to gather Member State perspectives on domain integration and the relevance of the UN-IGIF and UN-IGIF-Hydro frameworks. A total of 47 responses were received from 40 Member States, and these insights have shaped the content and direction of the report.

13. Structured around the nine strategic pathways of the UN-IGIF, the Compilation report addresses what needs to be integrated, as well as how and why integration should occur. It includes: (i) definitions of domain integration provided by Member States; (ii) case studies highlighting integration benefits in advancing the Sustainable Development Goals; and (iii) key enablers and challenges aligned with the UN-IGIF and UN-IGIF-Hydro. The report identifies priority action areas and presents seven recommendations for the Committee's consideration.

Domain Integration Forum (6 August 2024)

14. A combined forum on the Integration of terrestrial, maritime, built, and cadastral domains was held, sponsored by EG-LAM, WG-MGI, and the United Nations Global Geodetic Centre of Excellence (UN-GGCE). The forum addressed integration-related issues and gathered insights on why Member States should consider domain integration initiatives. Participants included representatives from governments, academic institutions, the private sector, and organizations such as the IHO and UN-GGCE. Discussions highlighted the importance of long-term monitoring of land and sea to assess sea-level changes and vertical land motion, as well as the use of emerging technologies like LiDAR and Global Navigation Satellite System (GNSS) reflectometry. The forum also considered the benefits and challenges of using the geoid as a unified height reference for land-sea integration.

"Joining Land and Sea" Workshop (2–5 December 2024)

15. The co-Chairs working group and EG-LAM participated in the International Workshop organized by UN-GGCE and hosted by the Geospatial Information Agency of

Indonesia in Bogor, Indonesia. The workshop brought together experts from the Committee of Experts including the working group on Policy and Legal Frameworks, and the Subcommittee on Geodesy, IHO, OGC, and UN-GGCE. Discussions explored integrated geodetic and spatial reference systems to address global challenges such as sea-level rise and freshwater aquifer impacts from coastal flooding. Participants were invited to complete a joint questionnaire, developed in collaboration with EG-LAM, to inform the Compilation report on domain integration and support the advancement of the working group's workplan.

Emerging Applications

16. The working group observed growing interest in and usage of marine geospatial information for new applications beyond traditional navigational safety purposes. In particular, integrated land–sea data are being used to study the impacts of climate change and sea-level rise. The working group also noted potential uses of marine geospatial data in protecting people, the environment, and infrastructure (e.g., undersea cables and pipelines) from unregulated use of the underwater sea space by an increasing number of civilian, manned or unmanned, sub-surface activities of vessels. Another emerging area of interest is the designation of area-based management tools, including marine protected areas, under the BBNJ Agreement. The working group recognizes the need to articulate the value of integrated marine geospatial information across safety, environmental, and economic dimensions. These efforts will help build investment cases, foster partnerships, and guide national capacity-building aligned with the UN-IGIF-Hydro.

Joint Working Group with IHO-MSDIWG

17. At its fourteenth session, the Committee of Experts adopted decision 14/111, which welcomed and supported the proposal for the working group and IHO-MSDIWG to strengthen collaboration, enhance cooperation, and optimize resources through the establishment of a unified global joint working group. In response, the working group was requested to initiate this process by reviewing and updating its working modality and procedures in coordination with the IHO-MSDIWG.

18. To advance this effort, the working group has engaged closely with the IHO-MSDIWG on the necessary next steps, including: (i) proposing an appropriate name for the joint working group; (ii) updating the Terms of Reference; and (iii) seeking endorsement from both the Committee of Experts and the IHO for the revised working modality. The IHO Inter-Regional Coordination Committee has formally endorsed the proposed name—UN-GGIM & IHO Joint Working Group on Marine Geospatial Information—and the updated Terms of Reference (provided in Annex I of this report).

III. Next Steps and Considerations

19. Going forward, the Working Group identified the following priorities for 2025–2026: (a) advancing the implementation of the Operational Framework for Integrated Marine Geospatial Information Management at the country level; (b) promoting the coordinated integration of terrestrial, maritime, built, and cadastral domains; (c) examining the implications of the BBNJ Agreement for integrated marine geospatial information management; (d) identifying areas of collaboration to demonstrate and communicate the value of integrated marine geospatial information; and (e) finalizing the establishment of the Joint Working Group with the IHO-MSDIWG and subsequently developing its joint workplan.

20. The Working Group remains committed to building momentum in coordinated and cross-cutting efforts in domain integration through its continued engagements and collaborations. It will continue engaging stakeholders in land administration, geodesy, and hydrography to ensure coordinated approaches. This reflects the understanding that integrated solutions are essential for addressing climate impacts and supporting sustainable development.

21. The Compilation report emphasizes that domain integration should be approached through the lens of the nine strategic pathways of UN-IGIF. The initial focus should be on addressing technical challenges, particularly those at the land–sea boundary and within the

vertical reference system. Integration strategies should draw on good practices from other disciplines and take into account legal, policy, and governance perspectives. The working group encourages Member States and partner organizations to prioritize these efforts, recognizing their significance for climate resilience, disaster risk management, marine protected areas and the advancement of sustainable coastal development.

IV. Points for Discussion

22. The Committee of Experts is invited to:

(a) Take note of the present report and provide guidance on the ongoing activities, and proposed next steps of the working group, including the update to its work plan;

(b) Endorse the proposed name, Terms of Reference, and working modalities of the new Joint Working Group developed in collaboration with the IHO;

(c) Take note of the priority areas and next steps identified by the working group, express its views, and provide guidance on the way forward, including on the collective efforts to advance the integration of terrestrial, maritime, built, and cadastral domains, as reflected in the recommendations of the Compilation report;

(d) Express its views on the necessary collaboration and partnerships required to enhance understanding and coordination in support of the implementation of the UN-IGIF-Hydro, ensuring it meets the operational needs of Member States; and

(e) Express its appreciation to the Government of Indonesia and its Geospatial Information Agency for successfully hosting the international workshop on "Joining Land and Sea," held from 2 to 5 December 2024 in Bogor.

ANNEX I

UN-GGIM & IHO JOINT WORKING GROUP ON MARINE GEOSPATIAL INFORMATION (MGI)

Draft Terms of Reference

1. Mandate

1.1. The United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM), at its Fourteenth Session in August 2024 (decision 14/111), welcomed the proposal to consolidate its Working Group on Marine Geospatial Information with the International Hydrographic Organization Marine Spatial Data Infrastructure Working Group (IHO-MSDIWG). The Committee requested both groups to initiate this process by updating their working modalities and procedures in coordination with each other.

1.2. The UN-GGIM and IHO Joint Working Group on Marine Geospatial Information (hereinafter "the Working Group") is established under the mandate of UN-GGIM, a subsidiary expert body of the United Nations Economic and Social Council (ECOSOC), and under the authority of the Inter-Regional Coordination Committee (IRCC) of the International Hydrographic Organization (IHO) to strengthen global coordination, technical development, and strategic alignment in the domain of marine geospatial information.

1.3. The Working Group aligns its activities with the marine geospatial information policy directions of both UN-GGIM and the IHO, ensuring consistency with the marine geospatial information policy directions and strategic goals of both the UN-GGIM and the IHO. Its work programme should be structured and managed to reflect and support the shared objectives and priorities of these organizations.

1.4. The Working Group shall also promote the recognition of the strategic role of national hydrographic offices in providing fundamental marine geospatial data essential for safe navigation, marine spatial planning, disaster risk mitigation, maritime boundary delimitation, and sustainable ocean resource management, in accordance with the United Nations Convention on the Law of the Sea (UNCLOS) and the recommendations of the International Hydrographic Organization (IHO).

2. Objectives

The objectives of the Working Group are to:

2.1. Provide strategic leadership and raise political awareness about the critical importance of reliable, timely, and fit-for-purpose of marine geospatial information for the sustainable administration, governance, management, and use of the marine environment.

2.2. Provide technical and policy advice on the role of integrated marine geospatial information in supporting international agreements, including those related to the Sustainable Development Goals (SDG), sustainable use of marine biodiversity, environmental protection, and joint use of sea space.

2.3. Promote and support the adoption and implementation of internationally agreed geospatial frameworks, schemas, and standards to strengthen the integration, enhance interoperability, and improve the usability of marine, coastal, and terrestrial geospatial information.

2.4. Promote the integration of marine and land-based geospatial information and infrastructure to support coordinated approaches to cross-sectoral challenges, in line with the 2030 Agenda and relevant international frameworks, including UNCLOS.

2.5. Coordinate and support activities across UN-GGIM and IHO on Spatial Data Infrastructure (SDI), and Marine SDI (MSDI).

2.6. Promote and strengthen international and regional cooperation for the effective governance and maintenance of marine geospatial information management, systems, standards, and infrastructure.

2.7. Contribute and advance the development of global norms, principles (including FAIR principles), guidelines and standards to increase the availability, accessibility, quality and interoperability of authoritative marine geospatial information.

2.8. Promote the integration of national hydrographic data into Marine Spatial Data Infrastructure (MSDI) frameworks at global and regional levels to ensure interoperability between terrestrial and marine geospatial information and support evidence-based decision-making.

3. Functions

The Working Group shall undertake the following functions, organised under thematic domains:

3.1. Policy leadership and strategic alignment

- Promote and monitor the inclusion of marine geospatial considerations in global and regional policy processes, including UN-IGIF, UN-IGIF-Hydro, and SDGs.
- Advise Member States on the integration of marine geospatial priorities into national, regional and international geospatial strategies.
- Facilitate alignment with the 2030 Agenda for Sustainable Development, the Sendai Framework for Disaster Risk Reduction, and the UN Decade of Ocean Science.
- Provide guidance on the integration of marine geospatial information in alignment with international agreements such as UNCLOS and the BBNJ Agreement.
- Advocate for policies that enhance the availability, accessibility, and usability of marine geospatial information.

3.2. Technical development and data governance

- Support and strengthen the development, adoption, and maintenance of integrated marine geospatial information management, infrastructure, systems, and geospatial data standards, including the S-100 Universal Hydrographic Data Model and the IHO S-100 Roadmap.
- Promote relevant geospatial standards to enhance interoperability across land, inland, coastal, and marine geospatial information management systems through harmonised MSDI frameworks.
- Develop and maintain technical guidance on datum challenges, metadata standards, and reference models for marine data.
- Promote integration of hydrographic data from oceans, seas, coastal zones, tributaries and inland waters into cohesive geospatial frameworks.

3.3. International coordination and stakeholder engagement

- Provide a platform for coordination between Member States, the UN system, IHO, international organizations and other global and regional stakeholders.
- Foster collaboration in marine environment mapping with marine policy bodies, scientific initiatives, and regional SDI communities.
- Promote geographic and thematic balance in participation and leadership.
- Improve the usability and integration of marine geospatial information.
- Support Member States in operationalizing the IGIF-Hydro.

3.4. Data accessibility, capacity development and knowledge exchange

- Advocate for open data policies while addressing legitimate data sensitivity and security concerns.

- Identify and support capacity development needs, including the creation and delivery of training materials for integrated marine geospatial information management and marine SDI familiarisation syllabus.

- Promote sharing of good practices, case studies, and technical resources among stakeholders by establishing and maintaining a knowledge repository of frameworks, guidelines, technical solutions, and examples of cross-border planning.

4. Membership and governance

4.1. Membership shall comprise expert representatives nominated by IHO and/or UN Member States from the national mapping, hydrographic, geospatial, and relevant data services. Additional subject matter experts from the UN System, international organizations, NGIOs and other organizations may be invited to contribute.

4.2. The Working Group shall have two Co-Chairs—one nominated by the IHO and the other through the UN-GGIM process—who should ideally serve staggered three-year terms, renewable once, subject to practical considerations and mutual agreement.

4.3. The Working Group may establish sub-groups or task teams to focus on specific aspects of its work programme. These teams shall have clearly defined objectives, deliverables, and timeframes, reporting progress regularly to the Working Group's Co-Chairs and the Secretariat. Performance should ideally be reviewed at the plenary meeting, considering the scope, duration, and nature of each sub-group's mandate.

4.4. The Working Group may engage with topic-related international organizations and the Co-Chairs invite their nominated experts as observers to contribute insights and expertise in integrated marine geospatial information.

4.5. Each member State is encouraged to nominate representatives from its national hydrographic authority to the Working Group to ensure a balanced representation of land and marine geospatial expertise.

5. Secretariat and administrative support

5.1. The United Nations Secretariat for the Committee of Experts on Global Geospatial Information Management in the Statistics Division, Department of Economic and Social Affairs, shall serve as the permanent Secretariat, managing coordination, communication, and administrative support for the Working Group.

5.2. The Secretariat, working in coordination with the IHO secretariat, shall:

- Support the organisation and documentation of meetings, including agenda preparation, invitations, minutes, and follow-up correspondence;

- Facilitate internal and external communication on behalf of the Working Group;

- Maintain a repository of deliverables, reports, guidance materials, and technical documentation;

- Coordinate inputs for joint reporting to UN-GGIM and IHO-IRCC.

5.3. The Co-Chairs shall coordinate and monitor sub-groups or task teams and report on their activities to UN-GGIM and the IHO-IRCC.

5.4. In coordination with the Co-Chairs, the Secretariat shall assist with the organization of meetings, preparation of agendas, and dissemination of notices and relevant materials.

6. Meetings and work modality

6.1. The Working Group shall primarily operate through virtual collaboration, utilising digital platforms to advance its work on a continuous basis.

6.2. Physical meetings should preferably be convened biennially, where feasible, in conjunction with IHO or UN-GGIM plenary sessions. Alternate-year in-person or virtual events may include management meetings, workshops, or high-level thematic seminars.

6.3. Sub-groups and task teams may convene virtual ad hoc meetings as required to meet specific milestones, in alignment with the Working Group's work plan.

7. Governance and decision-making

7.1. The Working Group shall seek to make decisions by consensus. In cases where consensus cannot be achieved, decisions may be made through a formal voting process involving only UN and IHO Member States, with each Member State entitled to one vote. Decisions shall be determined by a simple majority of the votes cast.

7.2. Governance of the Working Group shall be reviewed periodically by the UN-GGIM Bureau and IHO-IRCC, which may propose updates to these Terms of Reference based on the evolution of global needs or strategic direction.

7.3. In case of persistent disagreement, lack of progress, or conflicting mandates, the matter, if it falls within the purview of the Working Group, shall be referred to the UN-GGIM Bureau and/or IHO-IRCC for resolution.

7.4. The Working Group shall strive to ensure continuity and institutional memory by staggering Co-Chair transitions and maintaining consistent engagement with both parent bodies.

8. Reporting procedure

8.1. The Working Group shall prepare and submit an annual report to the Committee of Experts. This report shall include:

- A summary of key achievements, outputs and challenges;
- Progress against agreed objectives and work plan deliverables;
- Recommendations for strategic direction or new areas of work.

8.2. In parallel, a complementary report, prepared in accordance with the IHO reporting template, shall be submitted annually to the IHO-IRCC for review and guidance.

8.3. Reports shall be co-authored by the Co-Chairs and Secretariat, based on contributions from sub-groups and participating Member States, and aligned with the UN-GGIM and IHO reporting cycles.

8.4. The Working Group may also prepare and issue relevant background documents such as thematic briefs, technical notes, or policy guidance documents, as required, to inform relevant UN or IHO working groups, task teams, or relevant stakeholders.

8.5. All reporting shall be results-oriented, evidence-based, and aligned with the objectives of the UN-GGIM, IHO Strategic Plan, the Sustainable Development Goals, UN-IGIF and UN-IGIF-Hydro.