



Joining Land and Sea Update:

Federated Marine Spatial Data Infrastructure (FMSDI)

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TT L&S (lead)/C&E (Chair)/VLBI FP

Subcommittee on Geodesy

UN GGIM





Marine Domain Working Group

The 134th OGC Member Meeting, Philadelphia, PA USA

Caroline Levey | OceanWise

Glenn Laughlin | Pelagis

Rafael Ponce | ESRI

03 March 2026

Meeting Host

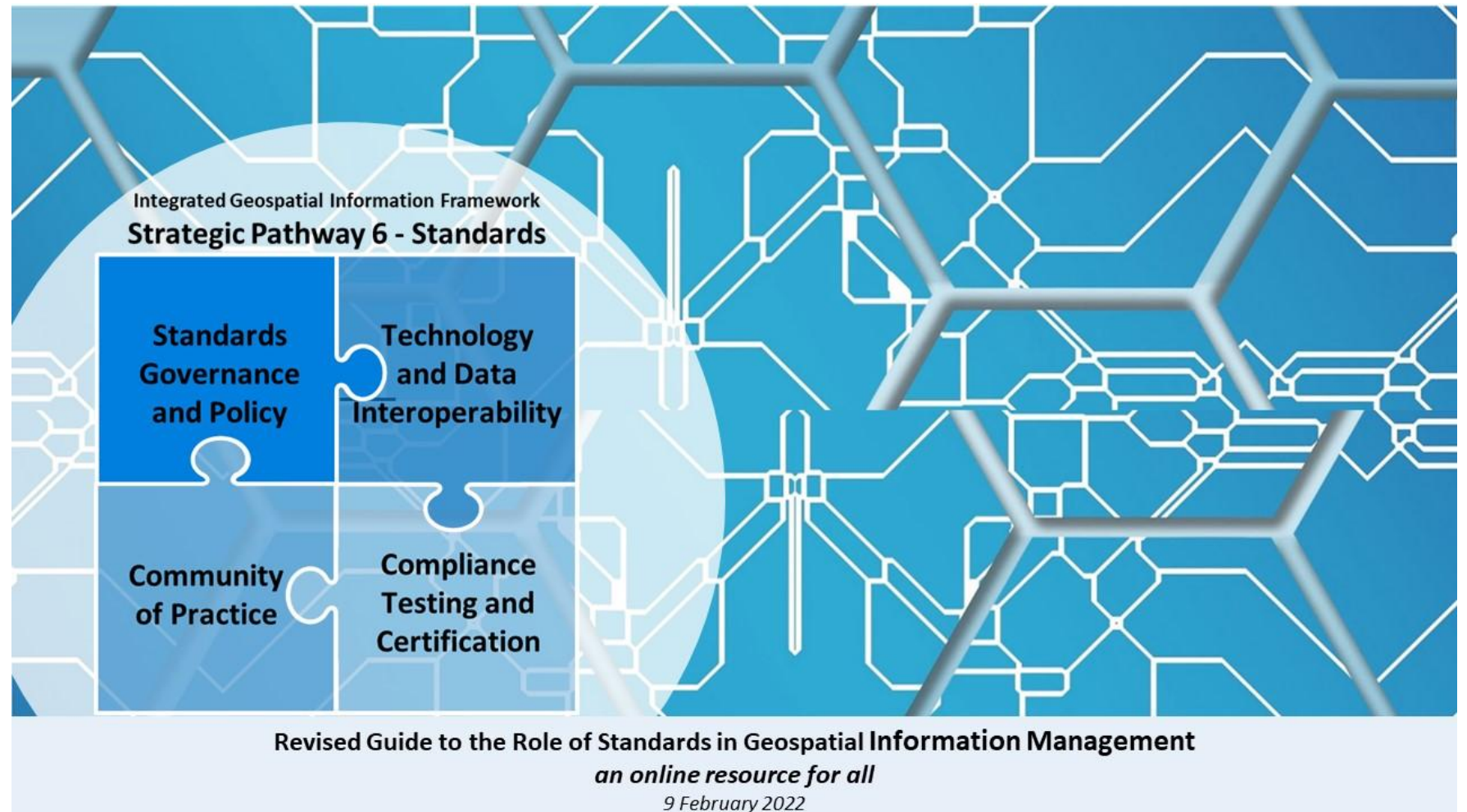


Meeting Sponsors



Standards Development Organizations (SDO)

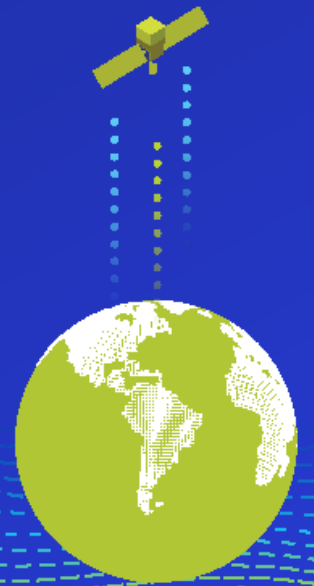
- SDO
 - OGC
 - ISO TC211
 - IHO
- UN recognized
- Integration of Land and Sea Domains
- OGC-IHO Project FMSDI



Open Geospatial Consortium - Marine DWG



- The Marine Domain Working Group (“MarineDWG”) focuses on the application of OGC Standards and Profiles to promote the discovery, use of and interoperability of ocean-related geospatial datasets.
- The working group is motivated by the widening use of marine data for purposes other than safe navigation, which can be captured loosely under the term Marine Spatial Data Infrastructure (MSDI) and Marine Spatial Planning (MSP).
- Consequently, they lead projects such as FMSDI





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International
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IHO S-100 Standards
in the Land-Sea

interface

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FMSDI 2024 – Bridging Land and Sea

Draft Guide and Best Practices for Land-Sea Data Integration

Establish guidelines to ensure inter-agency interoperability for data concerning the intertidal zone, facilitating seamless data sharing and usage between terrestrial and marine communities.

Address Semantic and Technical Differences

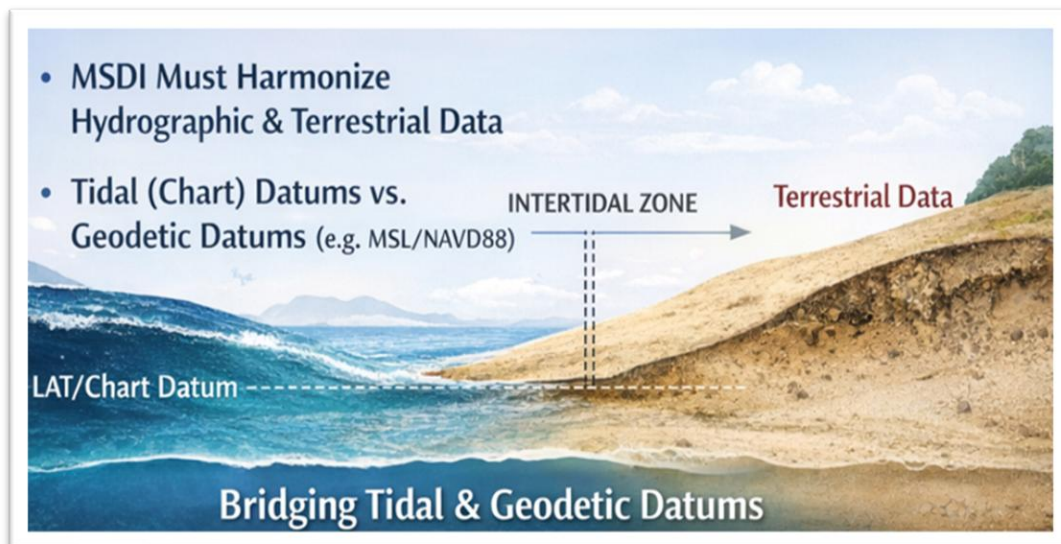
Analyze and bridge the semantic and technical disparities between land and marine data models, ensuring that data from both domains can be transformed and utilized

Create Software Demonstrators for Dynamic Data Integration

Produce practical demonstrations that illustrate how existing datasets can be integrated in real-time with minimal information loss across land-sea boundaries, showcasing the effectiveness of proposed best practices.

Project Overview: <https://fmsdi2024-d001.hartis.org>

Summary Report: <https://docs.ogc.org/per/24-061.html>



D002 Best Practices Report

An initial set of recommendations for improving the integration of land and sea datasets targeting the intertidal zone

Address the disparity of data and information derived from domain-specific agencies

Highlight effective policies and procedures established within regional agencies as a baseline of community practices for managing coastal observation datasets



D002 Best Practices Report

Best Practice 1.

Unified Geospatial Reference

Adopt a **modern vertical reference system** based on the geoid to harmonize land and marine elevation datasets. Implement **vertical separation surfaces** to convert between tidal, orthometric, and ellipsoidal datums with precision. This enables accurate coastal inundation modelling and eliminates distortions at the land-sea boundary, particularly in the dynamic "white ribbon" zone.

Best Practice 2.

FAIR Data Principles

Ensure datasets are **Findable, Accessible, Interoperable, and Reusable (FAIR)**. Include detailed metadata describing data quality, coordinate systems, vertical datum, acquisition methods, and uncertainties. Use internationally recognized standards like **ISO 19115** and **GeoDCAT-AP** to support data sharing in federated catalogs. This allows seamless integration across domains and simplifies usage by automated pipelines and AI systems.



D002 Best Practices Report

Best Practice 3. Mind the Gap

Identify spatial or temporal gaps where land and sea datasets do not meet—often in the intertidal zone. Address gaps using **remote sensing** (e.g. satellite bathymetry, airborne LiDAR), **targeted surveys**, or **interpolation** when necessary. Carefully document methods and limitations, especially when interpolating seabed morphology, to ensure model reliability in flood risk analysis and resilience planning.

Best Practice 4. Coordinated Governance

Apply **multi-agency frameworks** such as the UN-GGIM Integrated Geospatial Information Framework (IGIF-Hydro) to define roles and responsibilities across organizations managing coastal data. Promote data sharing agreements, joint policy development, and shared technical standards between land, hydrographic, and environmental agencies. This reduces duplication, resolves legal conflicts over data ownership, and accelerates climate risk mitigation and adaptation planning.



D002 Best Practices Report

Best Practice 5. Scalable Resolution Management

Use resolution-aware modelling techniques to integrate **multi-scale data** (e.g., high-res LiDAR with coarser sonar grids). Prefer point/vector data for accuracy and transformation flexibility. Tools like **Triangulated Irregular Networks (TINs)** or **Discrete Global Grid Systems (DGGS)** allow combining diverse datasets into unified coastal elevation models while preserving local detail. This approach enables precision analysis for coastal infrastructure while retaining broader context for regional planning.



<https://docs.ogc.org/per/24-061.html>



IHO S-100 Standards in the Land-Sea interface

Tidal datums vs. orthometric heights like MSL/NAVD88

Beyond individual products:

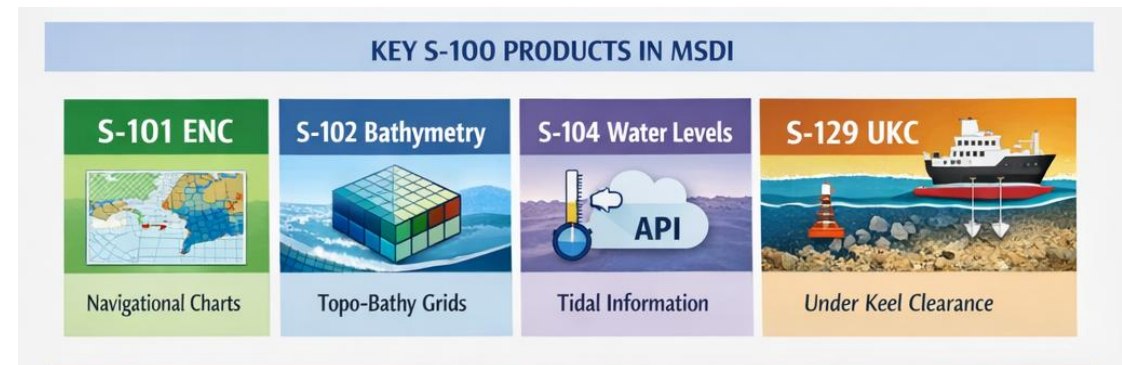
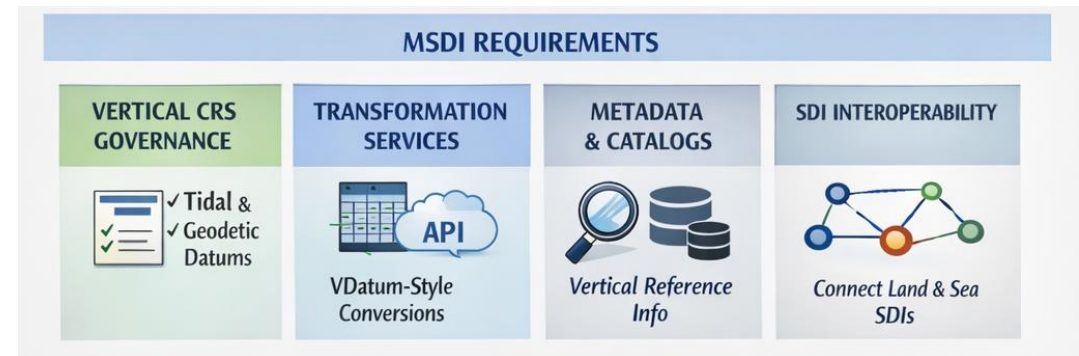
- The **S-100 geospatial framework** supports multiple vertical coordinate reference systems.
- Proper encoding of vertical CRSs and transformations is essential for seamless land–sea integration.
- This is a key issue in Marine SDI initiatives and intertidal modeling.

The most technically impacted standards (dealing with intertidal zone, ports, estuaries, etc.):

- **S-101** Electronic Navigational Charts (ENC)
- **S-102** Bathymetric Surface
- **S-104** Water Level Information for Surface Navigation
- **S-129** Under Keel Clearance Management

Other impacted standards:

- **S-111** Surface Currents
- **S-122** Marine Protected Areas
- **S-123** Marine Radio Services



IHO S-100 framework technically supports multiple vertical CRSs — but MSDI must operationalize it nationally

Purpose

- Identify key areas of interest for development within the MarineDWG
- Presentations @ OGC 135th Member Meeting Finland



AOI: OGC MarineDWG 2026

Application Profiles

build on the recommended set of best practices with specific application profiles based on the core OGC standards

Industry Collaboration

champion a harmonized geospatial reference model as a foundation for parallel areas of interest [UN-GGIM, IHO, WMO, LADM, etc.]

Semantic Interoperability

machine-readable shared vocabularies across domains tightly integrated with data quality and metadata

MetOcean

sea state modelling requires meteorological observation datasets to properly account for external forcings such as wind speed and coastal water currents

Integrity, Provenance and Trust

moving up the value chain from raw data to decision ready indicators requires standardization of the observation dataset lifecycle

Capacity Building

support training and capacity building to implement best practices suitable for regional, environmental and budgetary constraints



Discussions, recommendations & resolutions

- Not necessarily **Best** Practices just *best* Practices
 - [draft](#) final – vote last Thursday
 - May not be accessible though - - behind OGC wall. If not, a public link should come soon
- New techniques such as DGGS might address height / datum differences
- Possible case studies: coastal inundation, coastal erosion, coastal digital twin
 - tie to dollar amounts and bigger picture
 - IHO has a plan to improve S-100 to support the products and service for non-navigational purpose
 - See if any there is funding through S-100 to support analysis
- Governance comes down to data ownership and requirements
- IHO standards are based on S-100, which was only recently updated
 - May impact timeline for integrating land and sea domains
- These results will be further discussed at Joint UN/IHO MGI WG meeting on the May 4th in Chiang Mai Thailand

Thank you for your attention!

