



Proposed Paper on Domain Integration

Jointly developed by:

*Expert Group on Land Administration and Management (EG-LAM) and
Working Group on Marine Geospatial Information (WG-MGI)*

Kean Huat SOON
Singapore Land Authority



UN-GGIM

United Nations Committee of Experts on
Global Geospatial Information Management

EXPERT GROUP ON
LAND ADMINISTRATION AND MANAGEMENT

Positioning geospatial information to address global challenges

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Agenda item #4 - Work plan of the expert group

- Activities 5, 6 & 7 (integration of terrestrial, maritime, built and cadastral domains, the land/sea interface and its technical complexities)

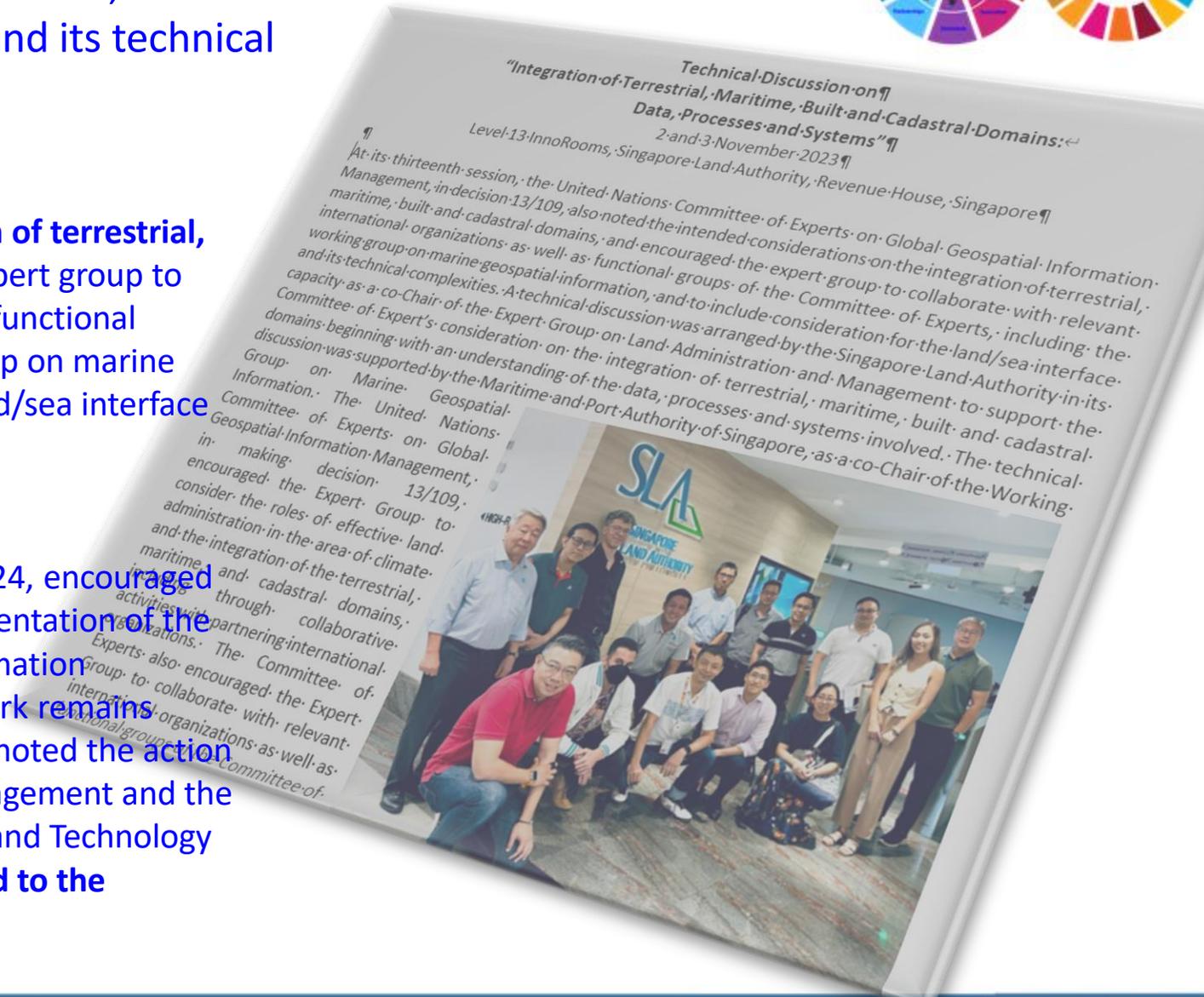


Decision 13/109

(e) Also noted the intended considerations on the **integration of terrestrial, maritime, built and cadastral domains**, and encouraged the expert group to collaborate with relevant international organizations as well as functional groups of the Committee of Experts, including the working group on marine geospatial information, and to include consideration for the land/sea interface and its technical complexities;

Decision 3/111

(e) Welcomed the updated workplan for the period 2023–2024, encouraged the working group to raise awareness and promote the implementation of the Operational Framework for Integrated Marine Geospatial Information Management at the country level and ensure that the Framework remains relevant through regular review and updates as necessary, and noted the action to work with the expert group on land administration and management and the Singapore-International Hydrographic Organization Innovation and Technology Laboratory to **advance the work of integrating activities related to the terrestrial and marine domains**;

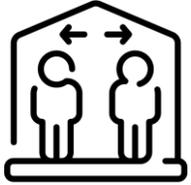


Singapore's Space

Diverse uses and users of Singapore's Land and Sea Space



Challenges



Limited land and sea space



Diversity of societal needs



Pressures of climate change

Opportunities: Geospatial as a public good



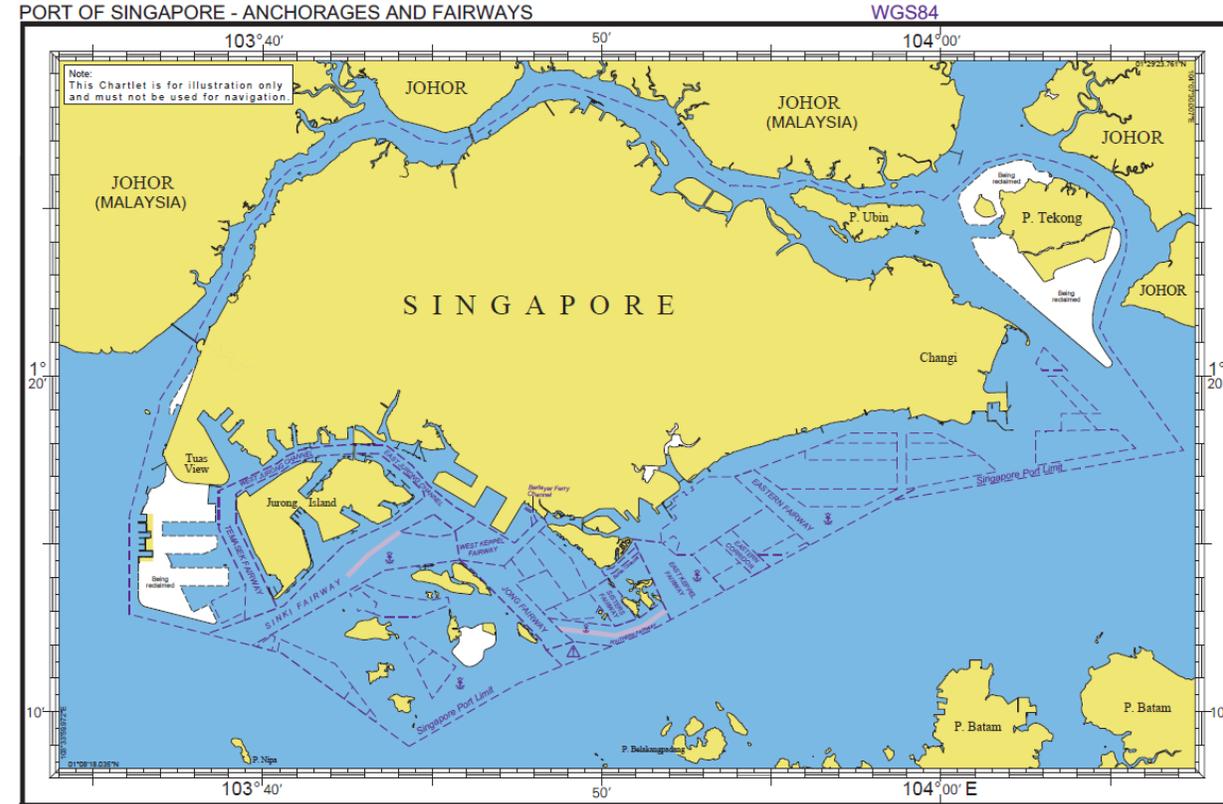
Environmental sustainability, biodiversity protection



Digital twin



Driven by data and metadata standards



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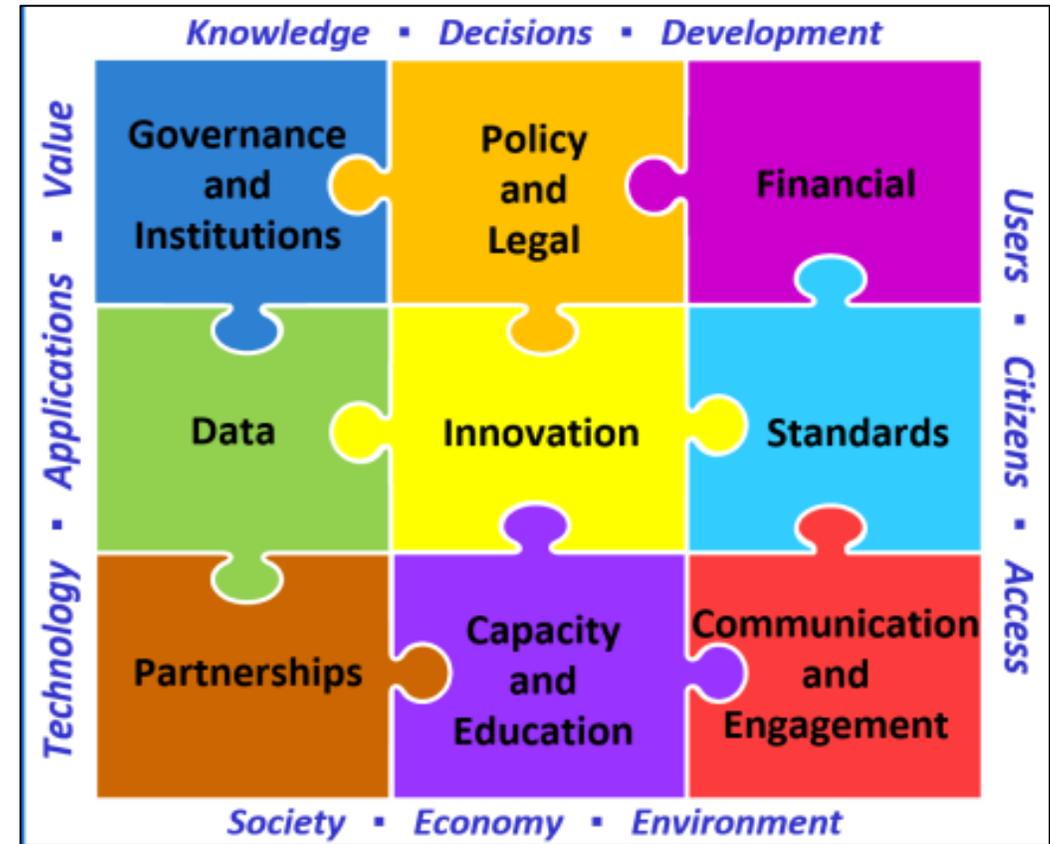
Why Domain Integration? Why now?



There are several documents relevant to the UNGGIM communities – and within the LAM and MGI community, documents from FIG, OGC, IHO, etc. to address our needs

Taking this into consideration, we want to produce a document that showcases **UN-IGIF in action**, across the terrestrial, marine, build, and cadastral domains.

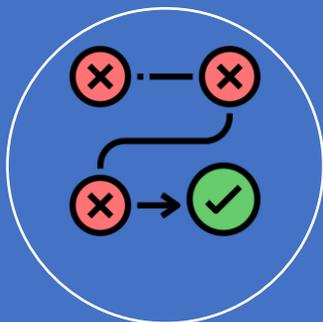
To bring us from *what*, to *how*, to *now*!



9 Strategic Pathways of the UN-IGIF



Proposed Approach - NOT a universal document or textbook, but a reference document for member states to tap on



From case studies of **domain integration** around the world, share Success stories and Lessons learnt



Understand **local contexts** & conditions
Trade-offs & priorities



Guide for Domain Integration in Singapore
For other member states to extract lessons and case studies

Assess across the UN-IGIF Strategic Pathways



What do we want to achieve?



Objectives



- Identify **innovative and insightful ways** to **deploy the UN-IGIF**
- Encourage **collaboration across domains and working groups** in the UNGGIM to address global challenges

Outcomes



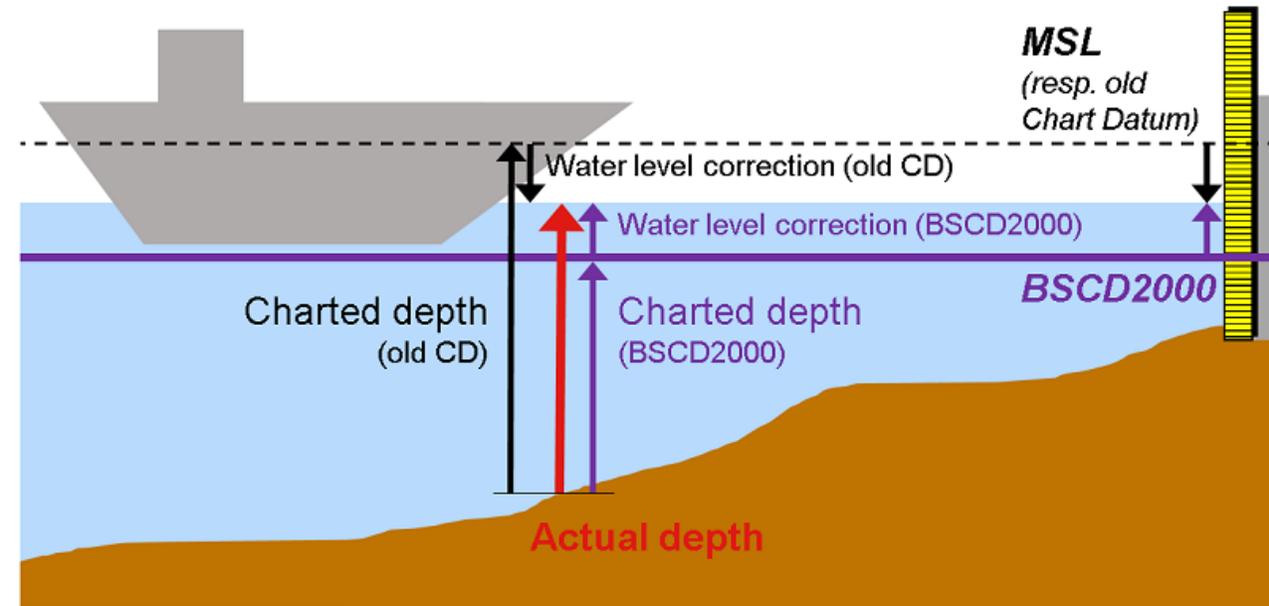
- For **policymakers**, to **garner support** for geospatial to address national, regional and global challenges
- For **technical experts**, to **encourage the use of IGIF** pathways in their roadmaps and strategies and **work across domains**





Case Studies in consideration (from sea)

- **Land-sea integration in the Baltic Sea: Baltic Sea Chart Datum 2000**
 - Collaboration between Baltic Sea Hydrographic Commission Chart Datum, Water level and Currents Working Group (CDWCWG) and Nordic Commission of Geodesy (NKG).
 - BSCD is a uniform reference from land to sea that accounts for both MSL and land uplift rates.
 - Supports S-104, S-111 and S-129 implementation, development of Geoid model, and environmental modelling.
- **To potentially incorporate:**
 - Long term integrated monitoring of tidal and vertical land movement
 - Capacity building and partnerships to support local needs



<https://www.bshc.pro/iho-bscd2000/> (Schwabe et al. 2020)



Case Studies in consideration (from land)



- **Support national effort in adaptation and monitoring of sea level rise**

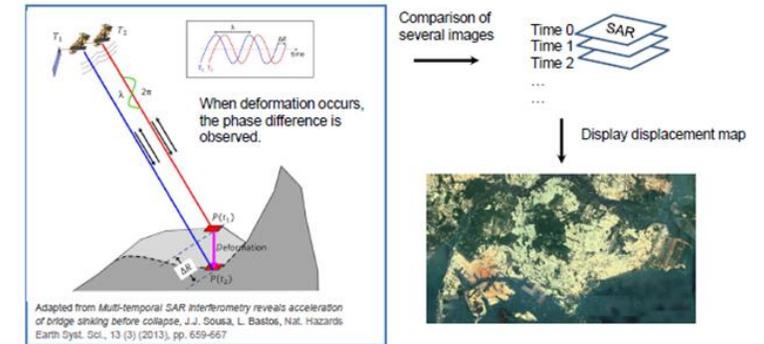
- National Sea Level Research Programme
- IAC (Inter-agencies Adaptation Committee)
- RWG (Resilient Working Group)



GNSS monitoring

- **Adopt integrated geodesy and mapping techniques in monitoring**

- GNSS reference station long-term monitoring
- Vertical Control Network data
- Airborne laser scanning point cloud data
- Satellite data and InSAR technique



InSAR Technique



Federated Marine Spatial Infrastructure Pilot 2023 - Thread 1: Digital Twin of Land and Sea Interfaces in Singapore

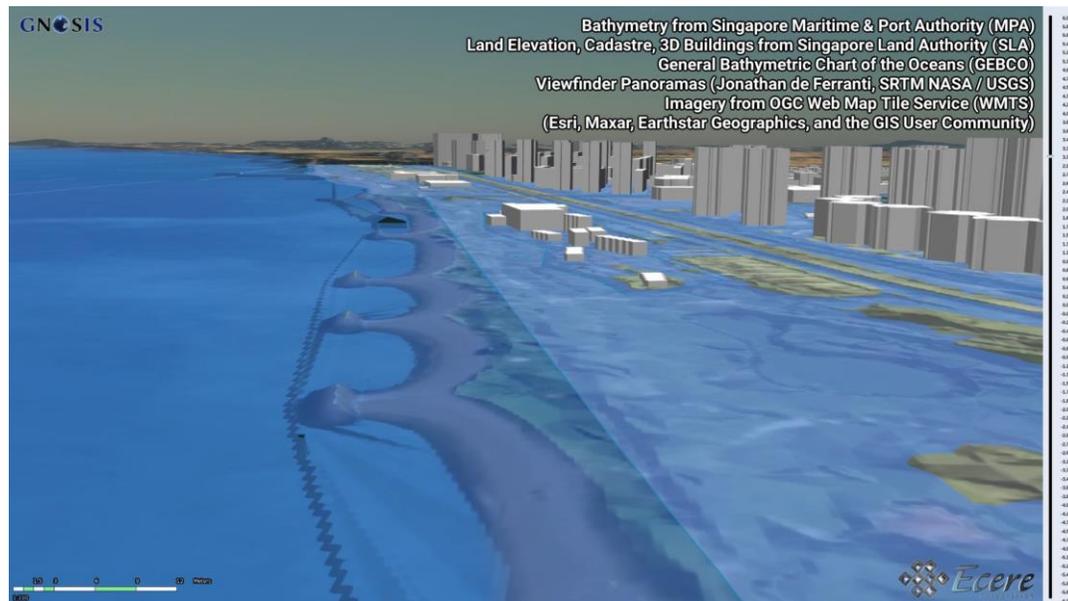


Objective:

- ❑ Demonstrate interoperability between land and marine data that is necessary to understand coastal environments and land-sea interactions.

Requirements:

- ❑ A 3D visualisation to illustrate the integration with a storm surge scenario.
- ❑ Overcome the chart datum and height datum gaps



Provided Datasets:

- Bathymetry Data (MPA)
- Cadastre, 3D Building and Topography DTM (SLA)
- Open source datasets

Study Area:

East Coast of Singapore

Pilot Website:

<https://www.ogc.org/initiatives/fmsdi4/>



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Federated Marine Spatial Infrastructure Pilot 2023: Outcome



Good Discussions and Learning Experience

Thread 1: Digital Twin of Land and Sea Interfaces in Singapore

- D111 - Digital Twin instance(D100 multiple instance)
 - Wuzhen University
 - Offering a 4D representation of the scenario
 - FMSDI Model + Platform
 - Databases
- D112 - Digital Twin instance(D100 multiple instance)
 - Geomatics
 - Already have a Digital Twin of Ocean
 - Can add multi-scale data to that Digital Twin
- D113 - Digital Twin instance(D100 multiple instance)
 - CompuSult Limited
 - Added benefit using Casium
- D114 - Digital Twin instance(D100 multiple instance)
 - Ecere Corporation
 - Good track record with Visualization
 - Discrete Global Grid Systems Instance
- Catalog
 - CompuSult Limited
 - Catalog service to host the data
 - Standards-based catalog
 - Could be used in all three threads

Demonstrators

Engineering Report: ogc.pages.ogc.org/FMSDI2023/

Engineering report: OGC Federated Marine Spatial Data Infrastructure Pilot 2023 - Connecting Land and Sea for Global Awareness

Open Geospatial Consortium

Glenn Laughlin Editor

Submission Date: 2023-11-06
Approval Date: 2023-12-xx
Publication Date: 2023-12-xx



6th Expert Meeting of Working Group on Marine Geospatial Information (WG-MGI) and International Seminar, Bali, Indonesia, 4 – 8 March 2024



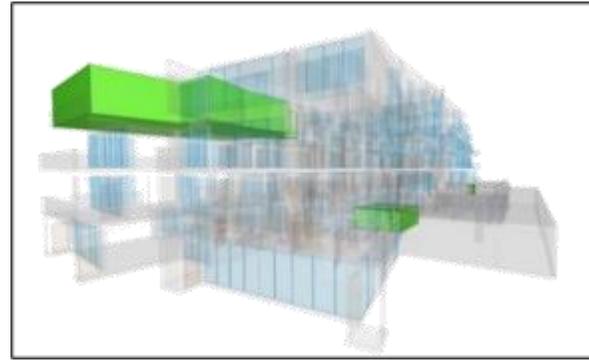
- WG-MGI acknowledged the leadership of the Expert Group on the integration of terrestrial, maritime, built and cadastral domains and will together leverage focus group modality to involve other functional groups (e.g. Policy and Legal Framework, GGCE, Singapore-IHO Lab)
- Initial focus will be on the land-sea interface and the technical complexities related to vertical reference (height datum)
- To convene a combined side event at the Fourteenth Annual Session on the integration of terrestrial, maritime, built and cadastral domains jointly with other functional groups



Integrating Built Environment and Cadastre

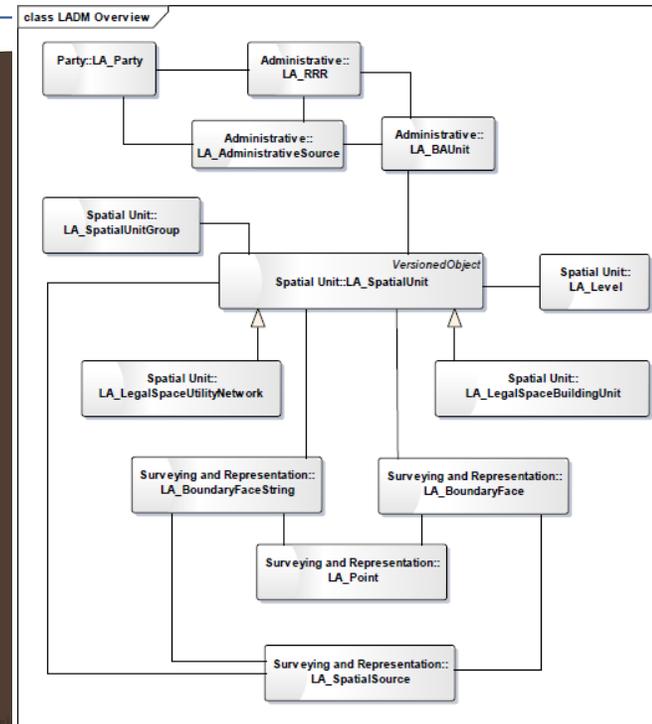
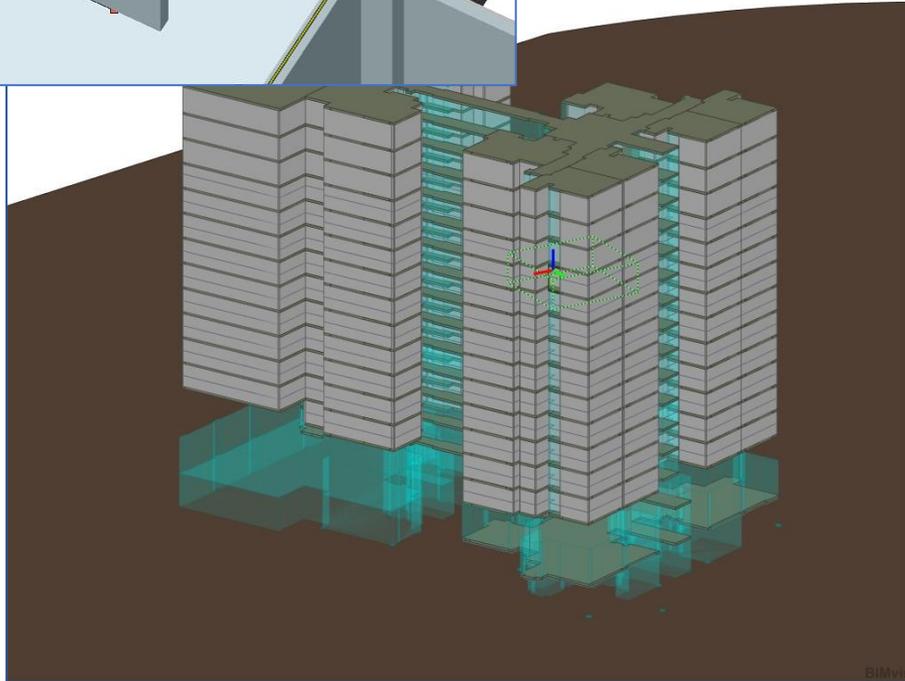


BIM



1. Design vs. Imaginary Ownership Boundaries
2. Physical vs. Imaginary Ownership Boundaries
3. Design vs. Physical

Strata
Ownership
Boundaries



ISO 19152 Land
Administration Domain
Model (LADM)



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EG-LAM Workplan 2023 - 2025



5. Engagement and collaboration including to further anchor the FELA in the UNGGIM programme of Work

11. Identify, agree and **work** on **cooperative projects** including with UN-GGIM regional committees, functional groups, thematic networks and relevant stakeholders.



1. Leadership and Advocacy in Effective Land Administration

- 1. Promote and raise awareness of the merits and benefits of **effective land administration**;
- 2. Encourage, promote and develop **guidance** for Member States to implement FELA at country level.

2. Promote and encourage the implementation of the FELA at the country level

- 3. Review, elaborate and adapt the **UN-IGIF Implementation Guide** and related implementation resources to further guide and support the implementation of FELA according to national circumstances and needs;
- 4. Encourage volunteered **translation** of the FELA into languages other than English to support raising of awareness and promote better understanding;
- 5. Facilitate sharing and exchange of knowledge, information, experiences, and practices, including relevant **use cases** and implementation examples.

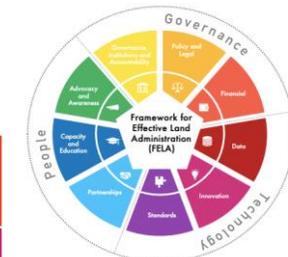
4. Innovation in land administration and management to strengthen resilience and sustainability



3. Integration of terrestrial, maritime, built and cadastral domains

6. **Gain better understanding** through cooperative project and activities.

- 7. Promote effective land administration **within an 'ecosystem'** or **'interconnected domains'**;
- 8. Address **rights, restrictions and responsibilities** associated with land;
- 9. Address **digital and mobile access** to land information including cybersecurity and data security mechanisms to protect vital land information;
- 10. Address the integration of information related to **land tenure, land value, land development, land use and land use change**.



Focus Area 3: Integration of Terrestrial, Maritime, Built and Cadastre Domains



Plans/Activities

Scope 6

Gain better understanding
through cooperative project
and activities.

- The integration of height and chart datums (with the Working Group on Marine Geospatial Information and the IHO-Singapore Innovation and Technology Laboratory)
- Authoritative data, data sharing and integration (with the Working Group on Policy and Legal Frameworks for Geospatial Information Management)
- Understand the role of open standards, keep abreast with and support the development of ISO 19152 LADM and relevant IHO and OGC standards
- **Develop a brief or paper to elaborate key considerations in the integration of terrestrial, maritime, built and cadastral domains**



Timeline

From now till August 2024:

- Develop paper, engage subject matter experts
- Conduct consultations with domestic and international stakeholders
- Present update at 6th Expert Meeting of WG-MGI and 5th EG-LAM meeting
- **Focus Group Discussions**

August 2024:

- **Host a combined side-event at the 14th Meeting of the UNGGIM Committee of Experts to seek perspectives**

September 2024 – June 2025:

- **Joint workshop in December 2024 in Indonesia with EG-LAM, WG-MGI, IHO, UN-GGCE**
- Further develop case-studies with subject matter experts
- Commence consultations with member states

August 2025 (TBC):

- Paper Publication
- Execute communication plan



