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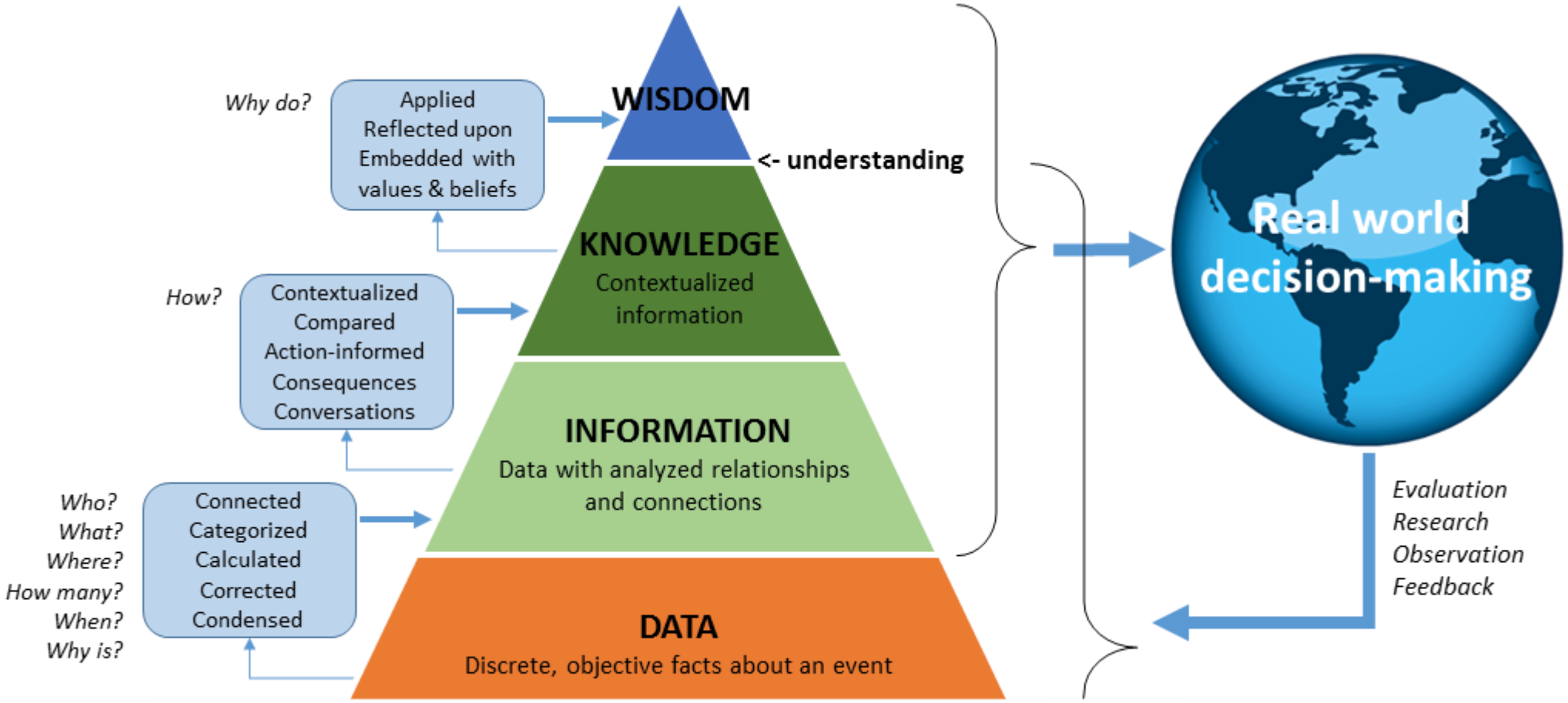
Geospatial Data Integration to support Safe, Sustainable & Smart City

Dr Victor Khoo, Director Survey & Geomatics, Singapore Land Authority
Co-chair, UNGGIM Expert Group on Land Administration and Management
Vice President, UNGGIM Asia Pacific

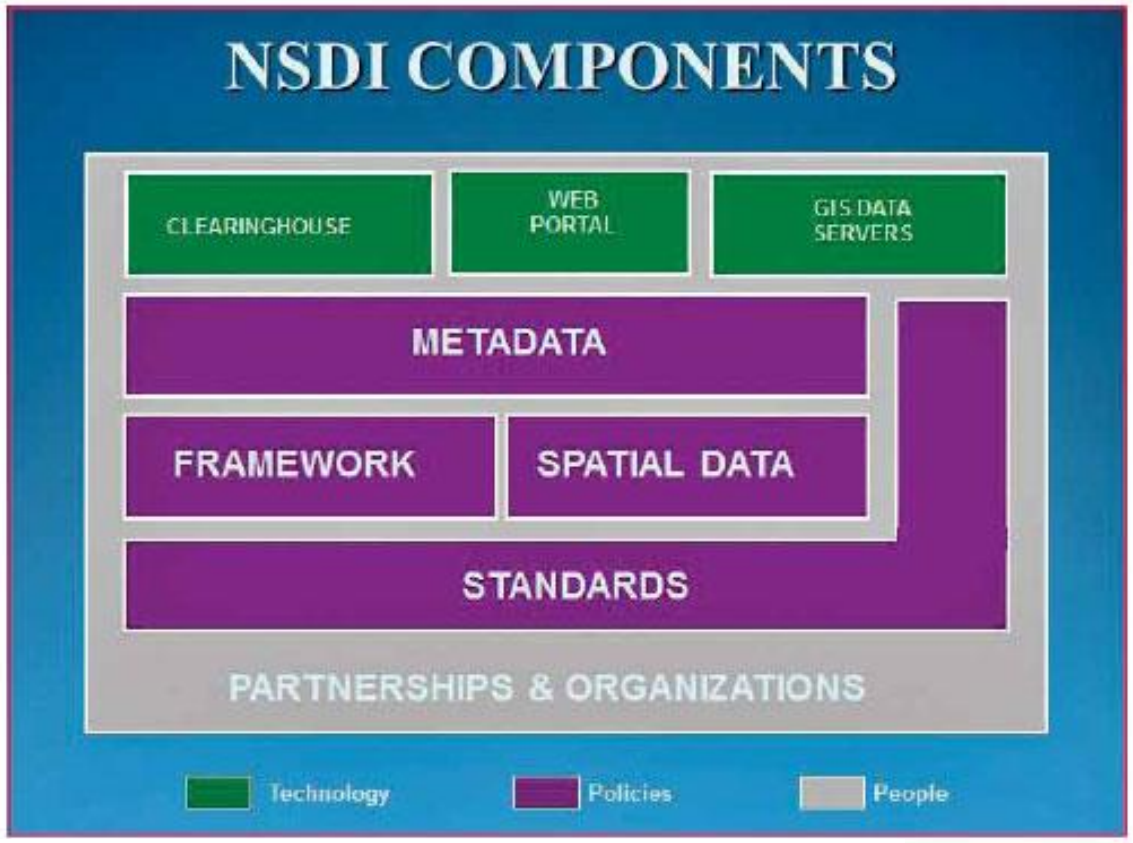
Agenda

- Why need geospatial data integration?
  - Support Decision Making
  - Increased 3D applications
  - Expectation for Digital Twins
  - New Use cases / Applications requirements
- What is geospatial data integration?
- What are the challenges?
- How can we address the challenges of the data integration?

Data-Driven, Evidence-based Decision Making



National Spatial Data Infrastructure (NSDI)



NSDI Component (Source: FGDC, 2005)

UN Sustainable Development Goal 2030

Safe, Sustainable and Smart Cities of Tomorrow

Cities of Tomorrow will be powered by Digital Twin

Sustainable
- Urban Planning
- Green Energy
- Urban Heat
- Natural Capital
- ….

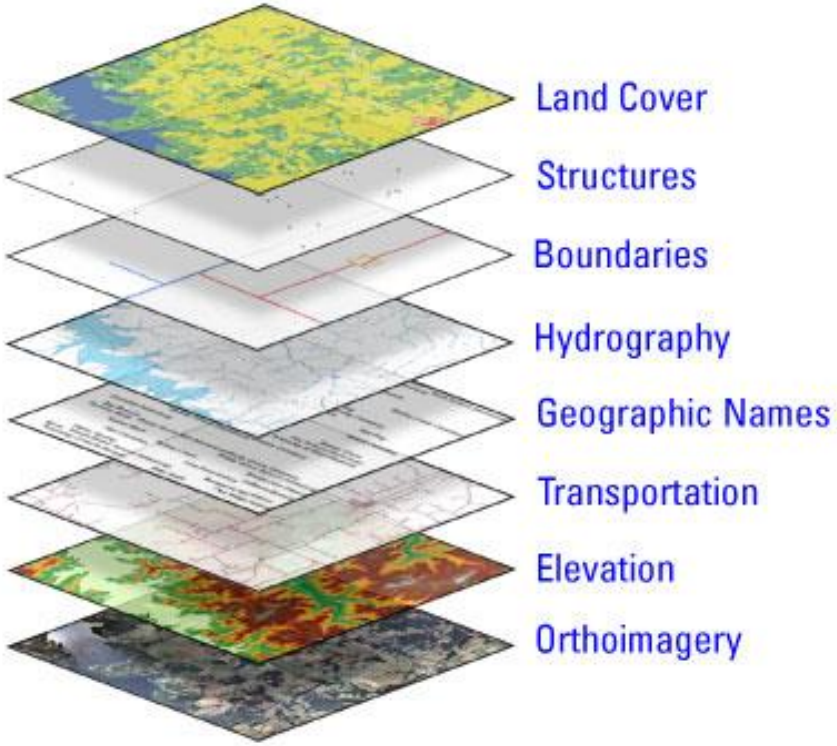
Safe
- Climate Change
- Sea Water Rise
- Change Detection
- Subsurface Infrastructure
- …..

Smart
- Digital Construction
- Autonomous Mobility
- Intelligent Transportation System (ITS)
- 5G Deployment
- ……

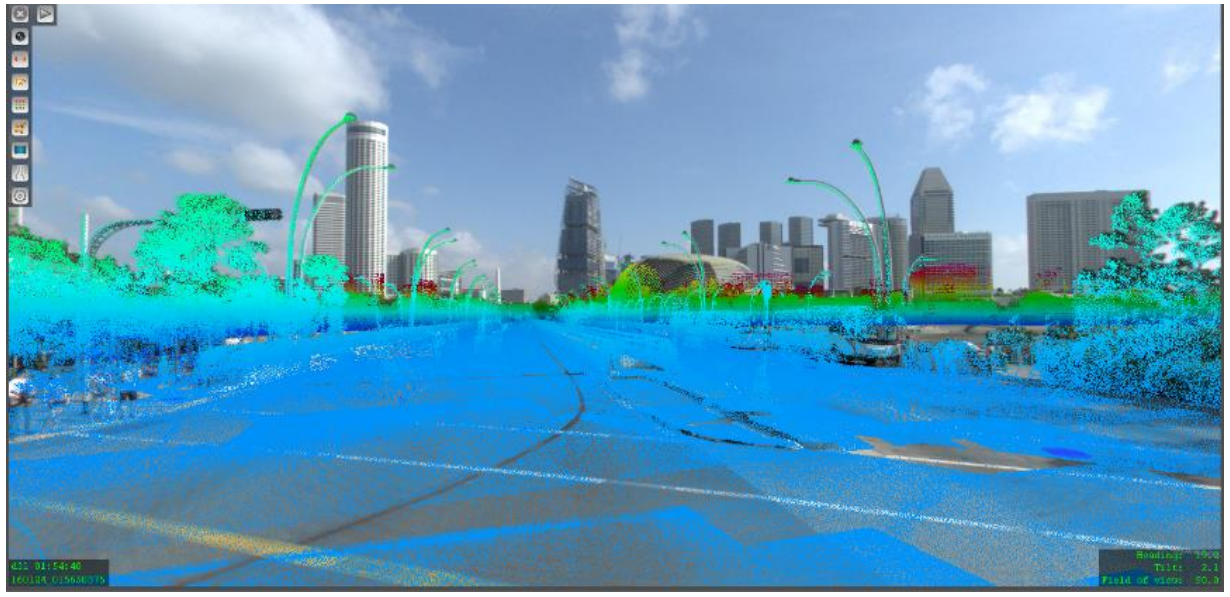

Source: Poland Today

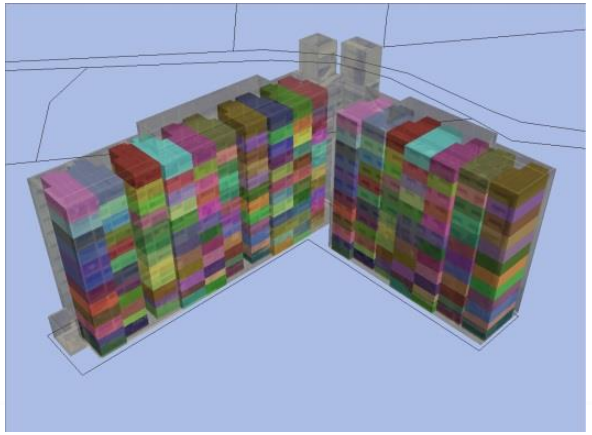
2D GIS vs 3D Datasets

2D GIS - Overlay



3D Datasets - Integrate





Digital Twin

Source: Bentley YII 2023

Accurate Metaverse

SG Digital Twin – Geodata Framework

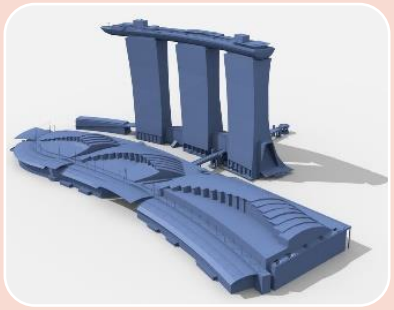
14 Core Datasets

- Geodetic Control
- Orthophoto
- 3D Coastline
- Digital Terrain Model
- Point Cloud
- 3D Reality Mesh
- Waterbody
- Administrative Boundaries
- Land Cover/ Land Use
- Cadastre (Ownership)
- 3D Building Models (LoD1 and LoD2)
- 3D Road
- Vegetation / Tree
- 3D Airspace
- 3D Geology

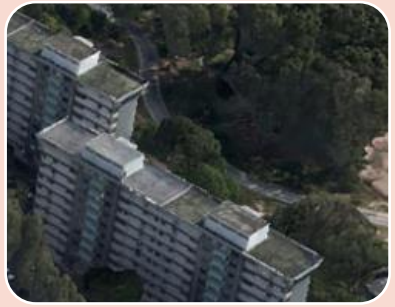
6 Key Add-on Datasets

- Imagery (Satellites, Oblique etc)
- Positioning Infrastructure
- 3D Address / 3D Unit
- BIM (Design Model)
- 3D Underground Asset

3D City Models

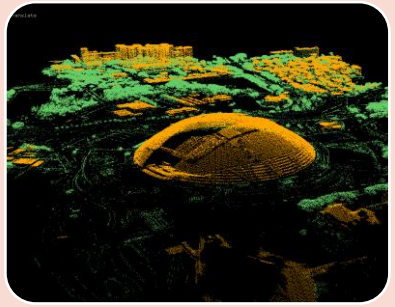


Semantics-based Vector Model

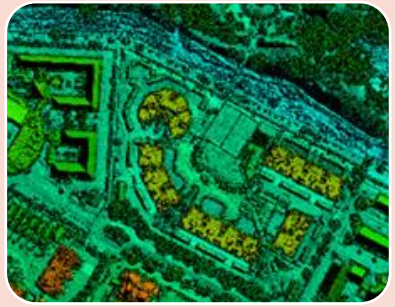


Mesh Model

Voxel Model



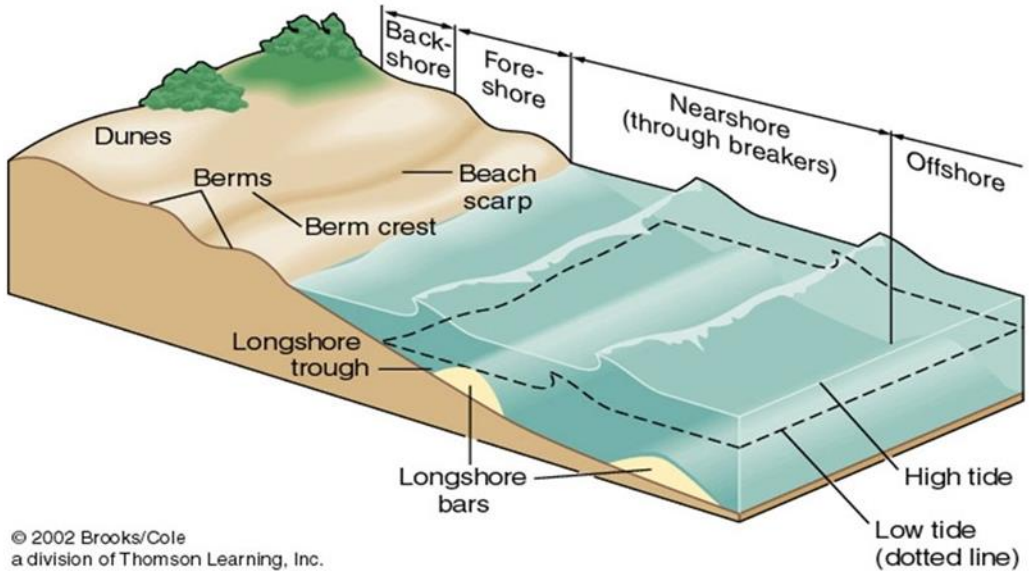
3D Point Cloud



Surface Model

Why need geospatial data integration – New Use Cases

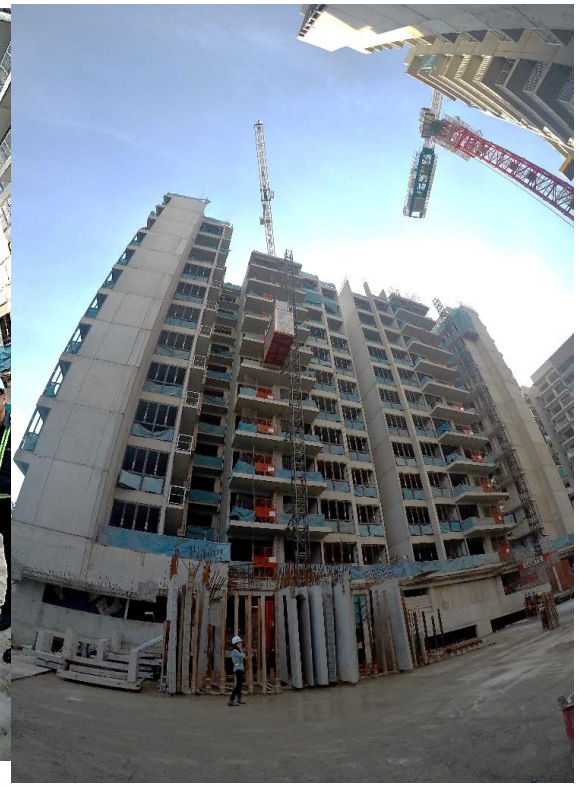
Climate Adaptation



Smart Land Administration

Why need geospatial data integration – New Use Cases

Digital Construction (i.e. BIM & GNSS)

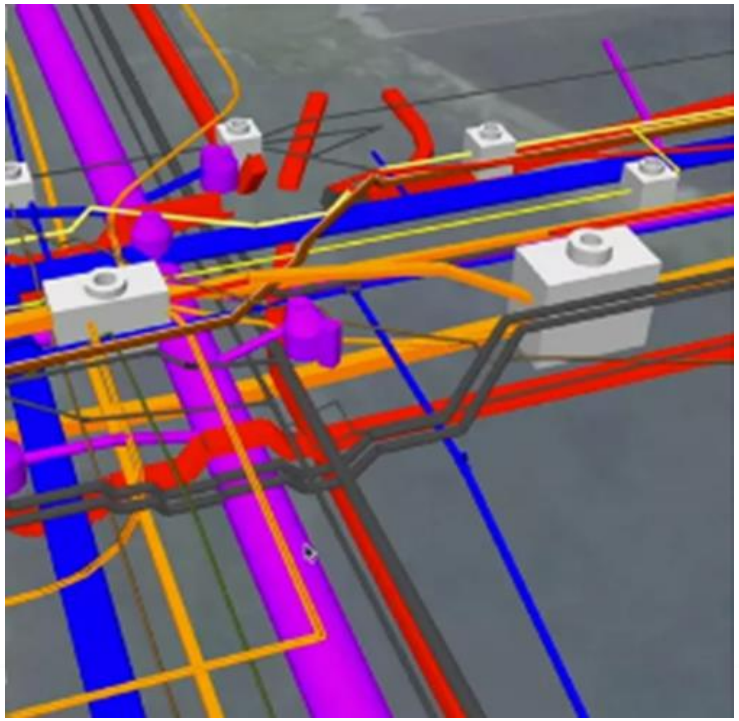


Autonomous Mobile Robots (indoor & outdoor data)

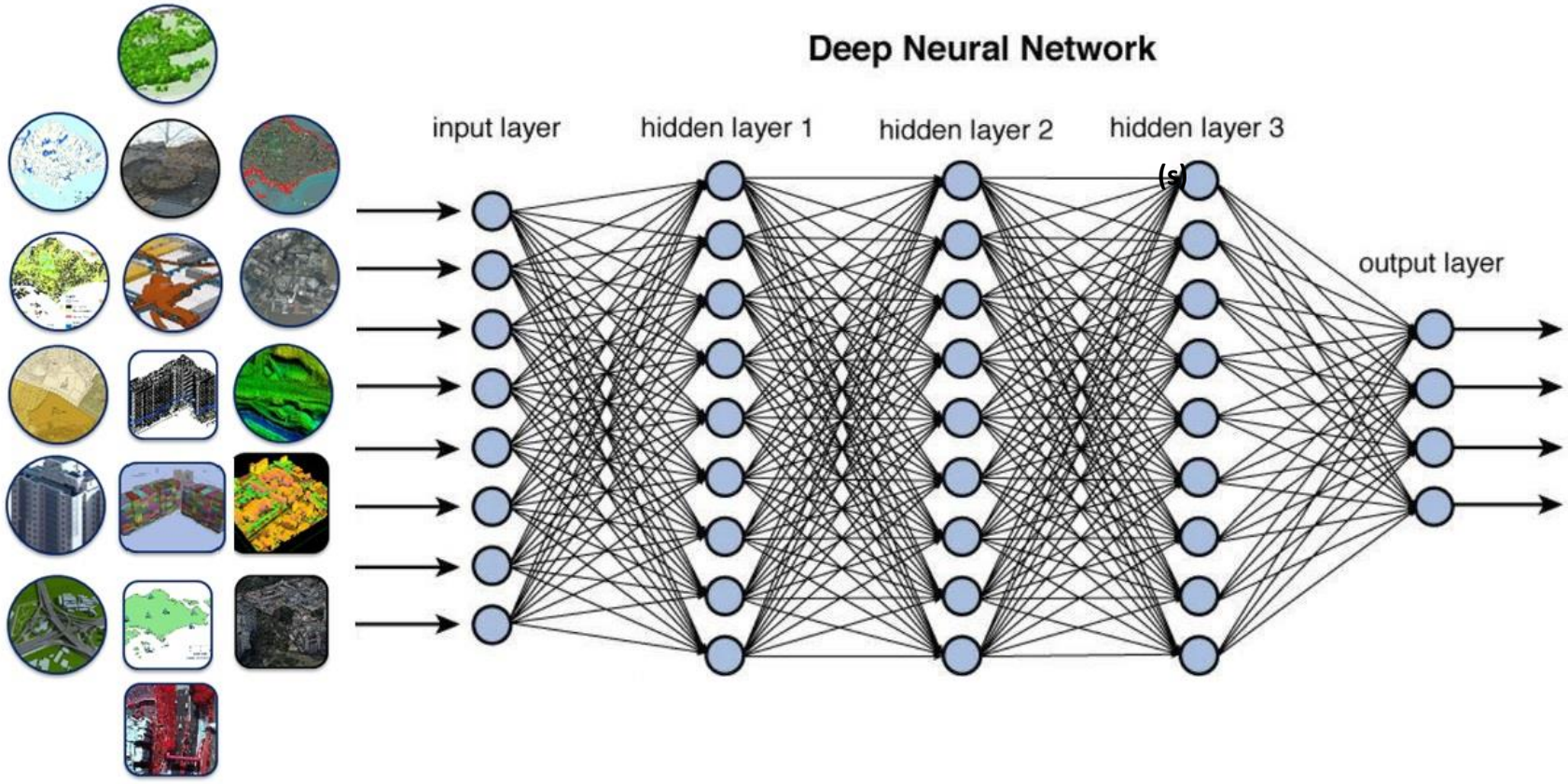
Why need geospatial data integration – New Use Cases

Coastal Protection

Underground Asset and Space Management

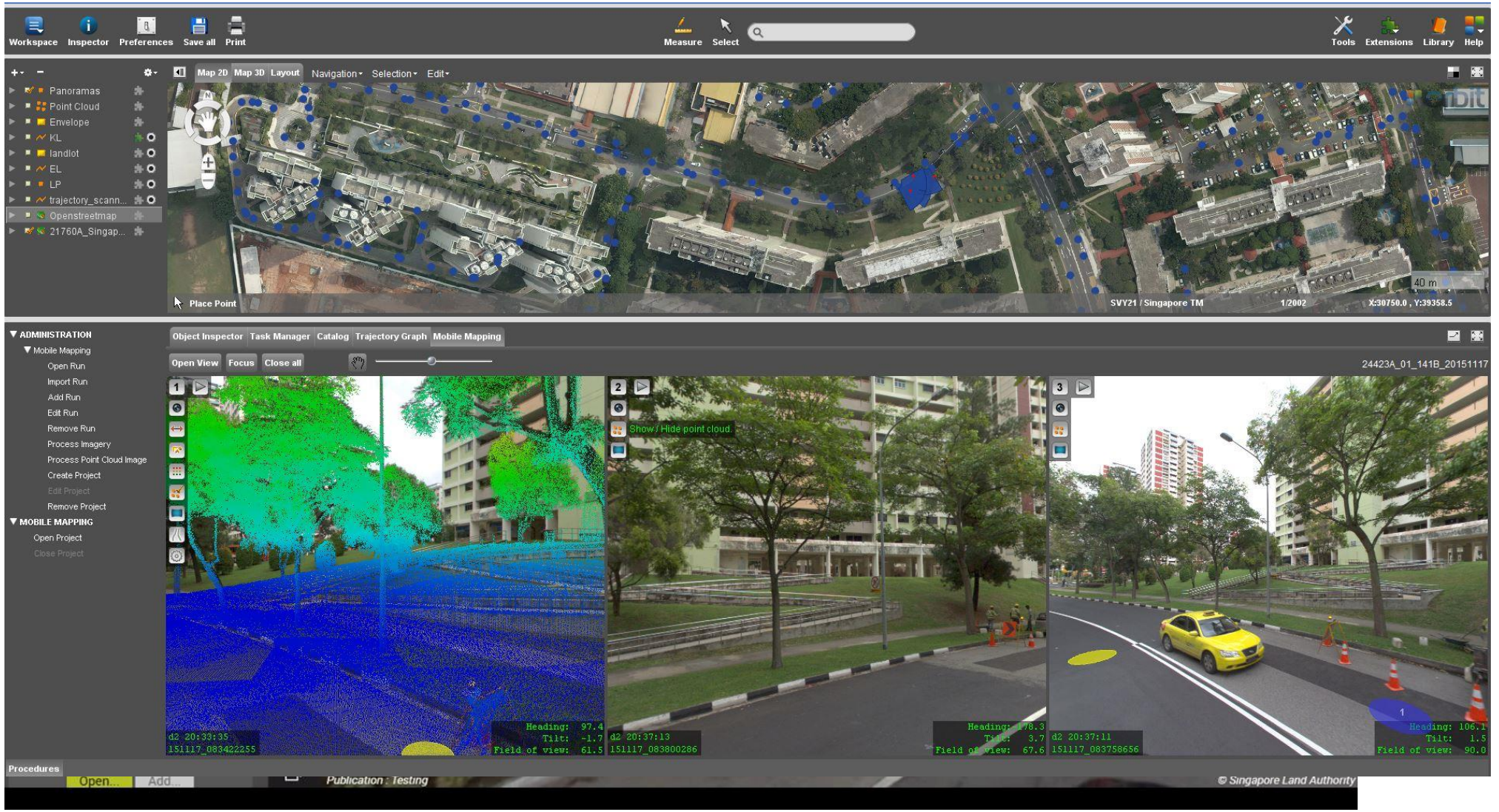


Why need geospatial data integration – New Application of GEOAI



- Environmental Monitoring
- Urban Planning
- Disaster Management and response
- Natural Resource Management
- Land Use and Land Cover Analysis
- Infrastructure Maintenance
- Navigation and Location-Based Services
- Tourism and Location-Based Marketing
- Real Estate and Property Management
- Autonomous Navigation

Platform to support Integration of Point Cloud and Panoramic Images

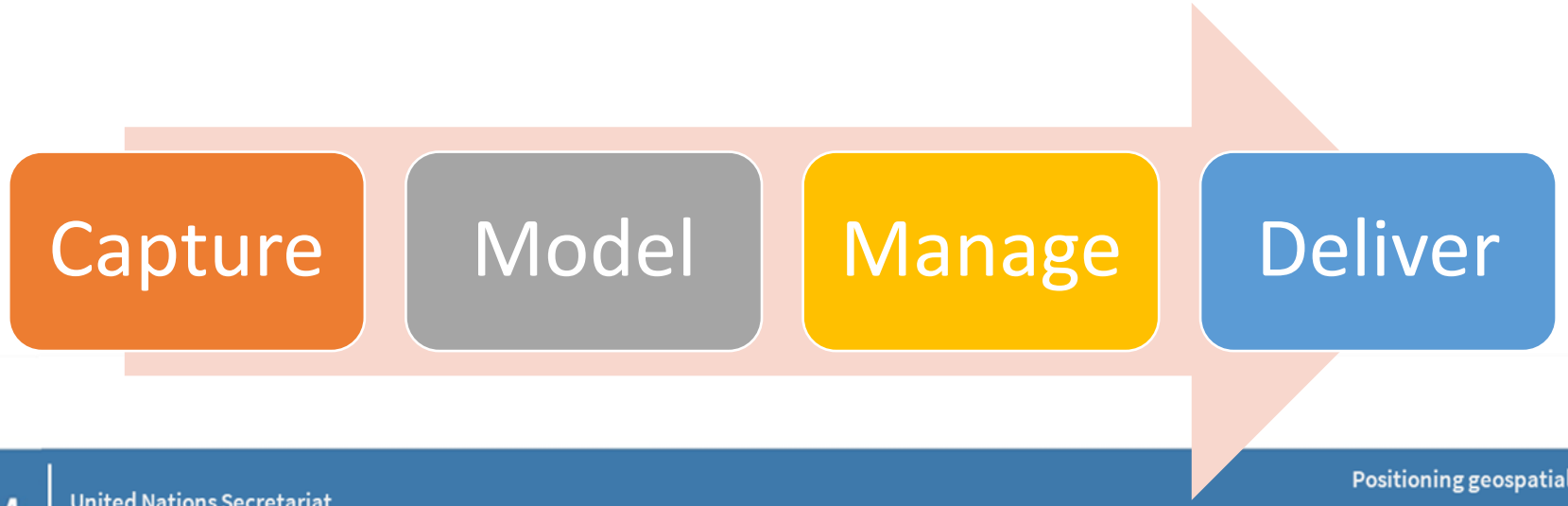


What is geospatial data integration

- To produce consolidated data sets that are clean and consistent and meet the requirements of use cases
- To produce processes, standards, methodologies and models that allow different types of geospatial data to be used cohesively all the time to meet specific use cases
- For some cases, it is about the process of combining or unifying multiple geospatial data types into a single “database” and providing for their continual updating, storage, retrieval, modelling, analysis and visualize (automatically)

What are the Challenges of geospatial data integration

- Geospatial data from many sources captured by different group of people
- Many different technologies were used to capture different type of geospatial data
- Many reference systems and map projections used
- A large variety of formats exist which are not interoperable
- Data models, Scales, resolutions and temporal variation caused inconsistency
- Data cost, access rights, use restrictions and licensing incompatibility

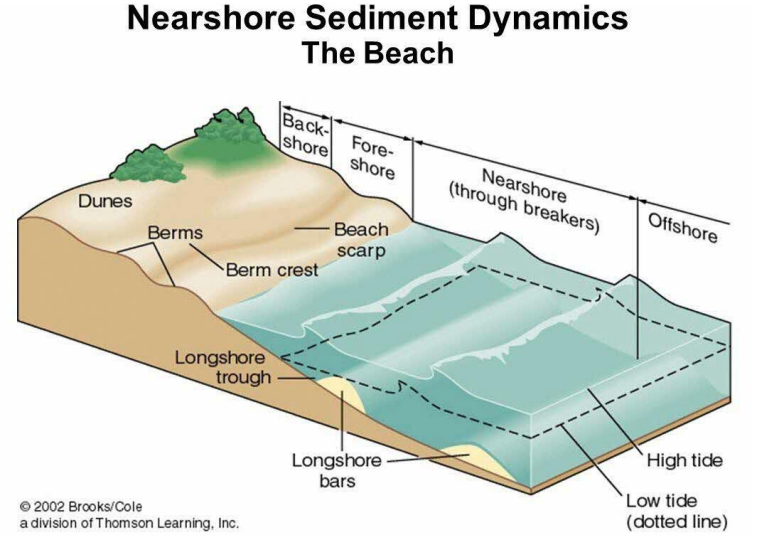


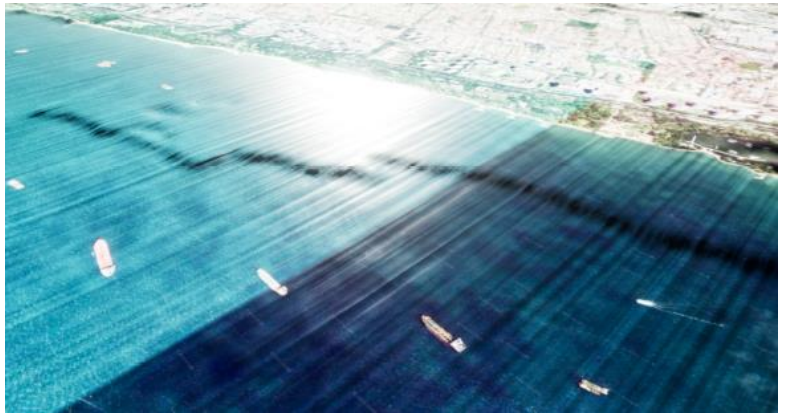
How do we address the challenges

1. How can we address the challenges of data integration?
2. What do we need? Another framework? More collaboration?....
3. Who is responsible? What is the role of authority/government? What is the role of technical institutions (i.e. OGC, ISO, FIG…)
4. How do we use existing framework to address the integration issues?
5. What are relevant use cases?

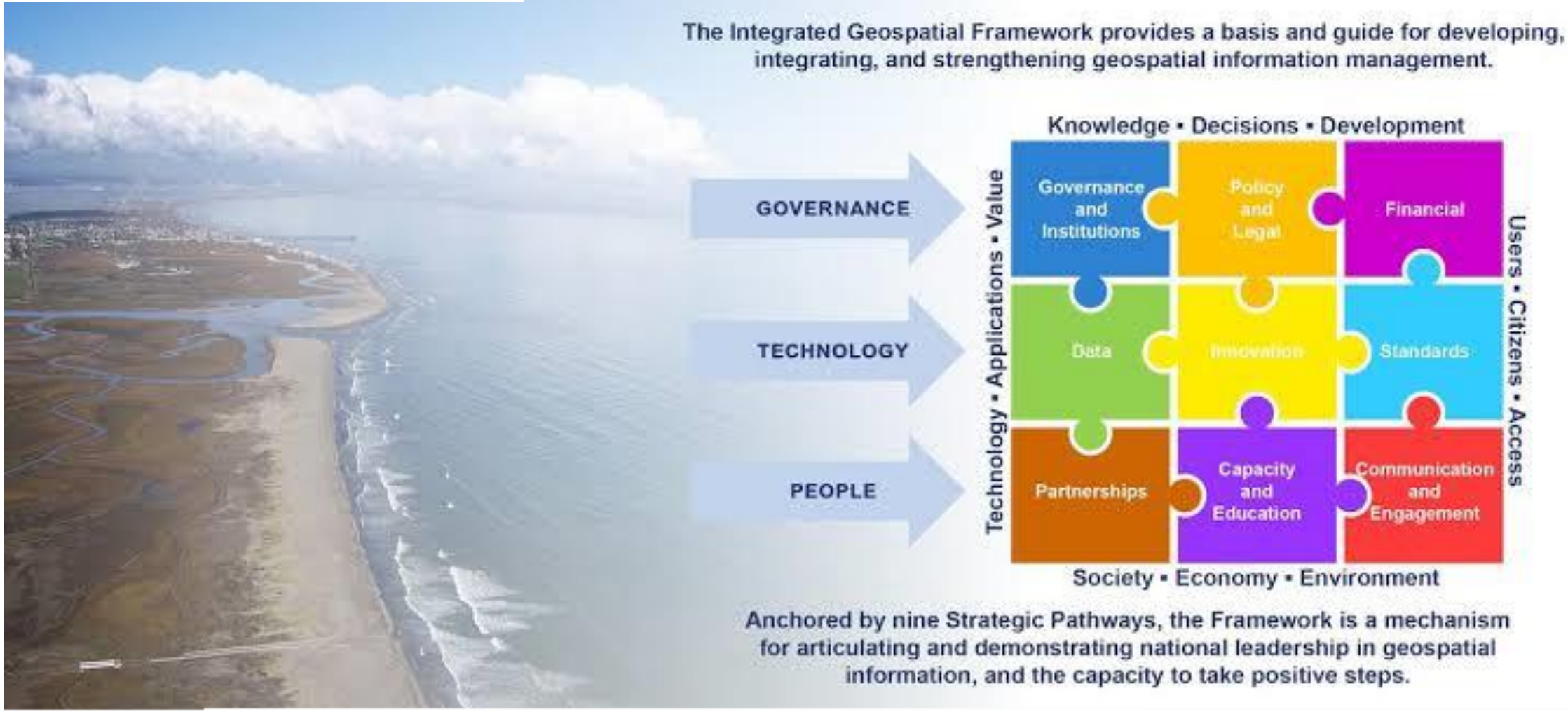
EG-LAM Focus Area 3: Integration of terrestrial, maritime, built and cadastral domains

- 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





How can UN IGIF support geospatial data integration



The Integrated Geospatial Framework provides a basis and guide for developing, integrating, and strengthening geospatial information management.

Anchored by nine Strategic Pathways, the Framework is a mechanism for articulating and demonstrating national leadership in geospatial information, and the capacity to take positive steps.

Thank You