



UNGGIM International Seminar on Effective Land Administration

Aguascalientes, Mexico 8-9 April 2024

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



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United Nations Secretariat
Global Geospatial Information Management

Positioning geospatial information to address global challenges
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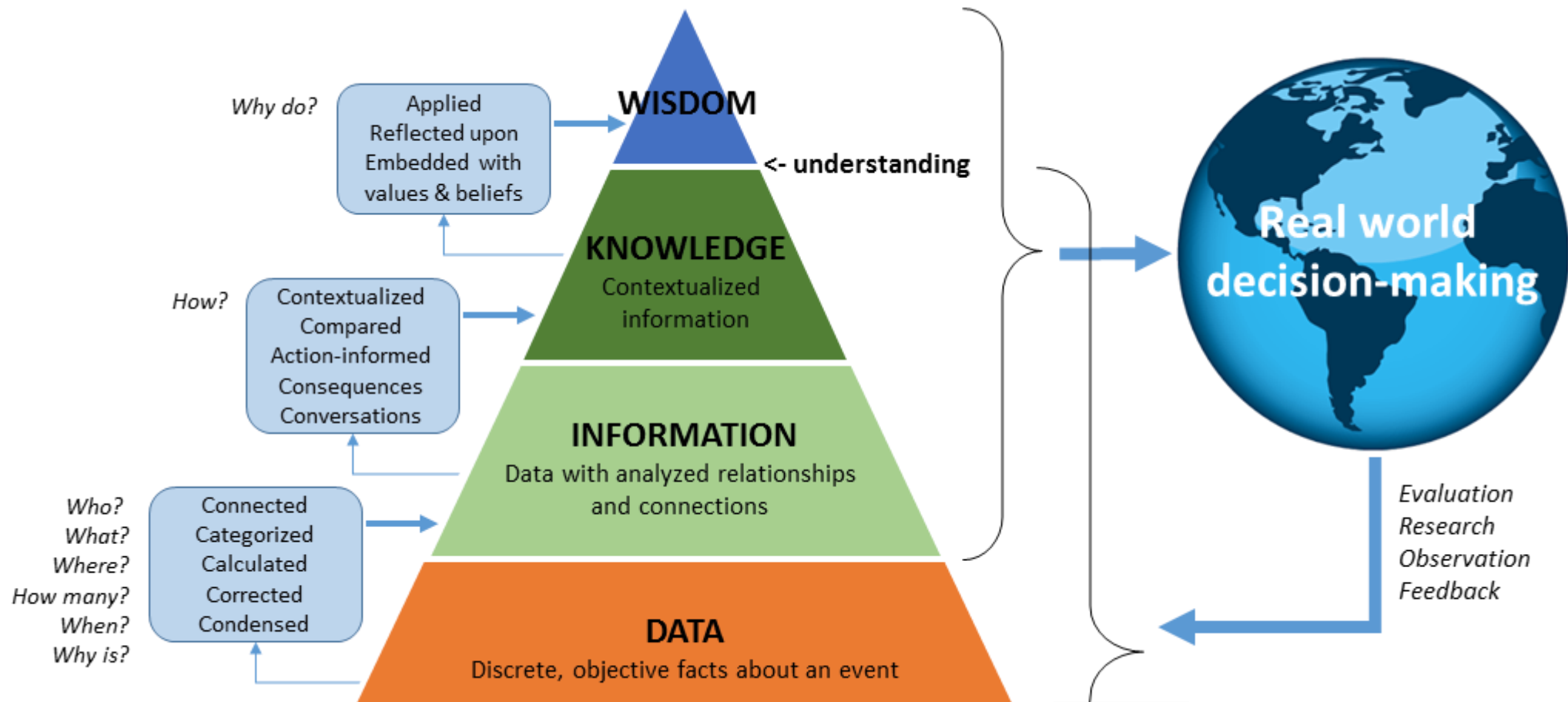
Agenda



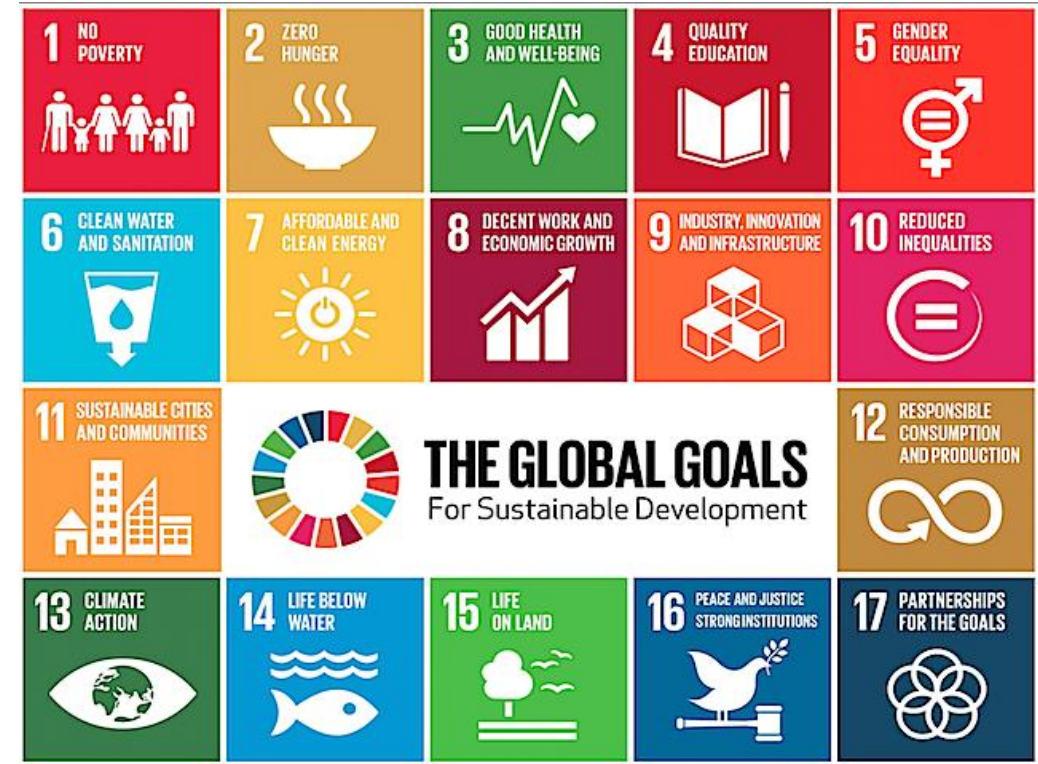
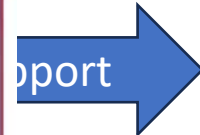
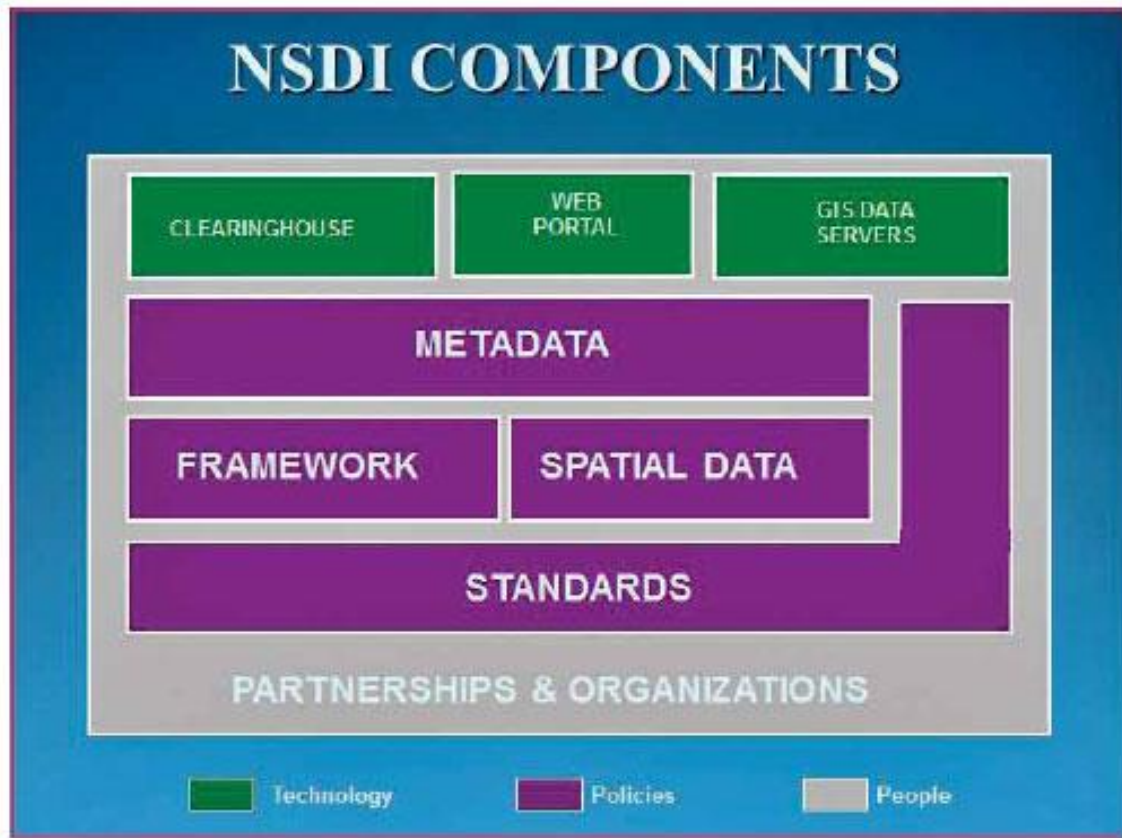
- Why need geospatial data integration?
 - Support Decision Making
 - Increased 3D applications
 - Expectation for Digital Twins
 - New Use cases / Applications requirements
- What is geospatial data integration?
- What are the challenges?
- How can we address the challenges of the data integration?



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



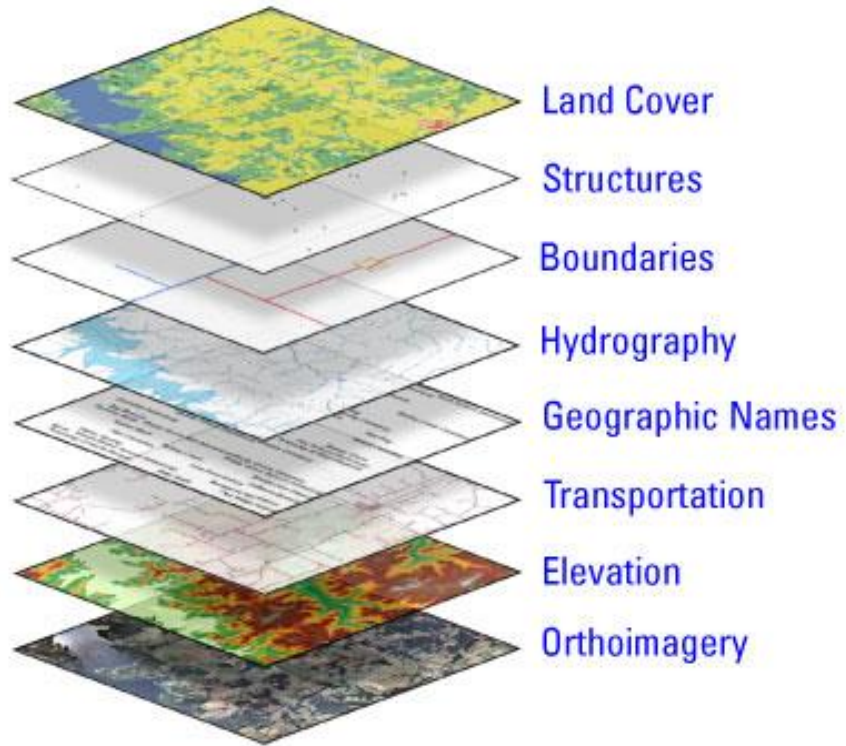
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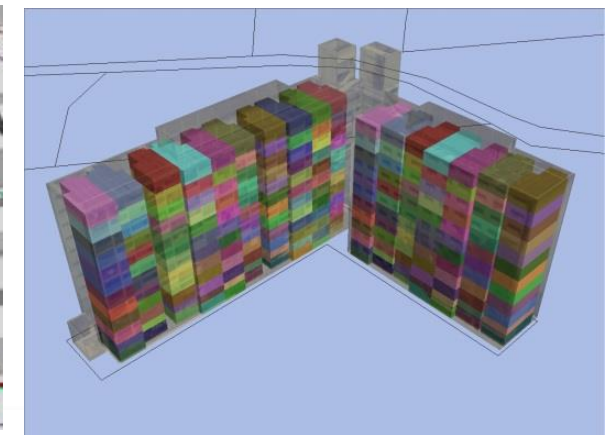
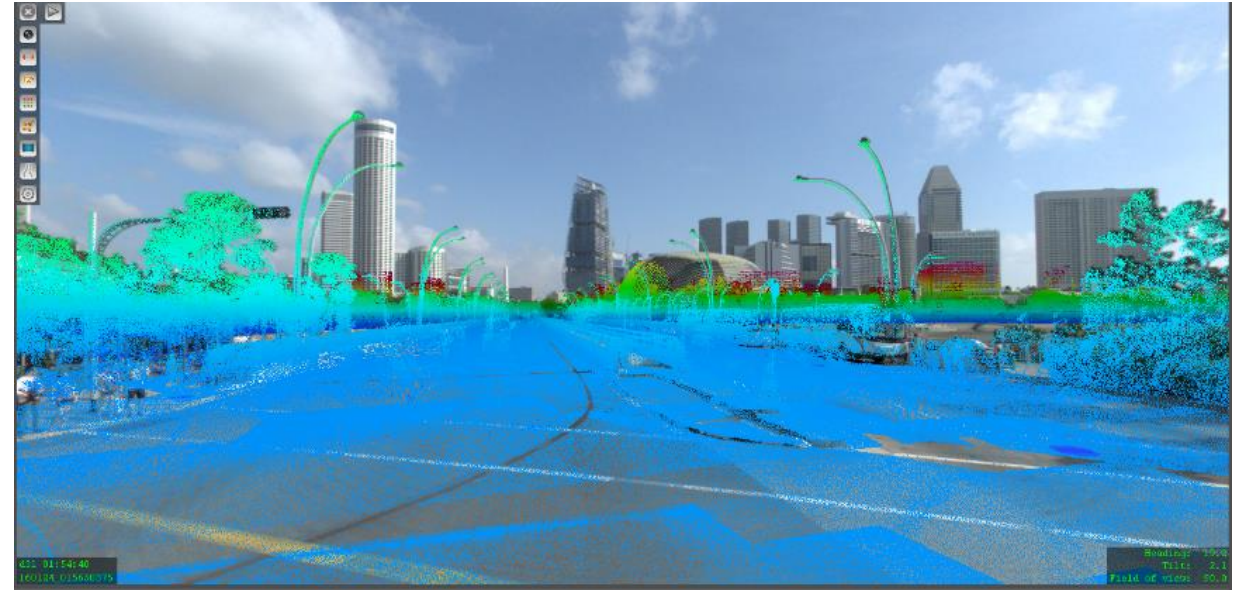
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2D GIS vs 3D Datasets

2D GIS - Overlay



3D Datasets - Integrate



Digital Twin

Source: Bentley YII 2023



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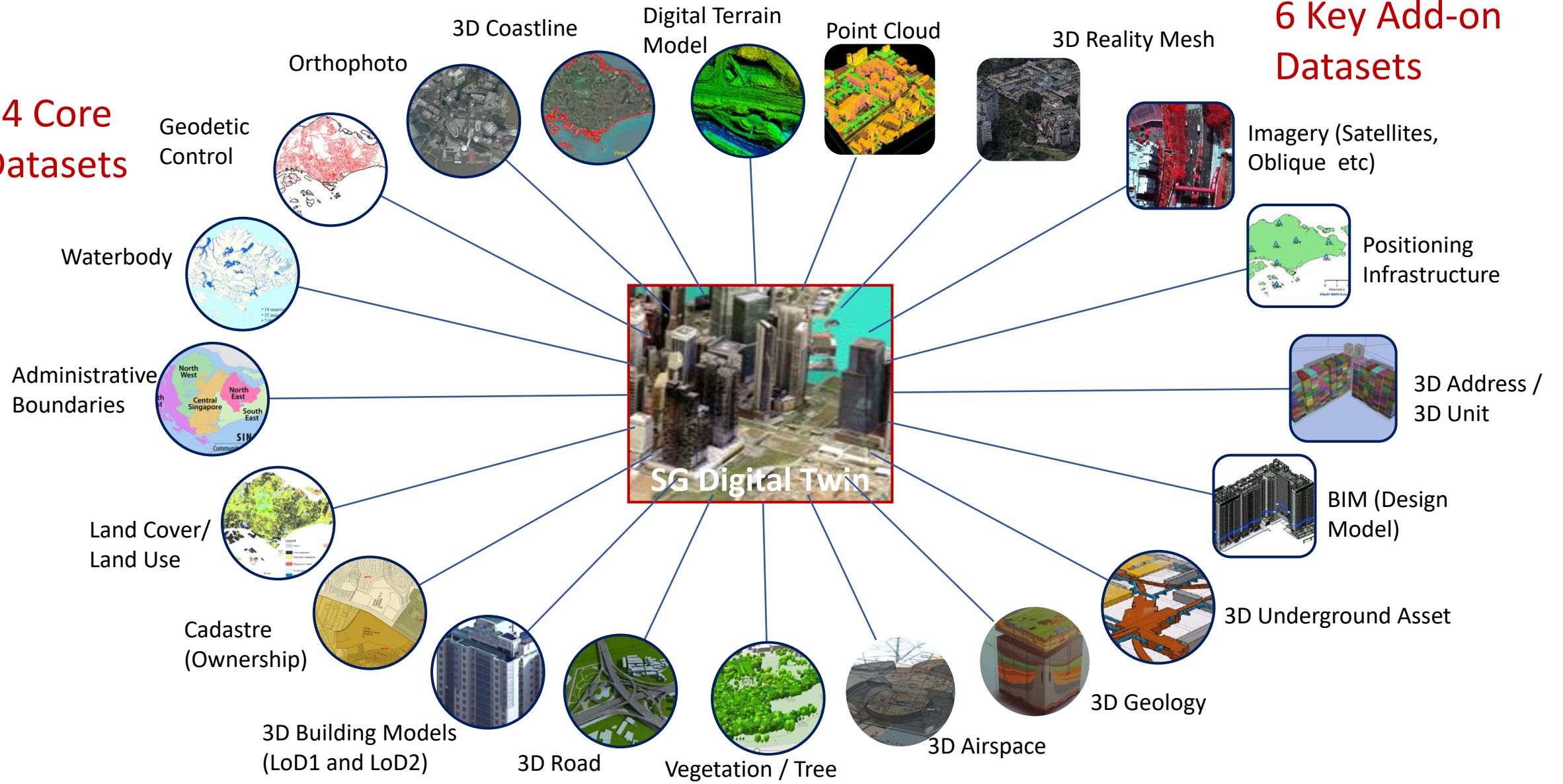
Accurate Metaverse



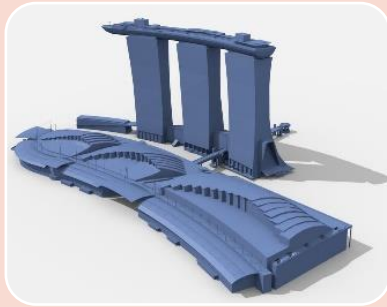
SG Digital Twin – Geodata Framework

14 Core Datasets

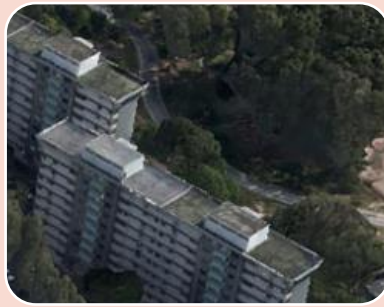
6 Key Add-on Datasets



3D City Models



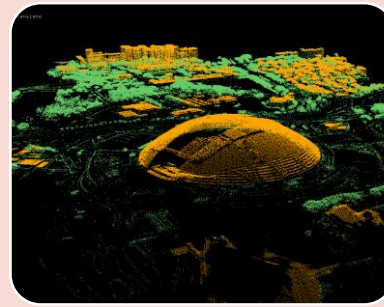
Semantics-
based
Vector
Model



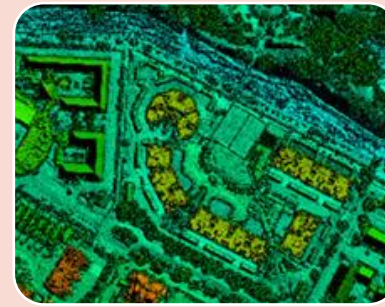
Mesh
Model



Voxel
Model



3D Point
Cloud

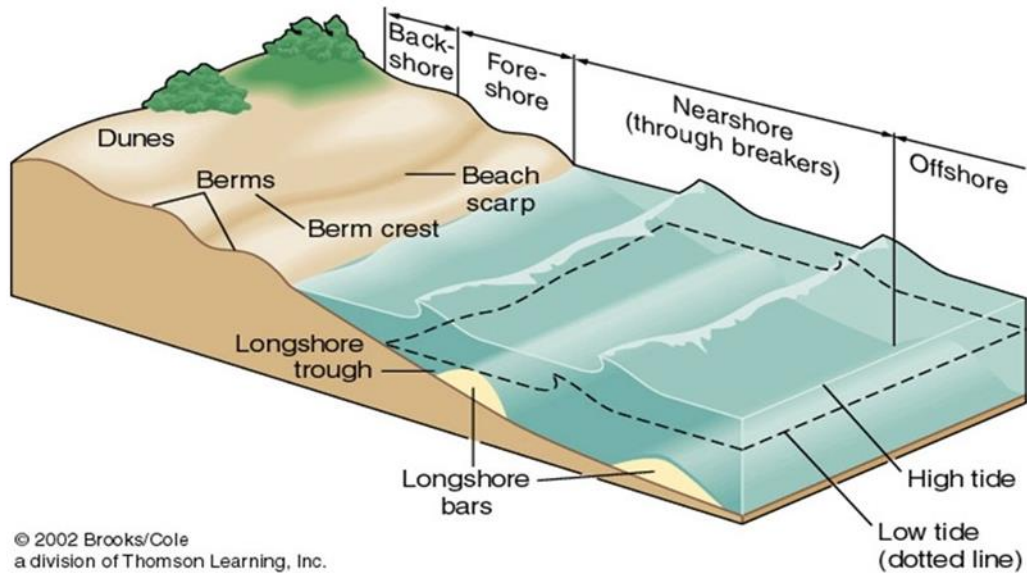


Surface
Model



Why need geospatial data integration – New Use Cases

Climate Adaptation

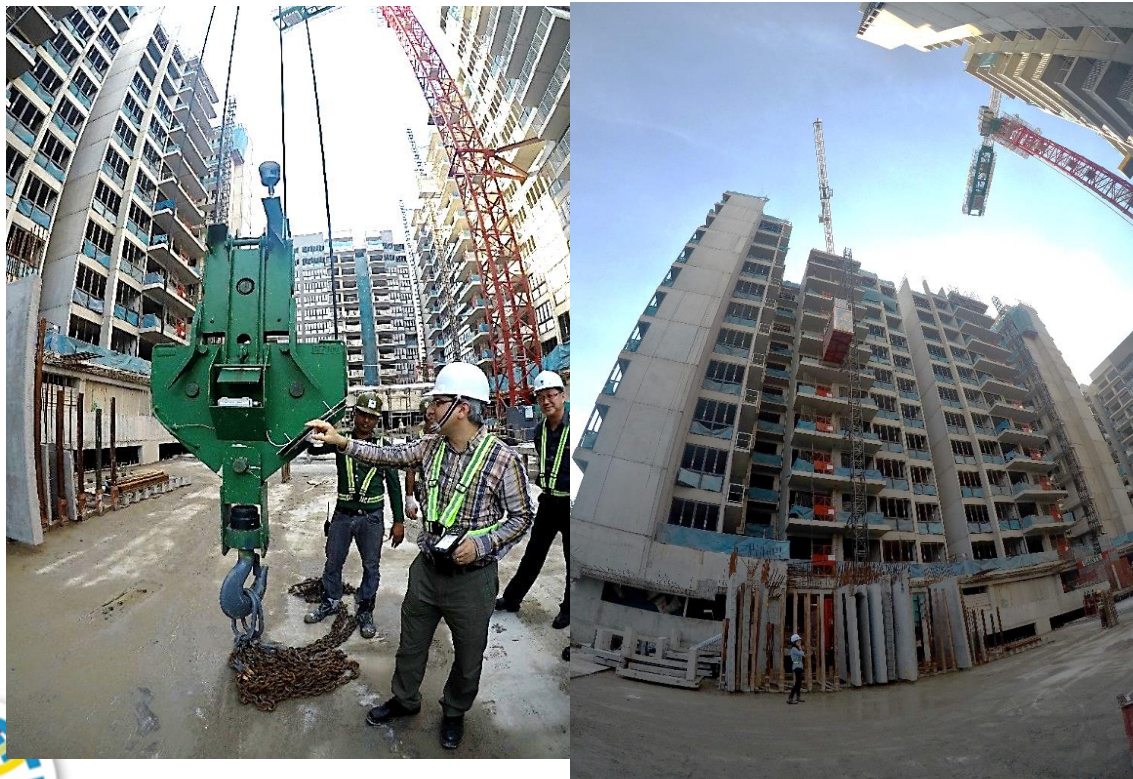


Smart Land Administration



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

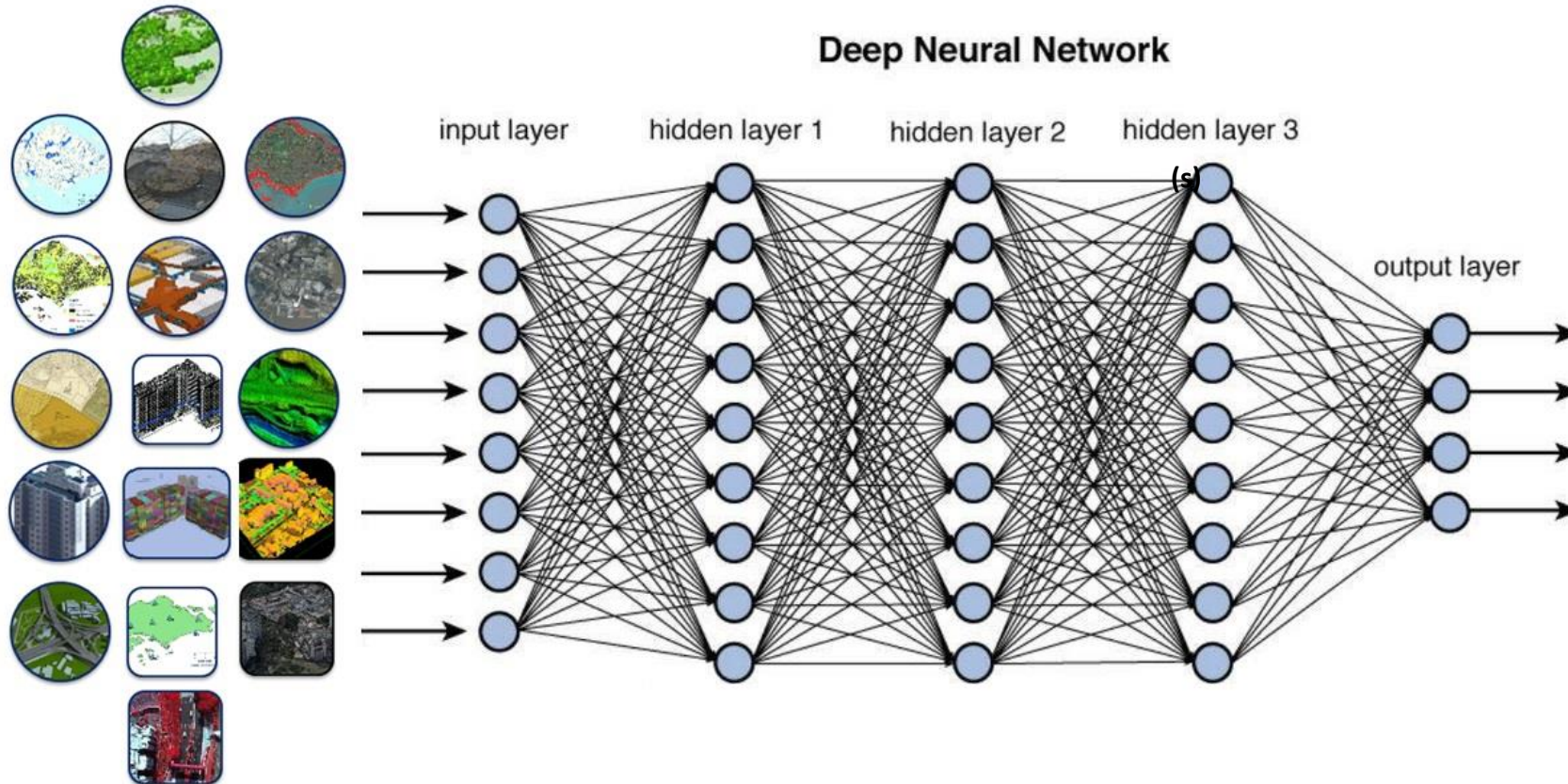
Coastal Protection



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

The screenshot displays a software interface for integrating point cloud data with panoramic images. The top section features a main map view showing an aerial view of a city area with a point cloud overlay. The interface includes a top menu bar with options like 'Workspace', 'Inspector', 'Preferences', 'Save all', and 'Print'. Below the map, there is a 'Mobile Mapping' section with a list of actions such as 'Open Run', 'Import Run', 'Add Run', 'Edit Run', 'Remove Run', 'Process Imagery', 'Process Point Cloud Image', 'Create Project', 'Edit Project', and 'Remove Project'. The bottom section shows three panels: a point cloud view on the left, a panoramic image view in the middle, and a panoramic image view on the right. The point cloud view shows a blue point cloud of a building and trees. The panoramic image views show a street scene with a yellow car and trees. The interface also includes a 'Procedures' section at the bottom with 'Open...' and 'Add' buttons, and a 'Publication: Testing' status.

Workspace Inspector Preferences Save all Print Measure Select

Tools Extensions Library Help

Map 2D Map 3D Layout Navigation Selection Edit

Panoramas Point Cloud Envelope KL landlot EL LP trajectory_scann... Openstreetmap 21760A_Singap...

Place Point

SVY21 / Singapore TM 1/2002 X:30750.0, Y:39358.5

ADMINISTRATION

Object Inspector Task Manager Catalog Trajectory Graph Mobile Mapping

Open View Focus Close all

24423A_01_141B_20151117

1 2 3

Show/Hide point cloud.

Heading: 97.4 Tilt: -1.7 Field of view: 61.5

d2 20:33:35 151117_083422255

d2 20:37:13 151117_083800286

Heading: 78.3 Tilt: 3.7 Field of view: 67.6

d2 20:37:11 151117_083758656

Heading: 106.1 Tilt: 1.5 Field of view: 90.0

Procedures

Open... Add

Publication: Testing

© Singapore Land Authority

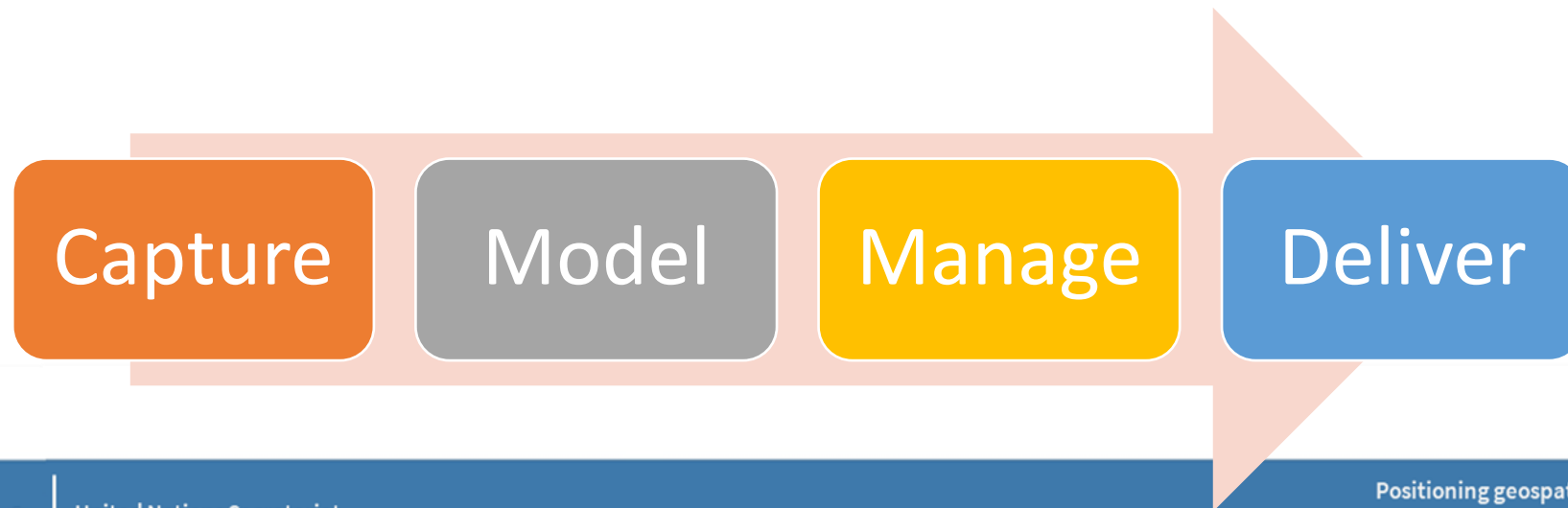
What is geospatial data integration

- 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

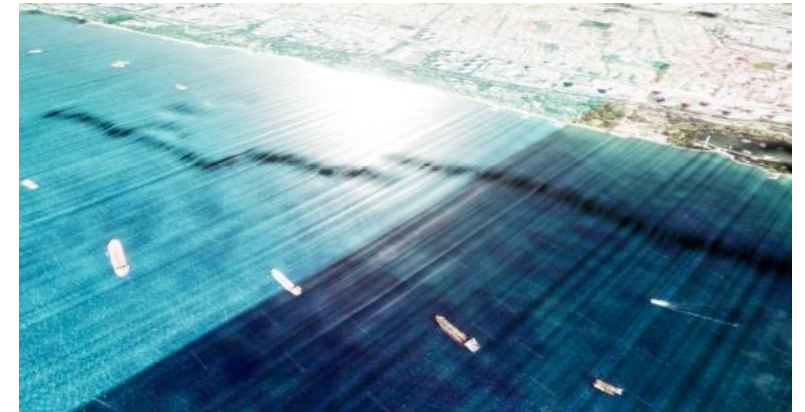
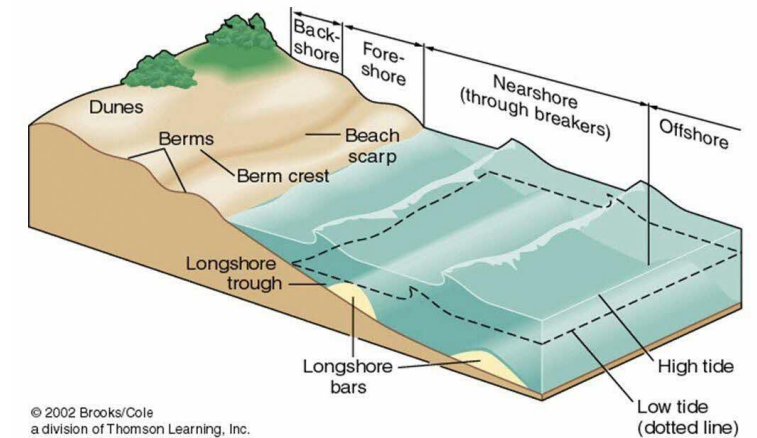
1. How can we address the challenges of data integration?
2. What do we need? Another framework? More collaboration?....
3. Who is responsible? What is the role of authority/government? What is the role of technical institutions (i.e. OGC, ISO, FIG...)
4. How do we use existing framework to address the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

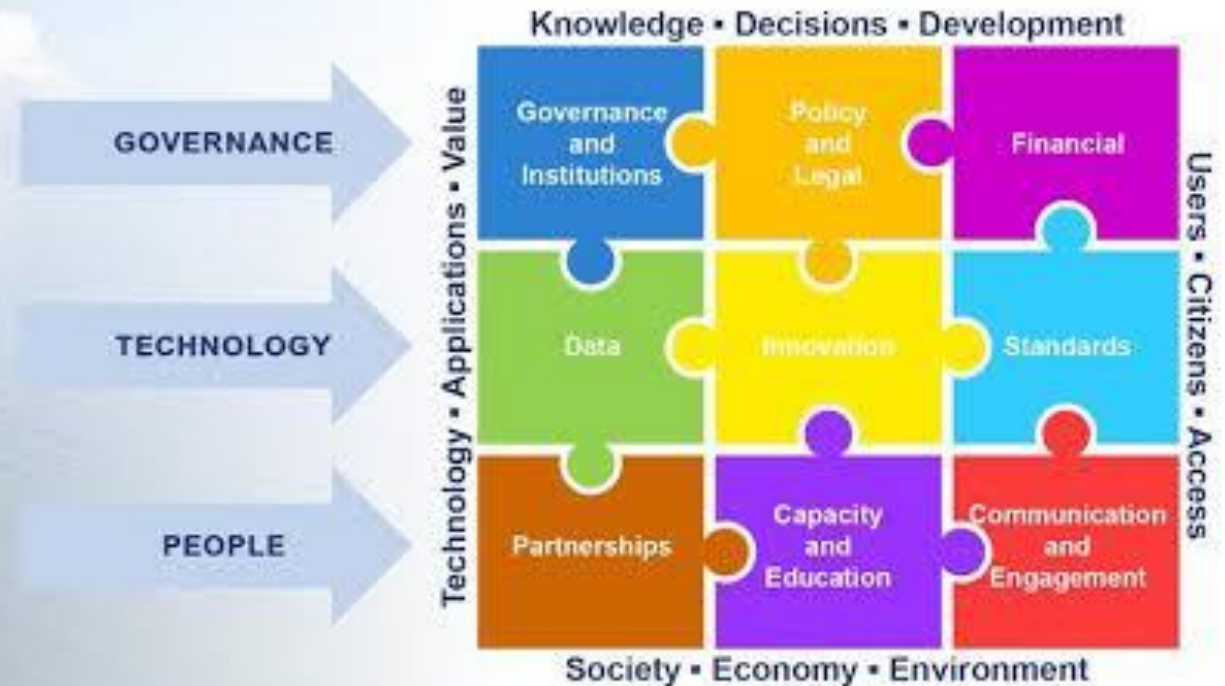
**Nearshore Sediment Dynamics
The Beach**



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



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