UN GEONOW 2025
第二届联合国地信周

Geospatial Knowledge for a Sustainable Future

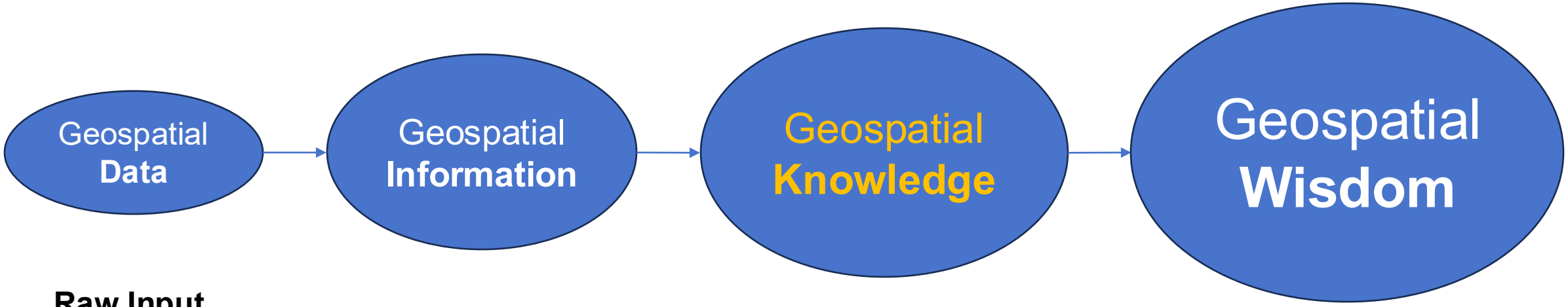
Songnian Li

Professor, Toronto Metropolitan University, Chair of UN-GGIM Academic Committee

Toronto Metropolitan University

Geospatial Knowledge

understanding, use, and analysis of information that has a geographic component



Raw Input
X, Y, Z
Pixel values
Sensor readings
What exists?

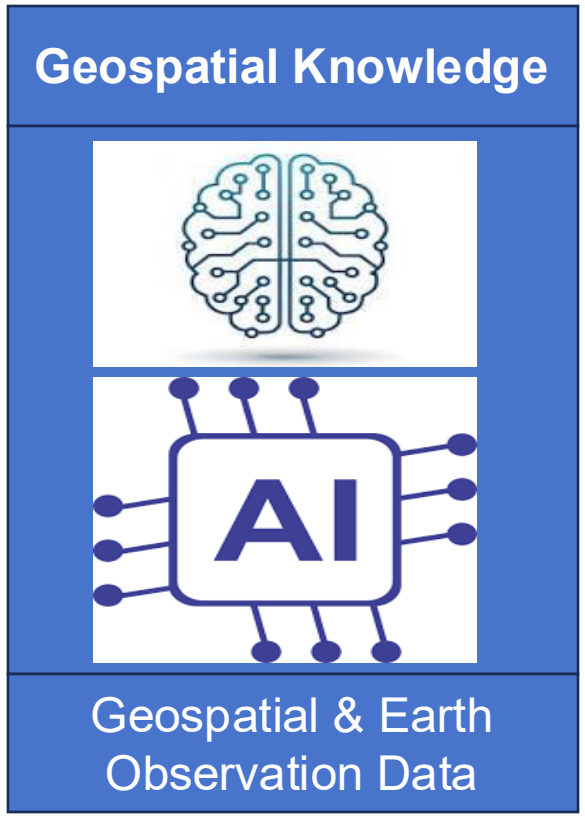
Processed Data
Temperature map
What/where is it happening?

Interpreted Information
Insights, models, strategies
How/why is it happening?

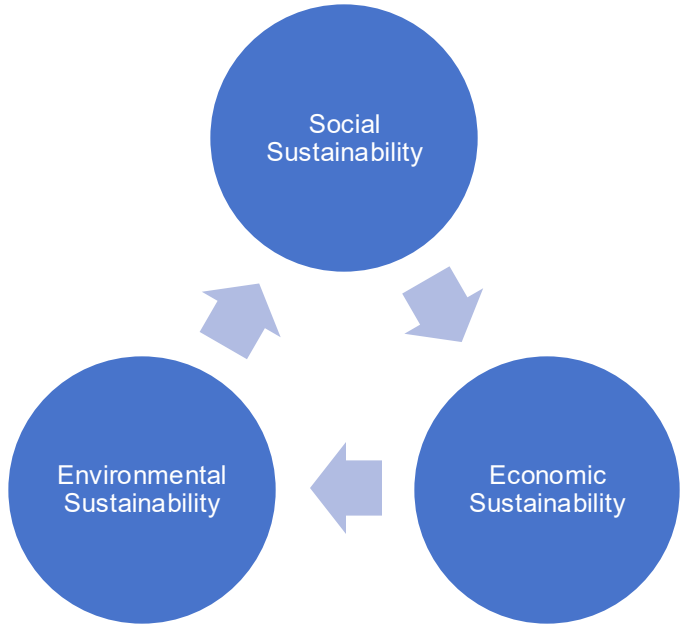
Actionable Insights
What should be done?

The complexity, value, and abstraction of what's being represented is increasing.

Connecting with SDGs

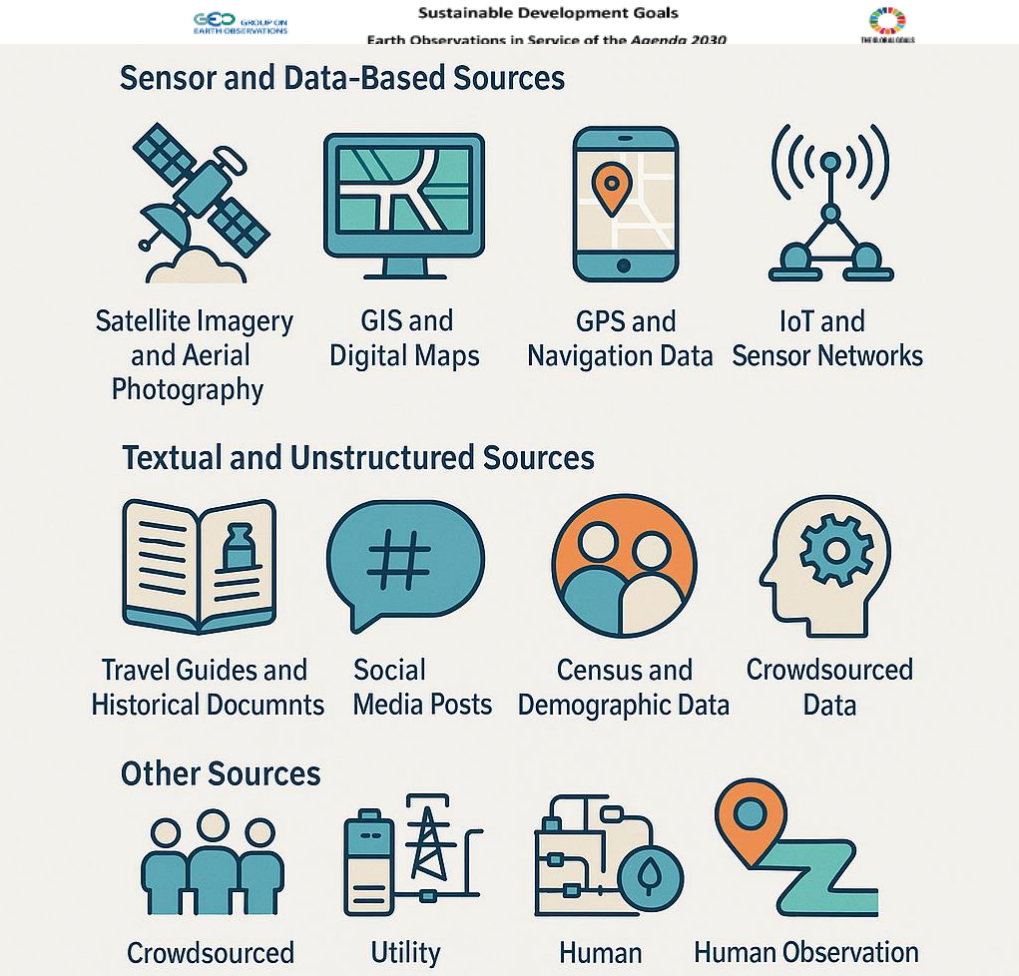


A sustainable future balances ***People***, ***Planet***, and ***Prosperity,*** often called the three pillars of sustainability.



SDGs are considered a global roadmap for a sustainable future.

Sources of Geospatial Knowledge



- Abundant big geospatial data are available but uneven access to them and varying quality is a big concern
- Lack of public geospatial data/info products (public goods), especially at the global level
- **GIS + earth observation data support all SDG goals/targets**

Are the currently available geospatial data sufficient to produce geospatial knowledge that can provide reliable actionable insights for SDGs?

Emerging Technologies

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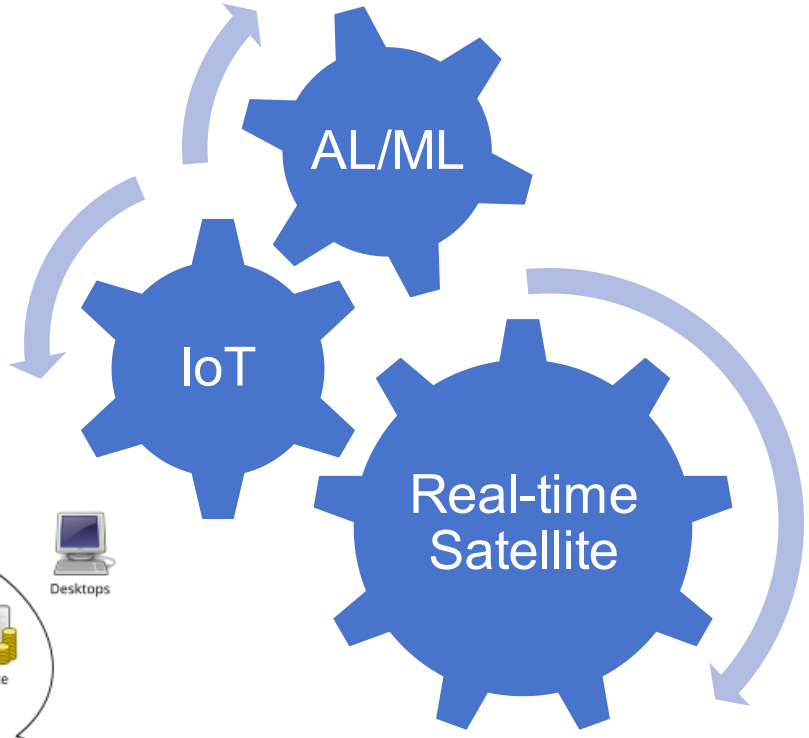
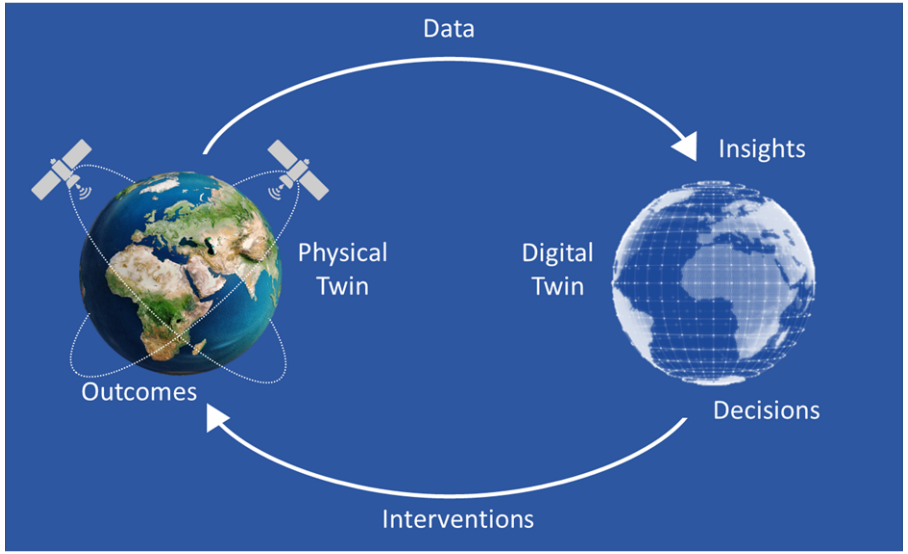
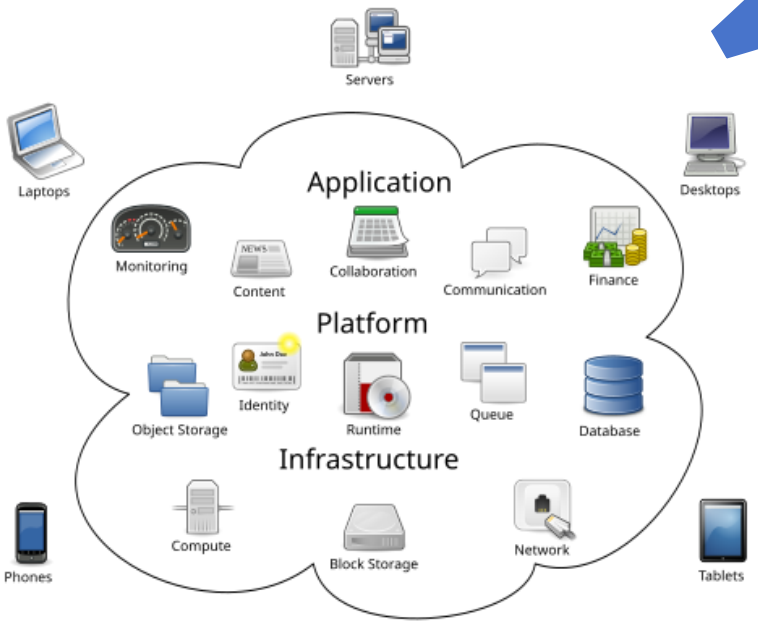




(Credit: Mark Hennen)



OPEN DATA CUBE

[Technology and innovation are making geospatial insights faster, more accurate & accessible than ever.]

Real-time Satellite

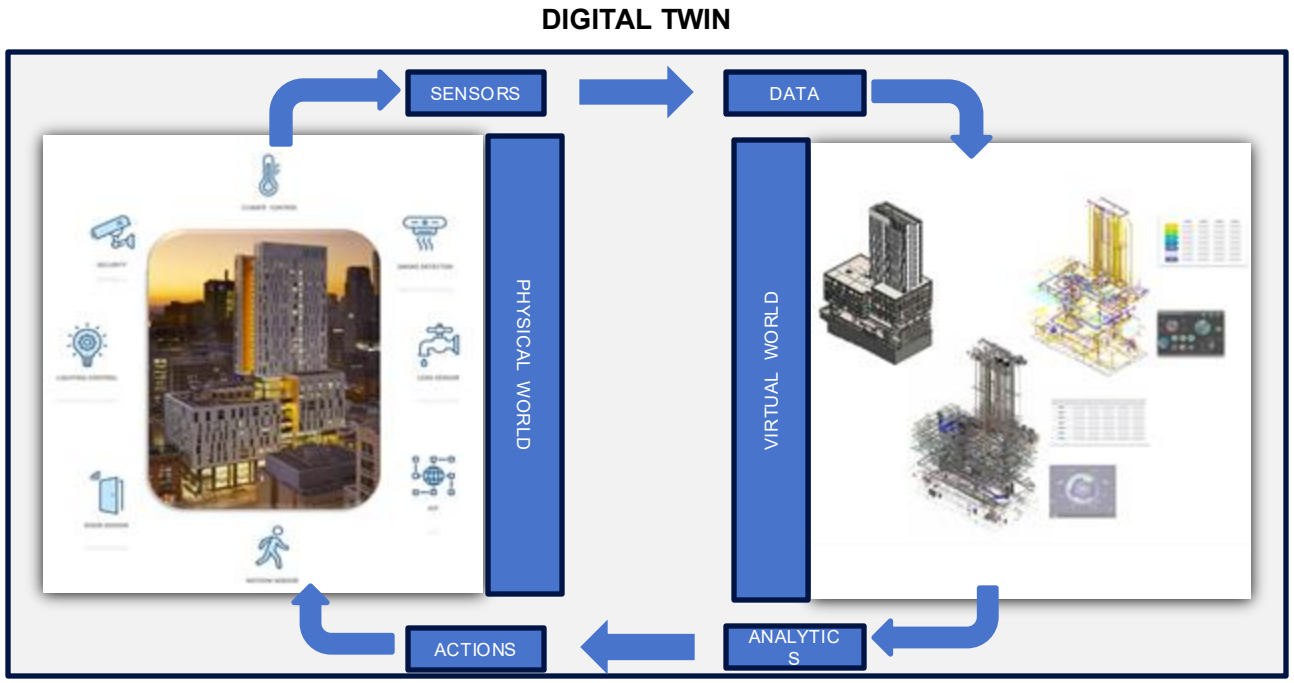
Next-Generation Monitoring Capabilities

The latest NVIDIA graphics processing units (GPUs) to enable AI at the edge

to deliver near-daily, 1-meter class imagery at low latency – a consistent, high-fidelity dataset ideal for integration with the leading AI foundation models and unprecedented among commercial providers.

Digital Twin

- Traditional monitoring is periodic, siloed, and retrospective
- **Digital Twins**: **continuous, integrative, predictive, and participatory**



Synced by reliable, timely, disaggregated data

6 CLEAN WATER AND SANITATION

[Clean Water & Sanitation: leak detection, water quality, NRW]

7 AFFORDABLE AND CLEAN ENERGY

Clean Energy: grid balancing, renewables siting & forecasting

11 SUSTAINABLE CITIES AND COMMUNITIES

Sustainable Cities: land use, mobility, resilience

13 CLIMATE ACTION

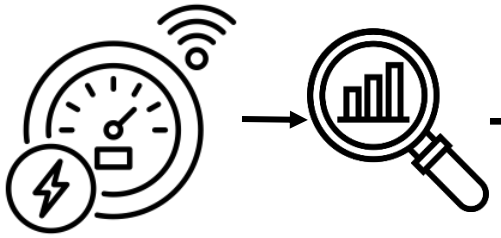
Climate Action: hazards, adaptation planning

15 LIFE ON LAND

Life on Land: deforestation & biodiversity monitoring

Digital Twin cont.

Analysis of factors affecting water consumption



Smart meter flow data

Water consumption monitoring and anomaly detection

Detection matrix

Outlier detection (Isolation forest) → Fuzzy based classification

Level shift detection → Matrix reset

Matrix reset → Detection matrix

Normal
Elevated use
High use
Critical anomaly

Water demand modeling and forecasting

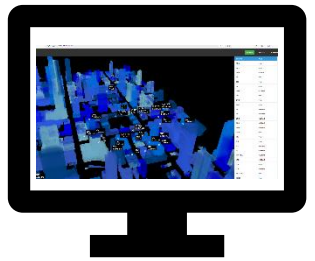
Feature engineering → Model selection → Model retraining → Model prediction

Time-based features: Hour, Minute, Day
Categorical features: Weekend, Working hours, Semester,
Lag features: 24h, 48h, 72h prior

Model: Online neural network
Hidden layers: 50 neurons
Activation: ReLU
Learning rate: 0.01
Regularization: 1e-4

Partial fitting based on latest data

Load pre-trained encoders and scalers.
Feature transformation.
Model prediction.
Inverse scaling for final results



3D visualization integrating Cesium Ion and backend Python/Flask for campus level monitoring

How can we make sure the use of these powerful technologies, with necessary skills and capacity, is ***responsible***, ***ethical***, and ***transparent***, which will produce ***reliable*** insights to guide the actions for ensuring the progress of SDGs, towards a sustainable future?

2023 GeoAI Survey

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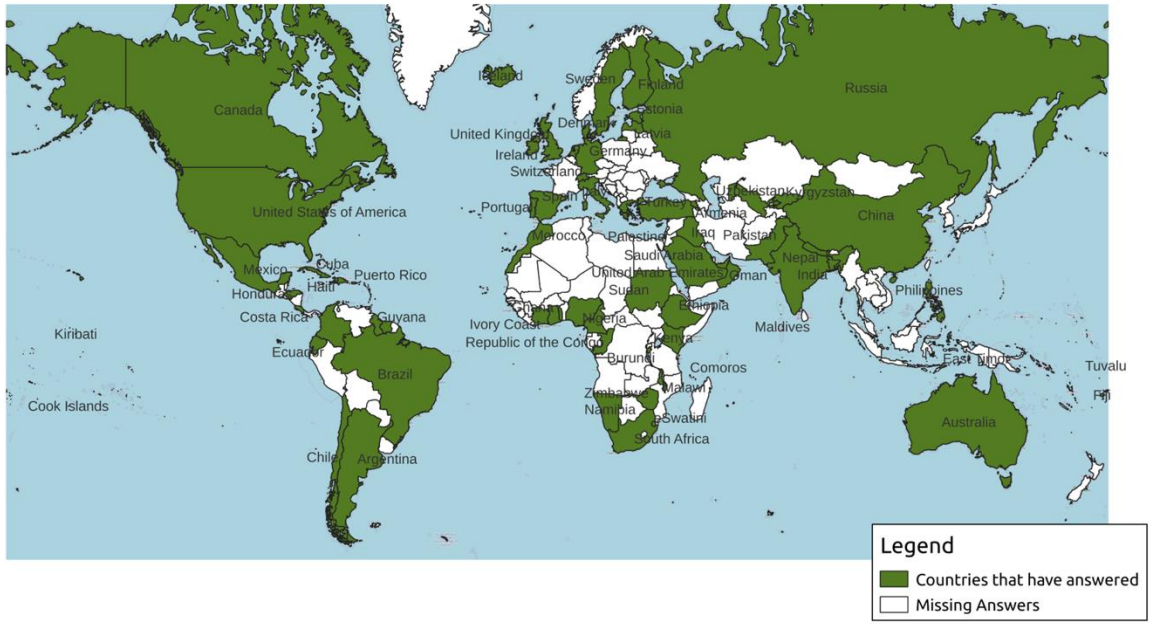
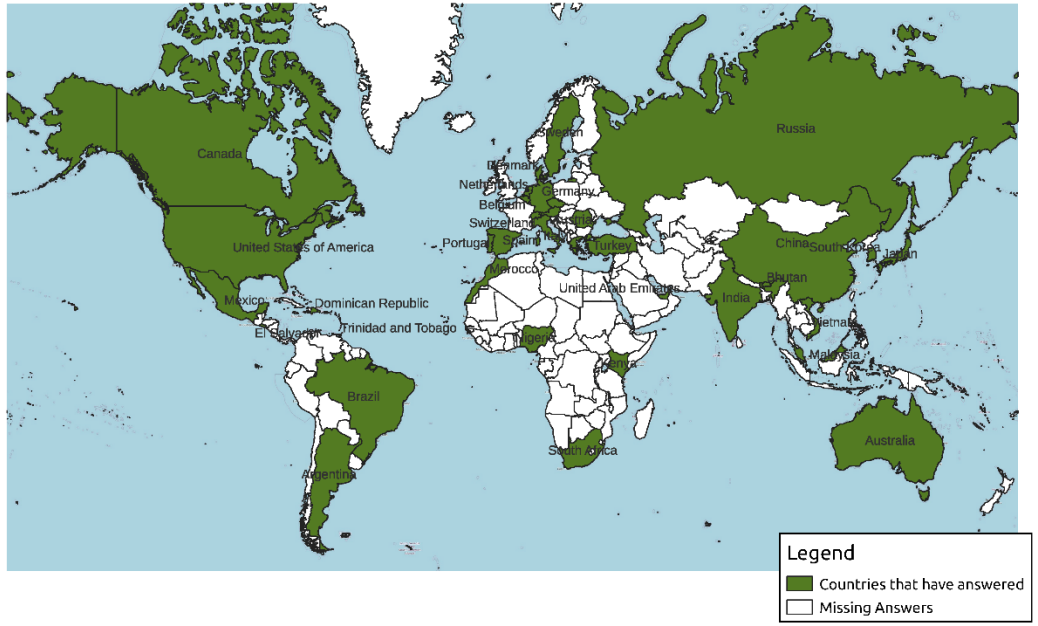
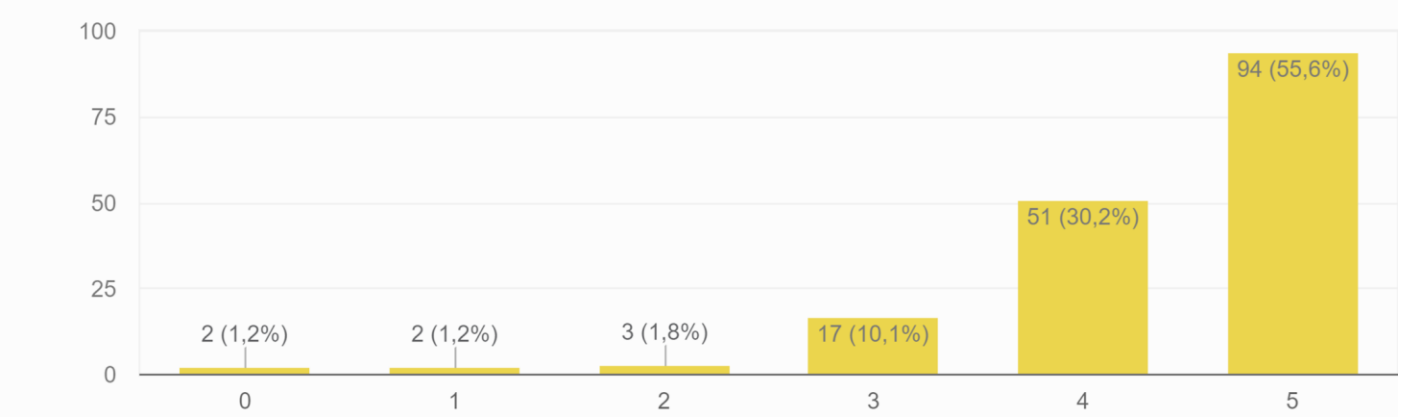
Survey to the Member States – 169 participants



Survey to the Universities – 70 participants

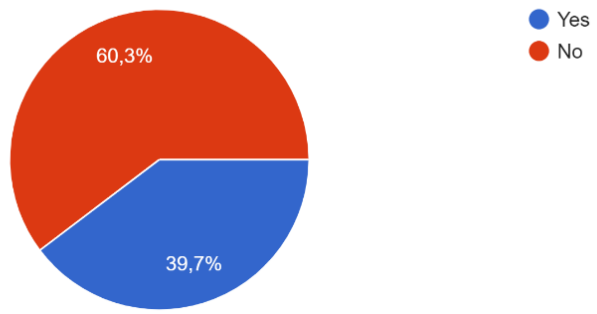


Do you believe that GeoAI can **improve** the **provision, effectiveness and value** of the existing geospatial procedures, products and services?



Is your University a member of the UN-GGIM Academic Network?

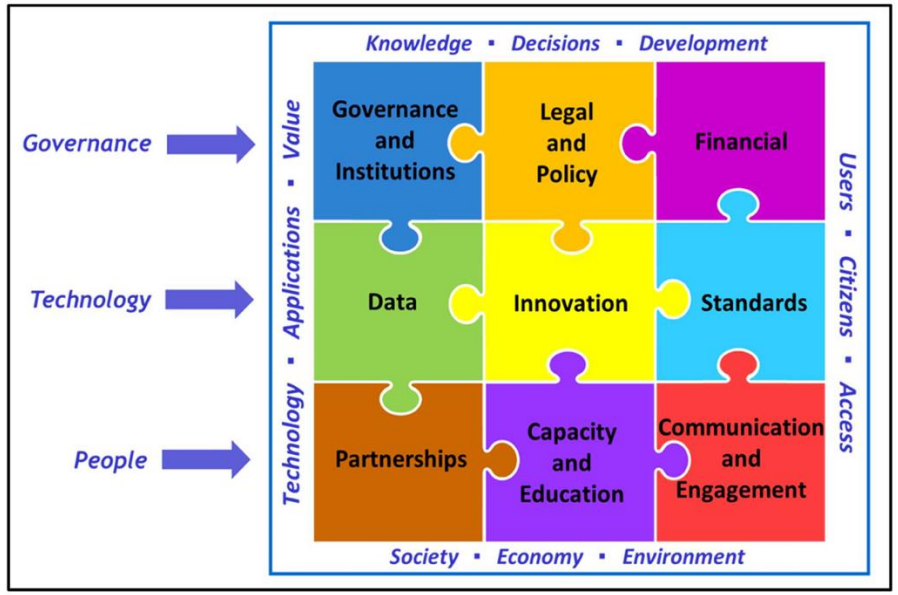
68 risposte

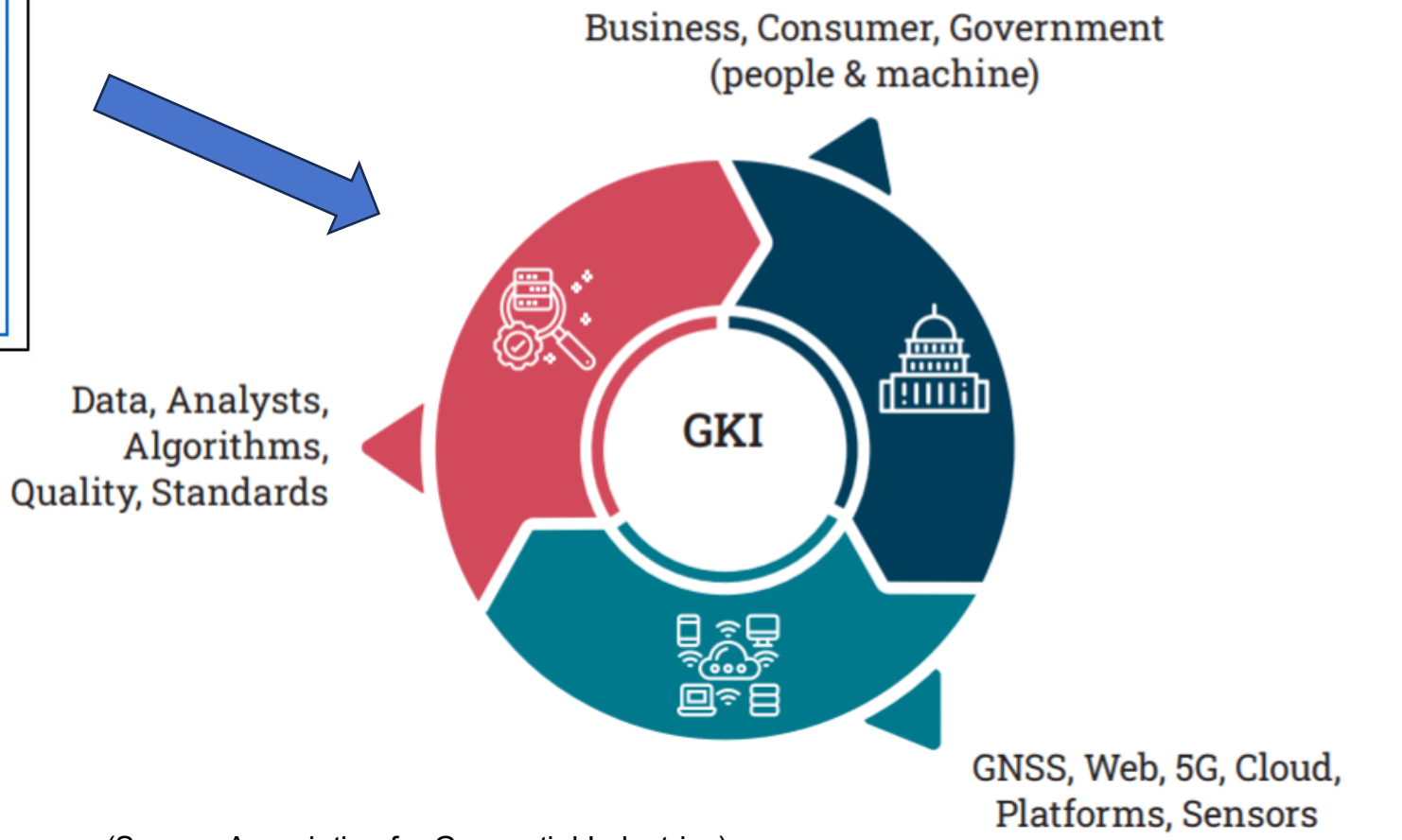


GeoAI BoK and Syllabus

- GeoAI syllabuses, tailored for different audiences:
  - developers
  - geomatics experts, and
  - decision-makers
- A comprehensive GeoAI body of knowledge (initial work)
  - Developed by:
    - WP1 – GEOAI Syllabus for developers
    - WP2 – GEOAI Syllabus for appliers
    - WP3 – GEOAI Syllabus for decision-makers
    - WP4 – GEOAI Body of Knowledge

GK Infrastructure/Platform





(Source: Association for Geospatial Industries)

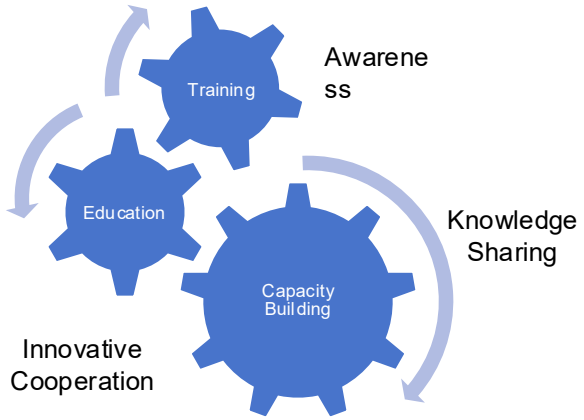
Challenges / Opportunities

Challenges

- Unequal data access between regions
- Privacy and data governance issues
- Skills gap in low-resource settings
- Difficulties in knowledge integration and interpretation to generate actionable insights
- balance visionary, technical, and ethical perspectives

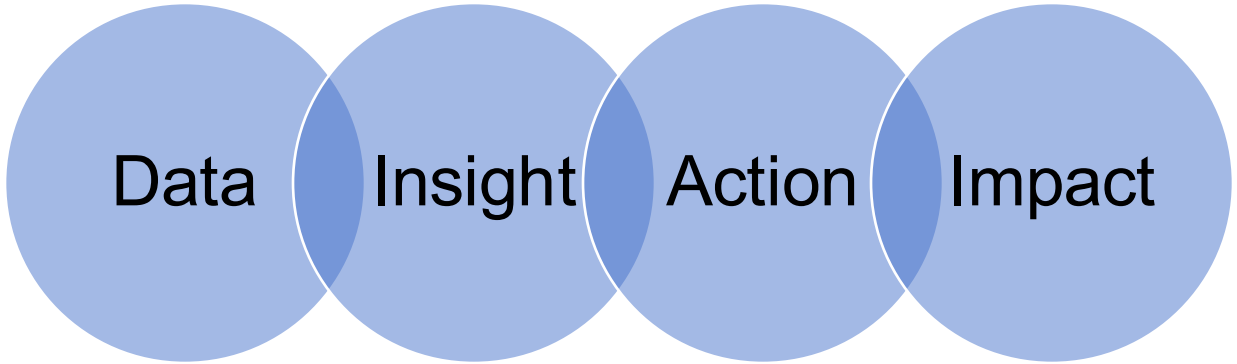
Opportunities

- Collaborative mapping and citizen science
- Capacity building through open education
- Integrating local and global data
- Lots to do on responsible, ethical and transparent use of data and technologies



Takeaways …

- Geospatial knowledge:
  - connects data, people and places
  - informs smarter, fairer, and more sustainable decisions
  - enables resilience and innovation across sectors



Simplified Chinese Site:
https://isprs2026.org/

Congress official Website:
https://www.isprs2026toronto.com/

02 MARCH 2026
Early Registration Ends

03 MARCH 2026
Regular Registration Begins

*** High-level Forum on UN-IGIF ***