From Maps to Knowledge – Reframing GKI As a National Infrastructure

Ananyaa Narain
Vice-President – Consulting
Geospatial World
ananya@geospatialworld.net

GEOSPATIAL WORLD
ADVANCING KNOWLEDGE FOR SUSTAINABILITY

CASE STUDY 01 — DISASTER RESPONSE

Southeast Asia Typhoon: Hypothetical GKI-Enabled Scenario

Hypothetical Ideal — GKI-Enabled Response

WITHOUT GKI

- NMAs hold terrain data — restricted, differently formatted per country
- NGOs have displacement models — incompatible coordinate systems
- Telecoms have mobility data — proprietary, inaccessible to responders
- Academia has flood models — locked in research repositories, not deployed
- Local govt holds ground truth — no interoperable channel upward

Result:
Fragmented Response . Duplicated Efforts. Lives at Risk

WITH GKI

- Unified operational picture — all agencies on one real-time layer
- Cross-border terrain + displacement data — standardised & accessible
- Telecom mobility feeds into a shared humanitarian dashboard
- Flood models deployed operationally, not left in journals
- Community ground-truth captured upward via open APIs

Result:
Coordinated response · Saved lives · Accountable decisions

KEY INSIGHT: GKI is not about who owns the data — it is about who benefits when it is connected.

CASE STUDY 02 — FOOD SECURITY & AGRICULTURE

Sub-Saharan Drought Early Warning: Hypothetical GKI-Enabled Scenario

The Problem: Five Siloed Data Holders — None Connected

Five siloed data holders

Space Agencies
Soil moisture data locked in scientific portals

Ag Ministries
Crop estimates 18 months old — field surveys only

Agri-Tech Firms
High-res crop health data — commercially licensed

Research Institutes
Climate-ag models published in journals — not deployed

Farmers
Ground-truth knowledge entirely uncaptured

GKI bridges all five

Real-time soil & crop data
Satellite feeds into national dashboards directly

Unified early warning
All five data types fused into one drought alert

Farmer-inclusive
Ground truth feeds upward — validated & acted upon

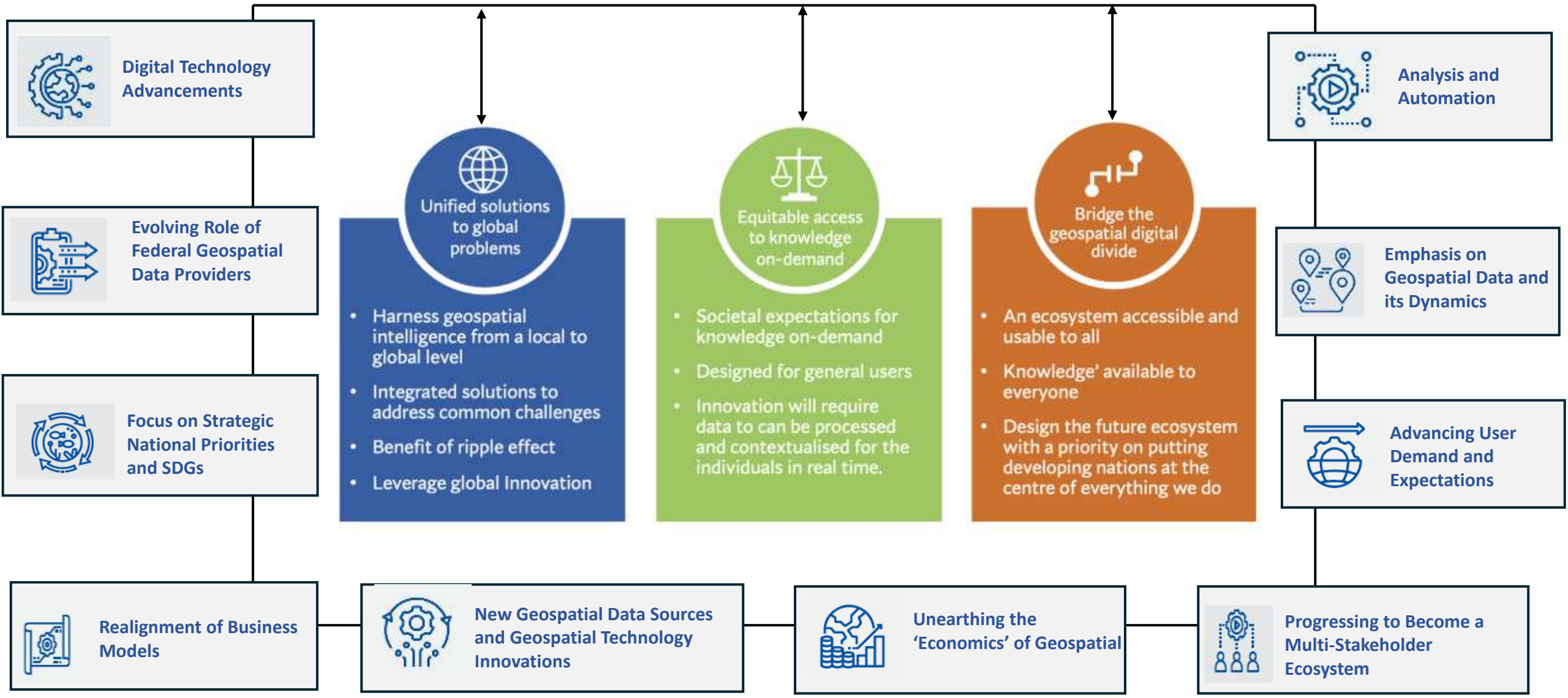
Policy-ready intelligence
Policymakers get knowledge, not raw data

KEY INSIGHT
When geospatial knowledge flows from satellite to smallholder, the entire food system becomes resilient.

“Geospatial data has moved from the realms of maps to knowledge – wherein citizens and customers require data and solutions which are more current, accurate, with on-demand accessibility and in application ready formats.

”

MACRO DRIVERS OF CHANGE



Source: UN-GGIM Discussion Paper on Future National Geospatial Ecosystem

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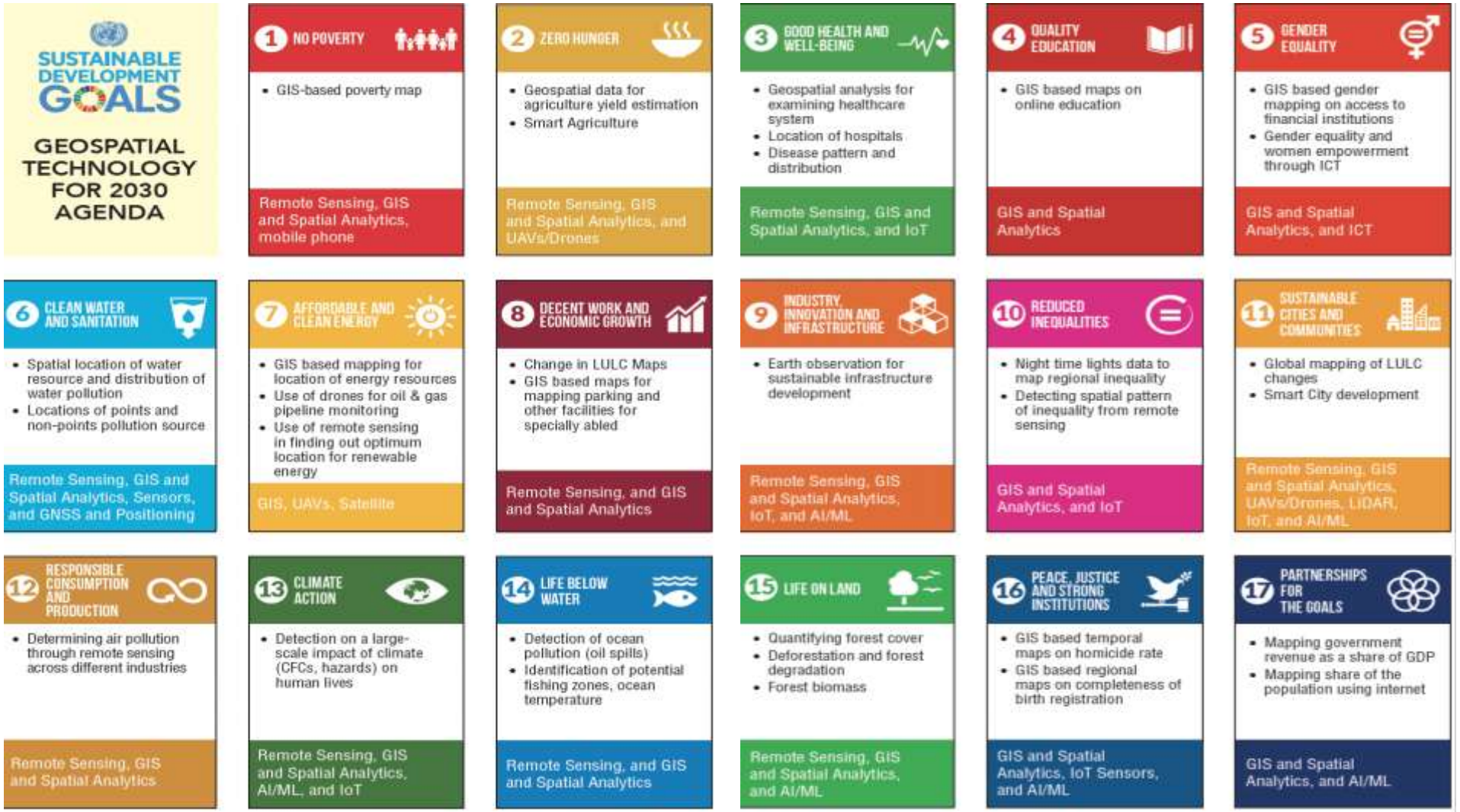
....because Geospatial is Changing!

"These companies do not recognise a 'geospatial sector', it is just data, analytics and user interfaces in which location plays a greater or lesser part. Innovative geospatially enabled businesses are the norm and set high user expectations." GKI White Paper

....because Geospatial is becoming central to SDGs!



….because Users are Evolving!

Vehicle Navigation

General Aviation

Financial Transactions

Utilities

Precision Agriculture

Surveying

Construction

Autonomous and Robotics

CHANGING GEOSPATIAL ECOSYSTEM

Data

Knowledge

1st Generation

Data/Product Based

Linkages of existing and future database

Data producers (NMA) - focusing on data production, database creation and centralization

2nd Generation

Process Based

Creation of an Infrastructure to facilitate the management of info assets

Driven by data sharing and re-using data collected by wide range of agencies for a diversity of purpose

Changing geospatial landscape

- New geospatial data sources and services
- Technological advances
- (Digital Twin/Metaverse)
- More automation, analytics, and intelligence
- Changing user expectations
- Transforming Organizations vision and mission

Future Generation

Knowledge Based

Real-time generation and integration of data

Integration of data from private (geospatial and other digital/data economy generated data), citizen and academia

Role

Profound impact of Technology (Moving towards 4th Industrial Revolution and Way Forward)

National Government → **Private Sector**

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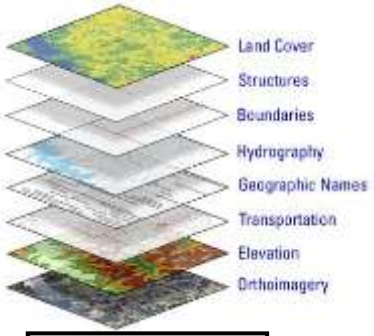
FEATURES OF THE FUTURE GEOSPATIAL ECOSYSTEM

- A shift from data *to* insight, knowledge and understanding
- User expectations will be matched through the convergence of digital and human worlds
- 4IR technologies will enable unprecedented advances in data collection and geoanalytics
- Location in decision-making will be common
- Movement towards democratization of knowledge



DATA

KNOWLEDGE

INSIGHT

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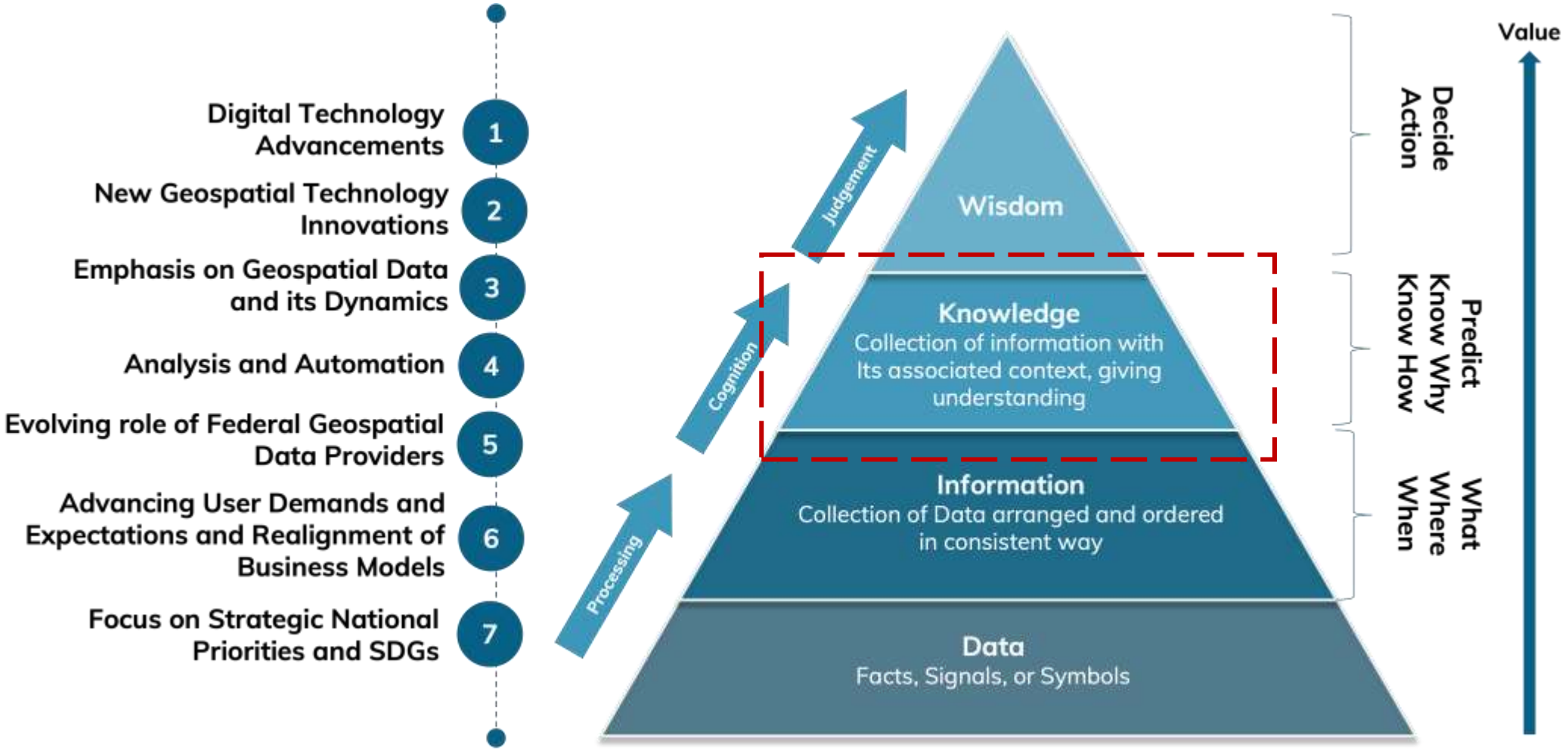
THE KNOWLEDGE PARADIGM

The Knowledge Management Cognitive Pyramid demonstrates the relationship between data and knowledge. 4IR technology increasingly enable knowledge to be generated 'automatically', improving decision making and adding value.



Source: Development of Contextual Understanding, Information and Analytics Towards Determining the National Geospatial Information Ecosystem

DEFINITION

What is GKI?

GKI is not...

A database

A mapping programme

A government IT project

An NMA mandate

GKI — THE DEFINITION

"The Geospatial Knowledge Infrastructure (GKI) provides a comprehensive blueprint for integrating digital economies, societies, and citizens with geospatial approaches, data, and technologies, aiming to deliver location-based knowledge, services, and automation expected in the Fourth Industrial Revolution (4IR), and by moving beyond the current focus on data infrastructures to knowledge infrastructures, it supports the progression from raw data to applied knowledge and intelligence."

Key Focus

Data
Authoritative, open, interoperable foundation layers

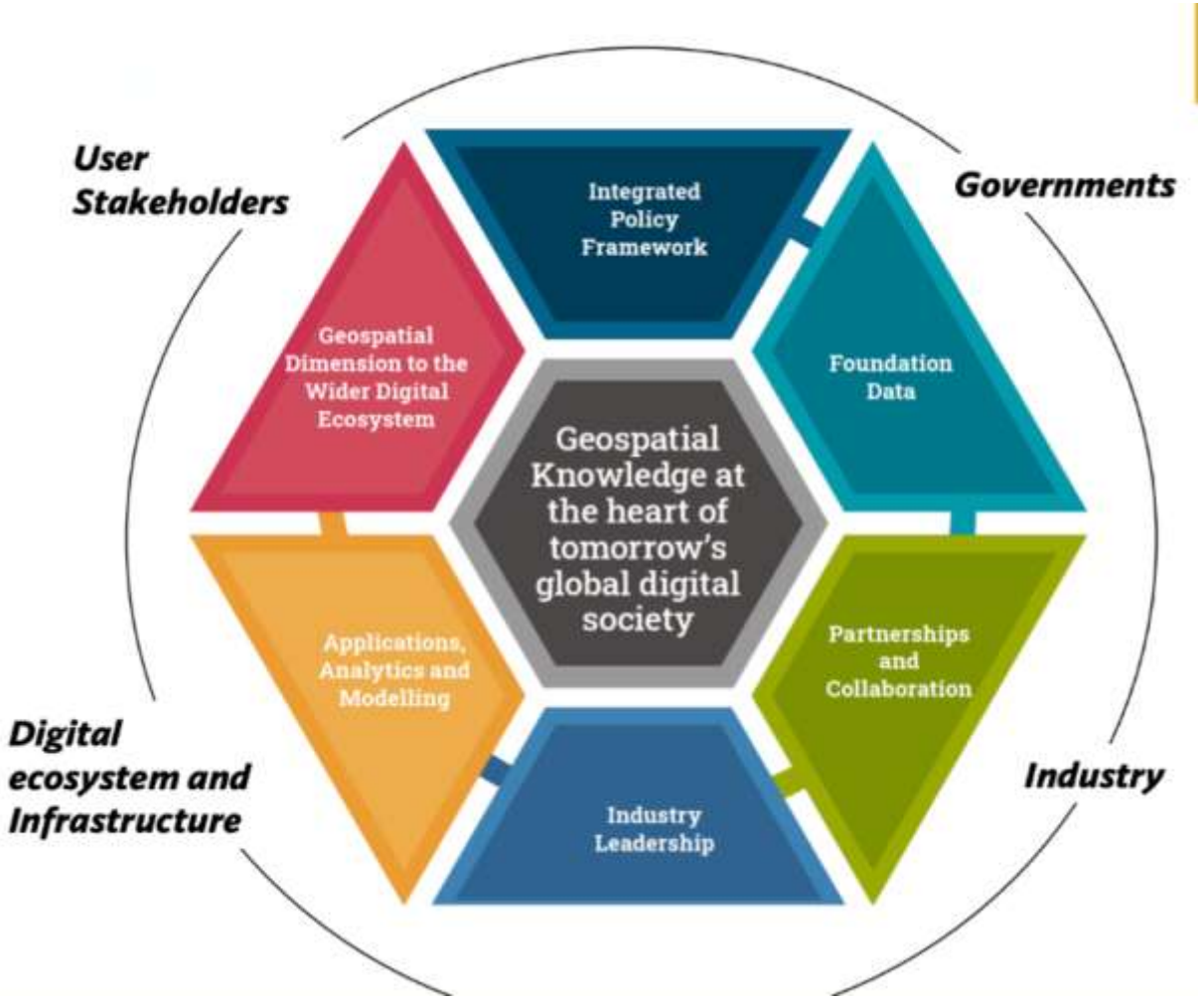
Knowledge
Derived intelligence: models, analytics, predictions

Governance
Standards, policies, trust frameworks, IP arrangements

Community
Stakeholders who create and consume value together

The GKI Framework: 6 Elements · 7 Principles · 5 Goals

6 ELEMENTS



7 PRINCIPLES

- Integrate with digital infrastructure
- Knowledge focus
- Predictive capability
- Led by users
- Achievable actions
- Agility built-in
- Decentralised & Collaborative

5 GOALS

Inclusive Access	Economic Growth	Climate Resilience	SDG Alignment	4IR Readiness

ECOSYSTEM

The GKI Stakeholder Ecosystem

National Mapping Agencies
Foundation data · Standards · Trust

Industry & Private Sector
Real-time data · Innovation · Scale

Government Users
Policy · Planning · Demand signal

Academia & Research
Models · Foresight · Rigour · Talent

Non-Profits & Civil Society
Ground truth · Equity · Legitimacy

GKI Ecosystem

Five stakeholders.

One infrastructure.

None of these stakeholders alone can deliver what all of them together can.

THE TRANSITION

Spatial Data Infrastructure (SDI)

- Data Centric
- Centralized System
- Desktop/Web portal
- 2D representation
- Supply-centric
- Limited Data Range
- Professional users only
- Linear Search
- No analysis/No modelling
- Government
- Web 1.0 – Static Web

IGIF - Enabler of GKI

Geospatial Knowledge Infrastructure

- Knowledge-centric (applied intelligence)
- Distributed System
- Distributed Cloud-based Spatial Computing
- 4D/5D Representation
- Demand Centric (Value Impact)
- Dynamic data with wide range of data (crowdsourced, mobile, IoT)
- Includes Machines
- Intelligent Search
- Advanced Augmented Analytics / Prescriptive Analytics
- Broader Stakeholder Group (including users, economics and statistics, etc.)
- Web 3.0 Semantic Web
- Network of Integrated Ecosystems of Ecosystems

Enablers and Facilitators	Commercialization and Industrialization		Public Private Partnership	Resilience	Geopolitics and World Order		Sovereign Assets
Technologies	AI/ML	Spatial Computing	Internet of Things (IoT)	5G and Advanced Connectivity	Blockchain	Digital Twin Enterprises	Open Data Platforms & APIS

Moving up the Value Chain towards the Future Geospatial Ecosystem

STRATEGIC SHIFT

The Repositioning: From NMA-Centric to Ecosystem-Led

CURRENT STATE — NMA-CENTRIC		GKI REPOSITIONED — ECOSYSTEM-LED
DATA FLOW Top-down — government pushes data to users	THE TRANSITION	**DATA FLOW** Multi-directional — including upward from communities
VALUE DEFINED AS Authoritative base maps & cadastral data		**VALUE DEFINED AS** Knowledge at the intersection of all stakeholders
COLLABORATION Bilateral, slow, standards-driven		**COLLABORATION** Open, demand-driven, cross-sector partnerships
NMA ROLE Primary data producer & gatekeeper		**NMA ROLE** Trusted node — not the centre of gravity
USER VOICE Minimal — demand rarely shapes supply		**USER VOICE** Central — demand shapes what gets built
INNOVATION PACE Slow — procurement-led, not market-led		**INNOVATION PACE** Accelerated — private sector & academia co-create

Note: This shift expands NMA value — it does not diminish it. NMAs become the trusted authority within a broader knowledge ecosystem.

Collaboration MULTIPLIES the Value of Geospatial Knowledge

CENTRAL HUB

NATIONAL MAPPING AGENCIES (NMAs)

- The authoritative source for national geospatial data
- Ensures data quality, standards, and governance

OTHER AGENCIES

- Hydrography Agencies
- Space Agencies
- Geological Agencies
- Statistical Agencies
- Land Agencies

COLLABORATIONS

- **Industry & Private Sector:** Technology innovation, scalable solutions, application development
- **Consortia & Public-Private Partnerships:** Resource pooling, cost-sharing, open standards
- **User Organizations:** Data contribution, contextual and sectoral knowledge, technical innovation and co-development, and use-case development and demand articulation
- **Academia & Research:** Methodological innovation, training, data validation
- **Citizens & Communities:** Crowdsourcing, VGI, participatory mapping, local knowledge

COLLABORATIVE PROCESSESS

Standardization & Governance

Data Sharing and Integration

Co-Creation and Participatory Mapping

IMPACT

QUANTITATIVE BENEFITS

- Economic Growth
- Cost Savings
- Efficiency Gains
- Improved Compliance
- Improve Productivity

QUALITATIVE BENEFITS

- Better Decision Making
- Innovations
- Social Inclusion
- Transparency
- Trust

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APPLICATIONS

Agriculture & Food Security

Crop monitoring · drought prediction · food policy

Cities & Urban Planning

Smart city layers · digital twins · mobility planning

Construction & Infrastructure

Project planning · asset tracking · BIM integration

Logistics & Supply Chains

Route optimisation · real-time tracking · resilience

Public Safety & Security

Disaster response · crime analytics · emergency routing

Autonomous Driving

HD maps · real-time positioning · V2X infrastructure

Land Administration

Cadastral data · property rights · boundary management

Energy Transition

Renewables siting · grid planning · carbon monitoring

Source: UNSD–Geospatial World GKI Phase 2 Report — Value Proposition across 8 user sectors

CALL TO ACTION

What We're Asking of Each Stakeholder

National Mapping Agencies

Evolve from data custodians to knowledge facilitators — open APIs, co-design with users, become the trusted node

Industry & Private Sector

Bring your real-time data into the commons — help build sustainable business models that serve the ecosystem

Government Users

Define your knowledge needs, not just data requests — pull the ecosystem toward demand

Academia & Research

Translate models into operational tools — sit at the deployment table, not just the research table

Non-Profits & Civil Society

Represent communities who cannot advocate for themselves — ensure GKI serves the margins, not the mainstream

GKI — Building an inclusive geospatial ecosystem where no stakeholder is left behind.

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THANK YOU

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