Third expert meeting of the working group on policy and legal frameworks for geospatial information management, including addressing issues related to authoritative and reliable geospatial data and emergent technologies

07-09 October 2025

Riyadh, Saudi Arabia

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1. Opening of the third expert meeting, welcome and introductions
2. Agenda, organization of the meeting and setting the scene
3. Policy and legal developments – national and regional
4. Workplan and deliverables for 2025 – 2027
5. Awareness, communication, engagement, developing and sustaining legal-policy capacity
6. **Evolving geospatial and technological landscape, artificial intelligence, and its regulation**
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Paper on Automated Routing and Navigation

07-09 October 2025

Riyadh, Saudi Arabia

Concept / Purpose

Series of papers about the Geospatial Data used by Automated Vehicles to make Routing and Navigation Decisions

Bridge the Knowledge / Awareness Gap between AV Community and Geospatial Info Community

Integrate Automated Vehicle and GIM Frameworks
Society of Automative Engineers – Levels of Automation
High – Definition Mapping Concepts
UN GGIM's Authoritative Data Trust-Control Continuum
Existing Routing and Navigation Data Frameworks
Existing Legal Concepts
Liability and Insurance
The Importance of Geodesy

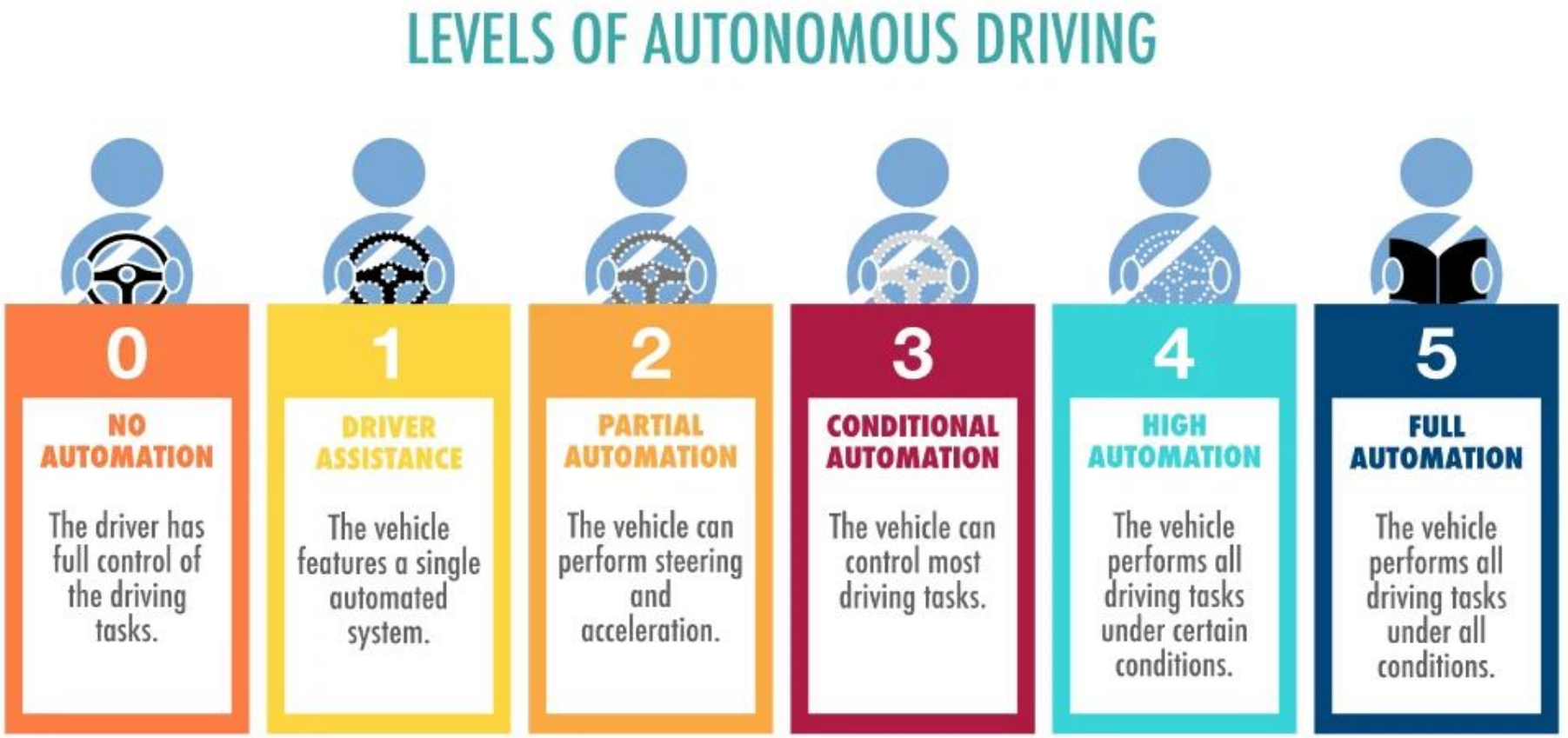
Legal Framework Relevance

From Kevin Pomfret

- Cross Border Data Sharing
- Data Privacy and Protection
- Data Ownership and Intellectual Property Rights
- Data Security and Cybersecurity

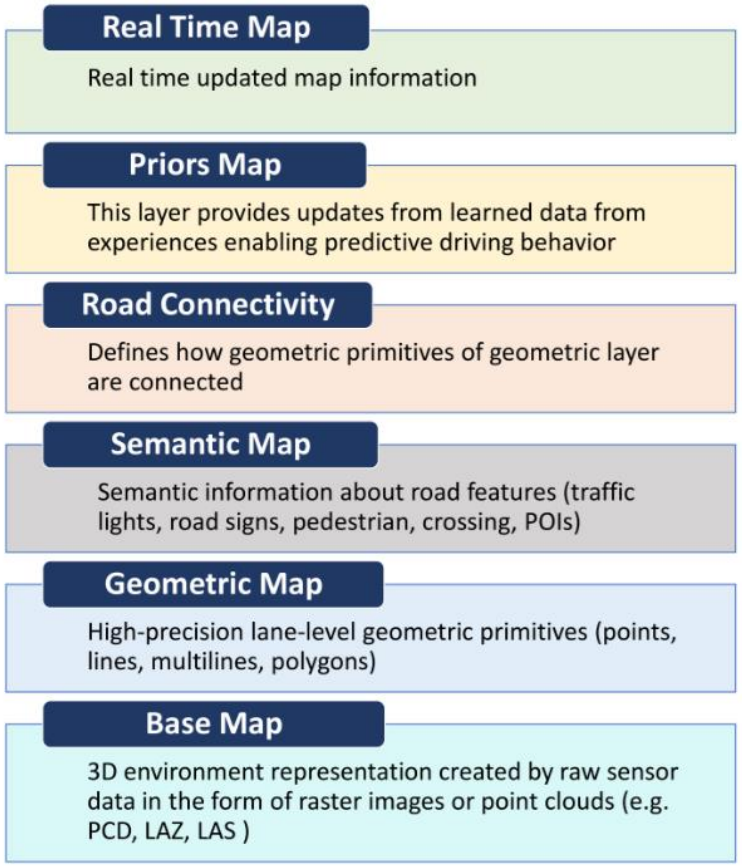
Background

SAE Levels of Automation



Source: ML-Vehicle.com

High-Definition Maps



Note: Figure sourced from Elghazaly, G., Frank, R., Harvey, S., & Safko, S. High-definition maps: Comprehensive survey, challenges, and future perspectives. IEEE Open Journal of Intelligent Transportation Systems.

- HD Maps are an On-Board GIS
- Exceptionally large scale (~5 to ~20 cm)
- Convey near-real-time road information to human or automated drivers
- AI Decision Support Tool (DST)
- Geospatial data layers act as a vehicle's memory; it defines the expectation
- A vehicle's sensors creates a perception
- A difference between the expectation and perception indicates a decision point

It’s Complex

The Wicked Problem of Road Data

Ensuring reliable access to relevant, accurate, and timely road data is difficult.

Road Data Layers available from

- All scales of government (Federal, State, Regional, County, Municipal, etc.)
- Multiple private data providers (Google, Here, TomTom, Sanborn, Apple)
- Multiple non-government organizations (E.g. OSM, Overture)

All independently describe the same network

Complexities involved in originating, maintaining, and serving data create numerous inefficiencies in both the public and private road data markets

Wicked Problem: Public Challenges

Public Stakeholders

- 19,500 incorporated places
- 3,143 counties
- 574 tribal nations
- 50 states + territories
- Federal government
- > 23,268 Jurisdictions

Public Challenges

Mutually reinforcing processes inhibit innovation and collaboration

Silos fueled by

- prestige guarding
- interagency rivalries
- minimum funding
- competing missions

All independently describe the same network

Wicked Problem: Private Challenges

Burden of Change Detection

- Multiple government collaborations
- Survey vehicles
- Volunteered geographic information (VGI)
- Remote sensing
- Artificial intelligence

Burden of Network Maintenance

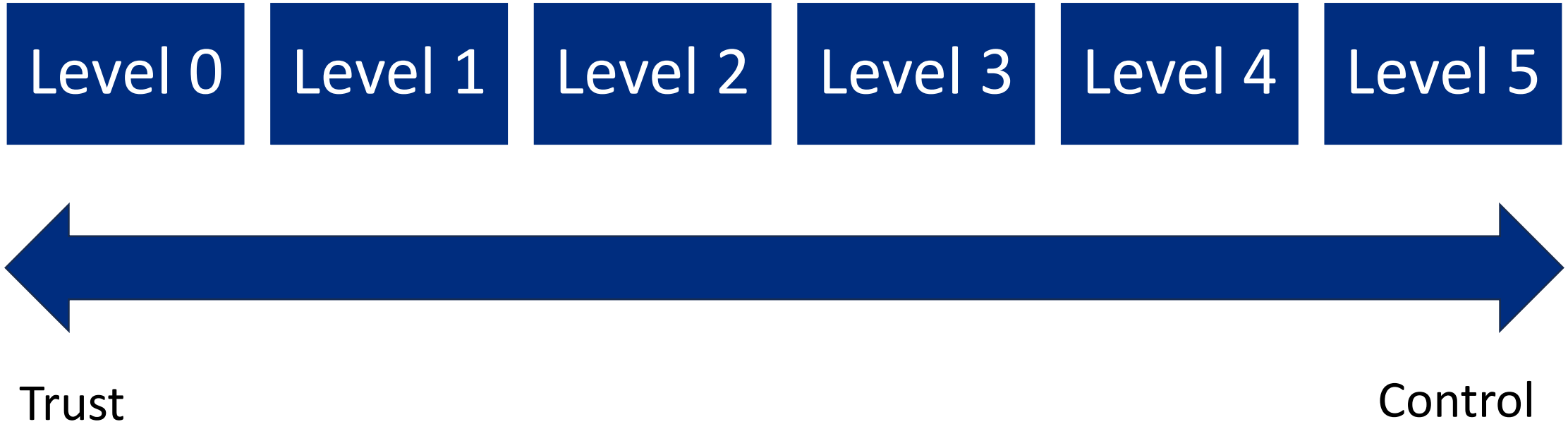
- Dynamic network
- Millions of daily updates
- Different update frequencies
- Different technologies
- Different Definitions of Authoritative Data

All independently describe the same network

A Few GIM Challenges
in
Automated Routing and Navigation

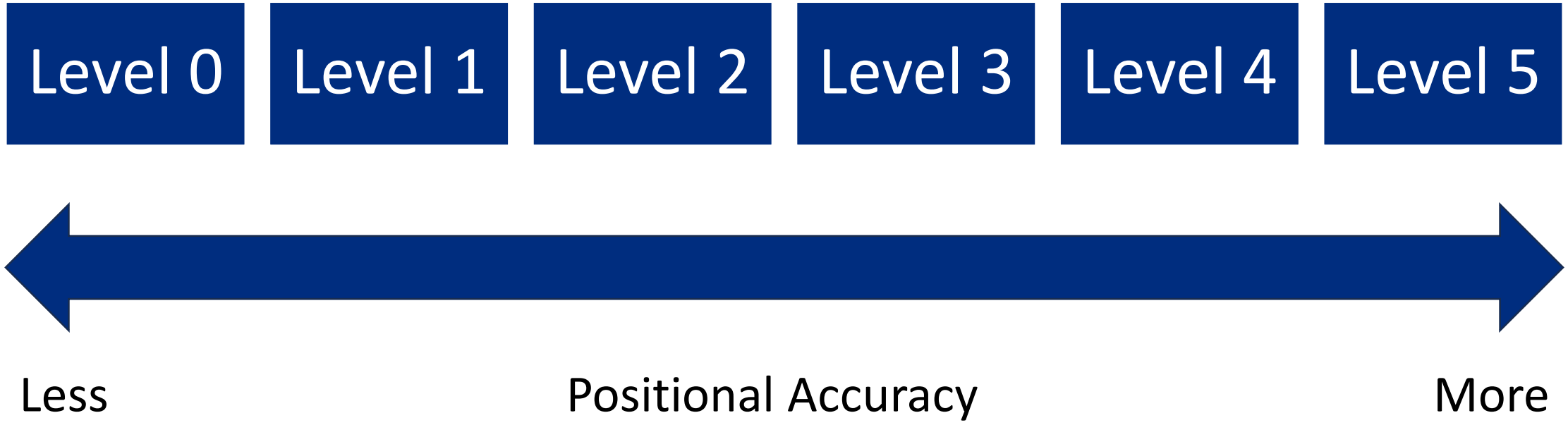
Increasing Need for Authoritative Data

Full automation requires more authoritative data



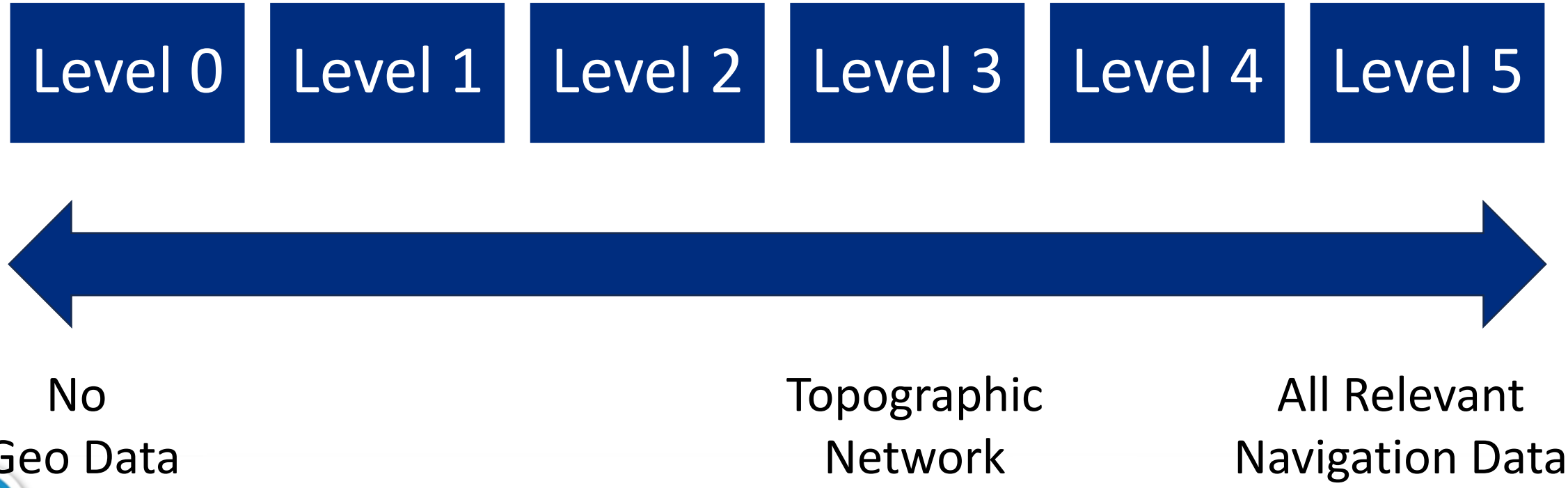
Positional Accuracy

Full automation requires data higher positional accuracy
Geodesy plays an important role in localization



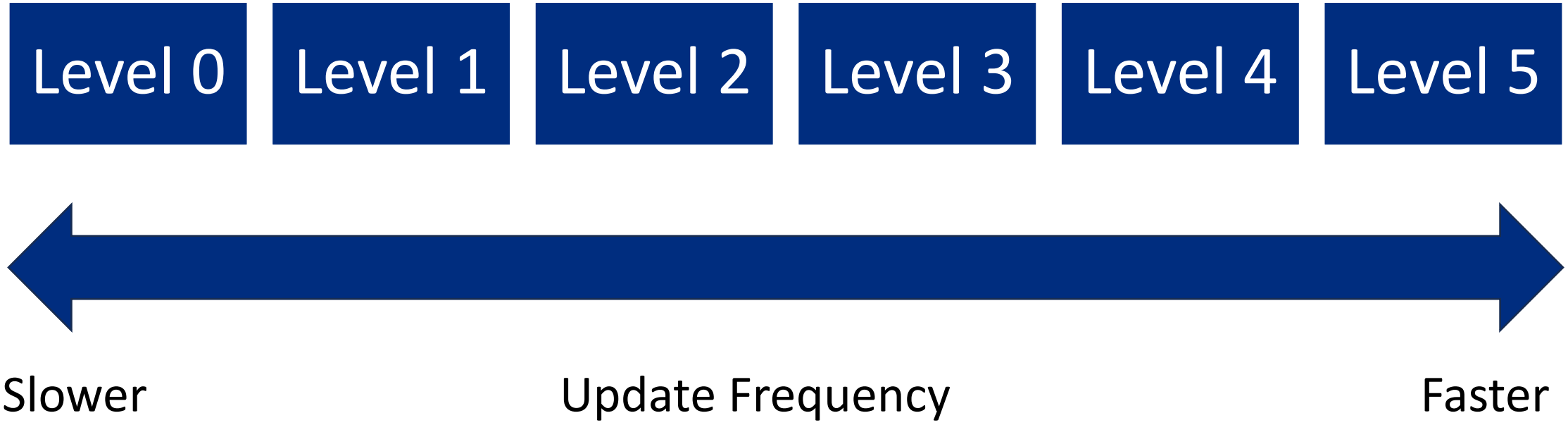
Increasing Need for Geospatial Content

Full automation requires more geospatial features
More features needed at higher automation levels



Change Management – Detect and Update

Full automation requires data be updated more frequently
Update Frequency is Dependent on Hazard Level



Perhaps Existing GIM Frameworks Can Help

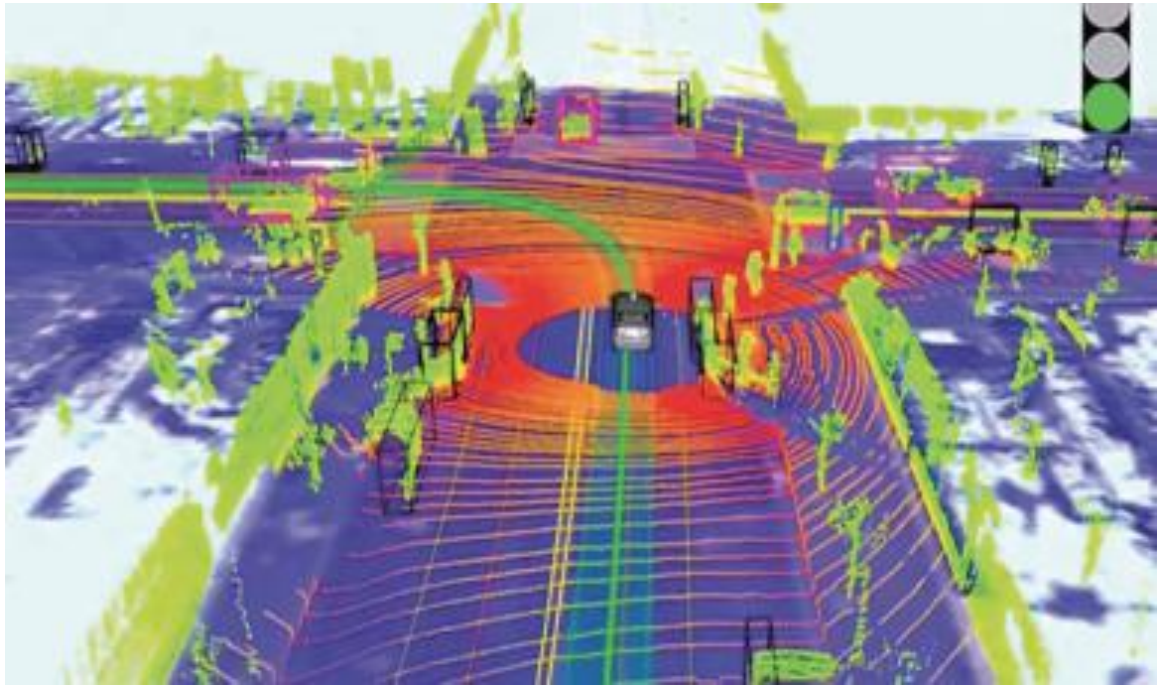
HD Maps and Navigation Charts

- Airplanes and ships use Navigational Charts to inform navigation
- HD maps are starting to the share the same characteristics as Navigation Charts

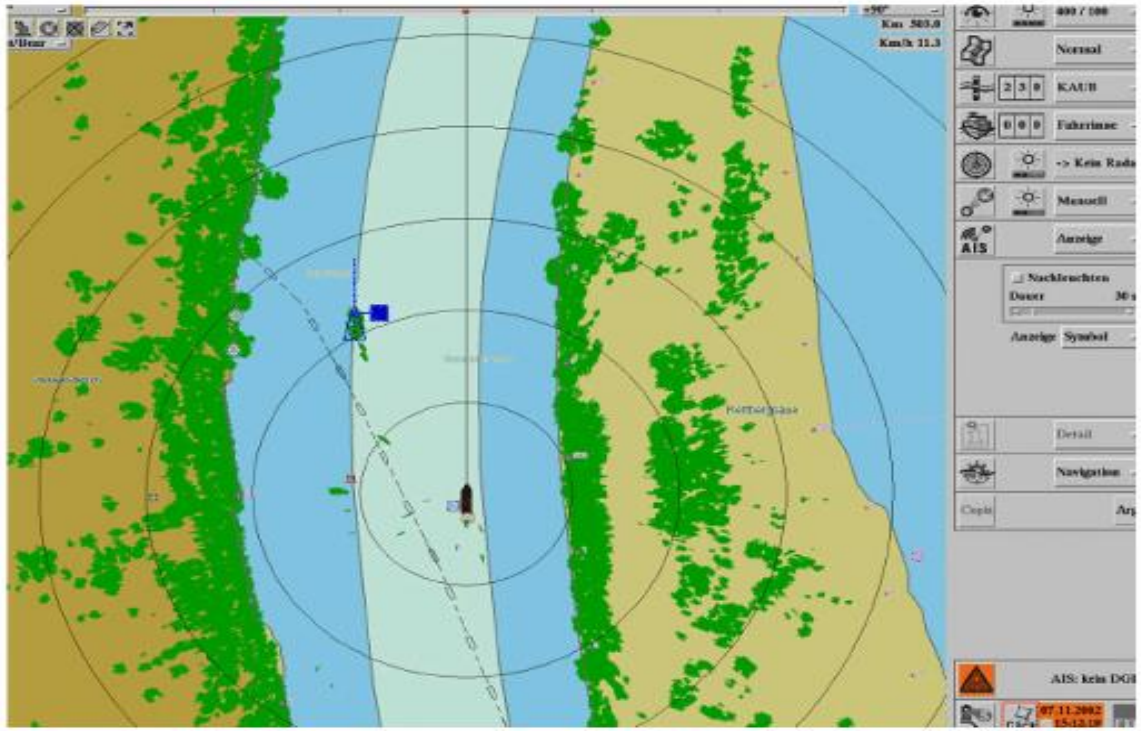
Characteristic	Map	HD Map	Navigation Chart
Authoritative	X	X	✓
Cartographic Liability (Negligence)	X	✓	✓
Product Liability (Defective Chart)	X	✓	✓
Large Scale	X	✓	✓
Working Document (Must be Maintained)	X	X	✓
Inform Navigation (Hazard Avoidance)	X	✓	✓
Inform Routing (Efficient Network Traversal)	✓	✓	✓

HD Maps and Nautical Charts

HD map



Inland Nautical Chart



Relevance

Why does this matter?

Framing HD Maps as Navigation Charts clarifies their purpose

To promote safe navigation and facilitate commerce

Knowing the data's purpose enables us to define the processes and characteristics that make the data authoritative

In this case, authoritative data means the data is fit for the automated safe navigation of AVs across the nation's road network

Can we leverage existing charting frameworks to address some of the challenges of providing Automated Routing and Navigation Data?

Conclusion

- Explore challenges around collecting, publishing, maintaining, and archiving geospatial data fit for automated routing and navigation

- Explore roles within the Automated Routing and Navigation Ecosystems
  - National Governments
  - Subnational Jurisdictions
  - Privates Industry
  - Non-Government Organizations

- Considered through market-based, rights-based, & risk-based approaches

Questions?

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Saudi Arabian National Geospatial Ecosystem

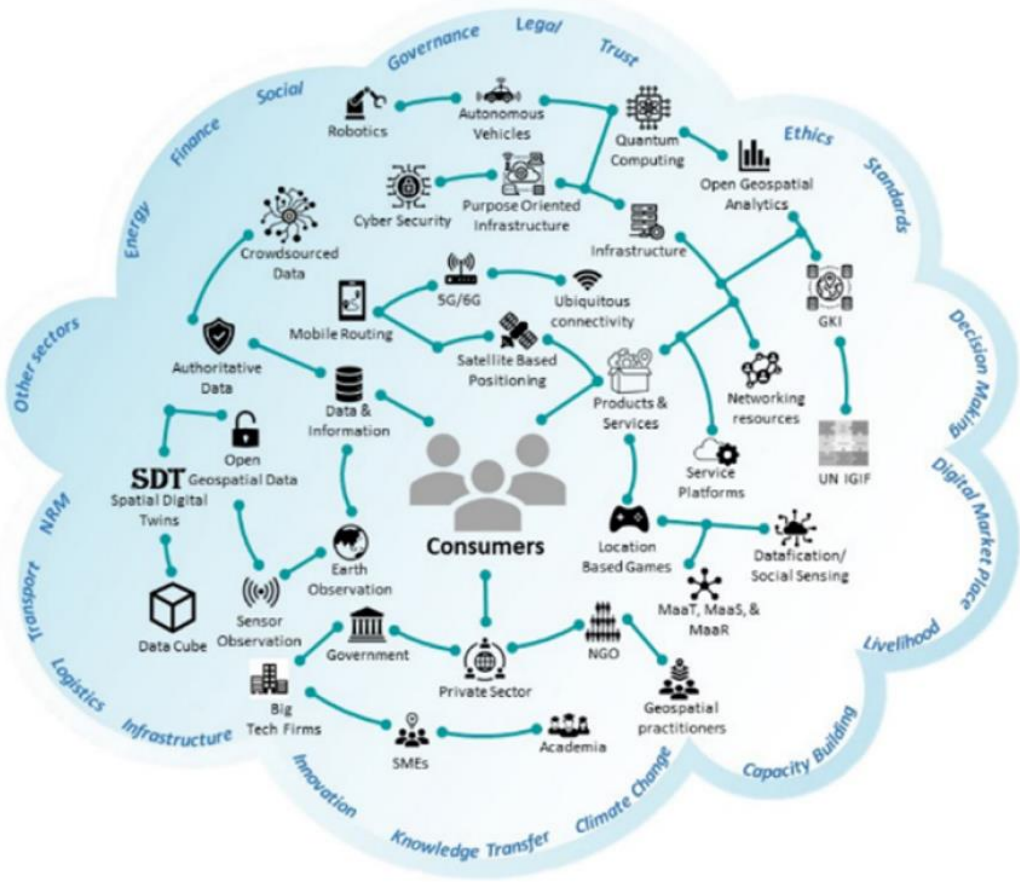
Establishment Phase

2023-2025

Geospatial Ecosystem

A Geospatial Ecosystem is where people from all over the world interact with each other directly or indirectly, utilizing dependable and accurate location-based data and advanced geo-analytics conveyed through dynamic geomedia or open computing environments. Like a natural Ecosystem, Geospatial Ecosystems are marked by solid interrelationships between actors and their surroundings, constant adaptation, and the potential for significant transformations resulting from certain events.

Source: Towards a sustainable Geospatial Ecosystem beyond SDIs



CONSUMERS & CONTRIBUTORS

Specialized services for scientists, experts, decision-makers, politicians, and the general population.

E-GOV PROCEDURES

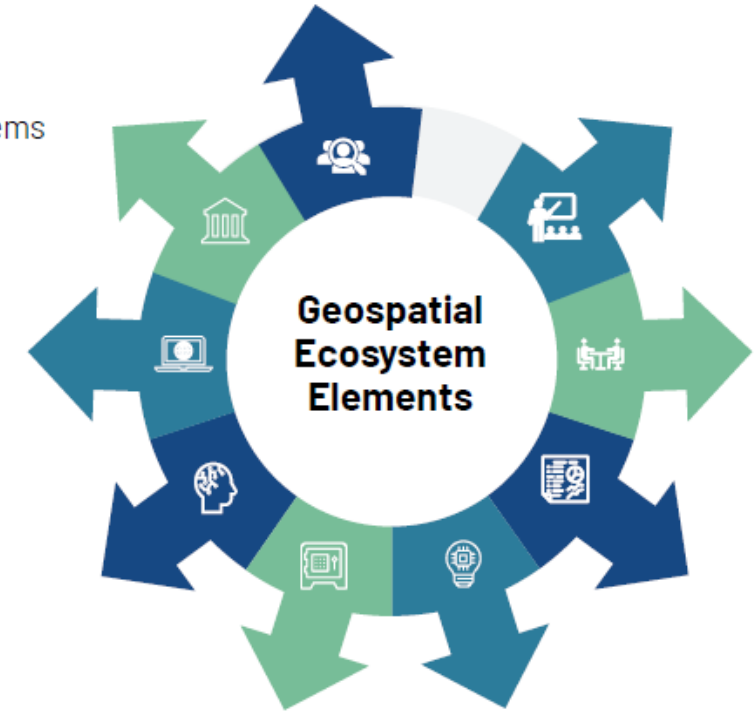
Presence of sophisticated and interconnected e-governance systems and procedures.

ANALYTICAL SOFTWARE

Software and systems that provide predictive and prescriptive analytics.

AI-DRIVEN SERVICES

Services that prioritize user needs and are partly driven by AI/ML.



EDUCATION

Broader services and domain-specific solutions require new ways of education.

COLLABORATION

Collaboration mechanisms among stakeholders will play a crucial role.

DATA & TECHNOLOGY

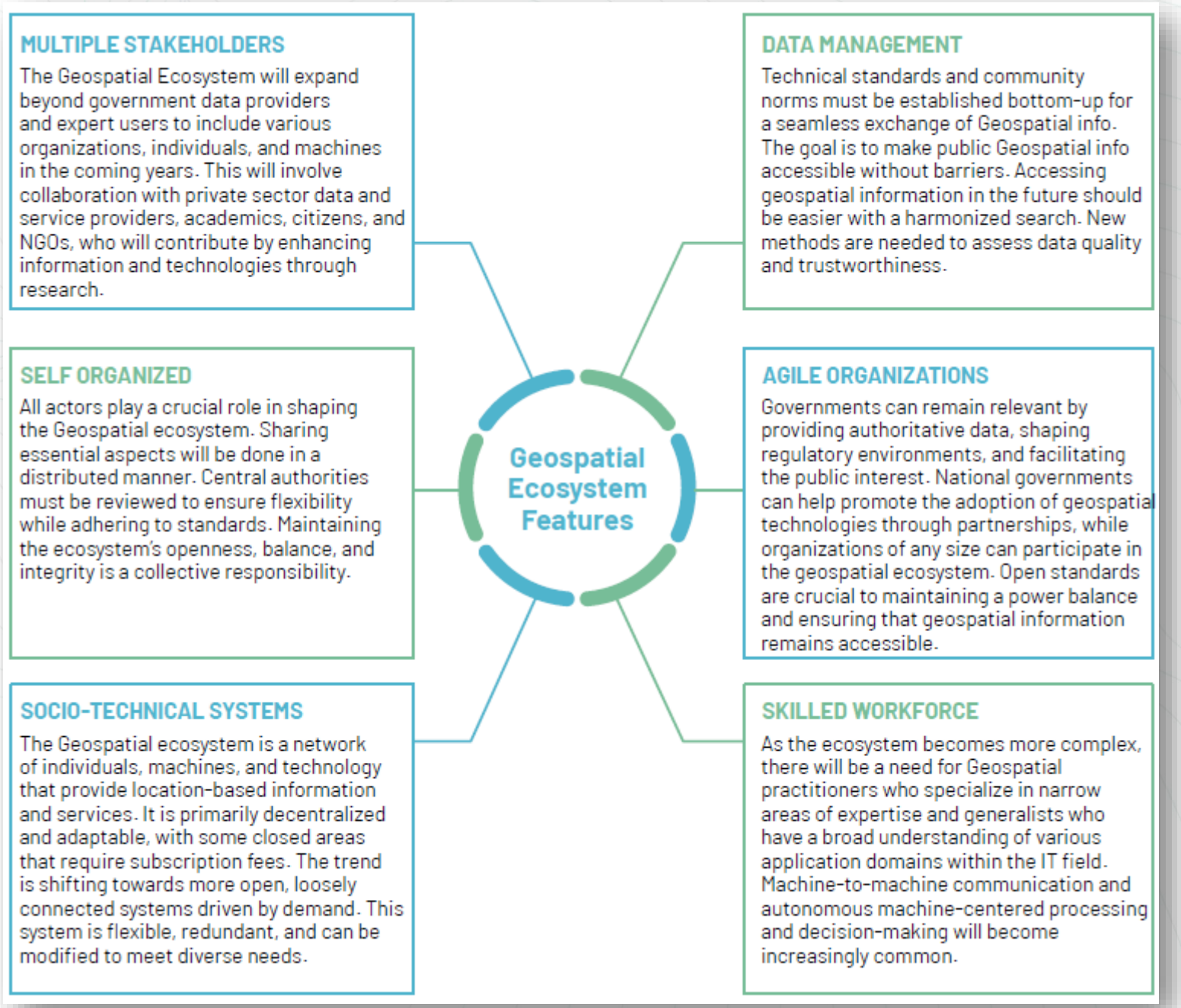
Up-to-date data licensing, and technology platforms are the new normal in the new ecosystem.

WEB-APIs

Web- APIs that allow enhanced use of data and technology.

OPEN DATA

Open data will drive innovation in the new ecosystem..


MULTIPLE STAKEHOLDERS
The Geospatial Ecosystem will expand beyond government data providers and expert users to include various organizations, individuals, and machines in the coming years. This will involve collaboration with private sector data and service providers, academics, citizens, and NGOs, who will contribute by enhancing information and technologies through research.
SELF ORGANIZED
All actors play a crucial role in shaping the Geospatial ecosystem. Sharing essential aspects will be done in a distributed manner. Central authorities must be reviewed to ensure flexibility while adhering to standards. Maintaining the ecosystem's openness, balance, and integrity is a collective responsibility.
SOCIO-TECHNICAL SYSTEMS
The Geospatial ecosystem is a network of individuals, machines, and technology that provide location-based information and services. It is primarily decentralized and adaptable, with some closed areas that require subscription fees. The trend is shifting towards more open, loosely connected systems driven by demand. This system is flexible, redundant, and can be modified to meet diverse needs.
Geospatial Ecosystem Features
DATA MANAGEMENT
Technical standards and community norms must be established bottom-up for a seamless exchange of Geospatial info. The goal is to make public Geospatial info accessible without barriers. Accessing geospatial information in the future should be easier with a harmonized search. New methods are needed to assess data quality and trustworthiness.
AGILE ORGANIZATIONS
Governments can remain relevant by providing authoritative data, shaping regulatory environments, and facilitating the public interest. National governments can help promote the adoption of geospatial technologies through partnerships, while organizations of any size can participate in the geospatial ecosystem. Open standards are crucial to maintaining a power balance and ensuring that geospatial information remains accessible.
SKILLED WORKFORCE
As the ecosystem becomes more complex, there will be a need for Geospatial practitioners who specialize in narrow areas of expertise and generalists who have a broad understanding of various application domains within the IT field. Machine-to-machine communication and autonomous machine-centered processing and decision-making will become increasingly common.

Factors Influencing Saudi Arabian Geospatial Ecosystem

1 Policy and Governance Framework

Comprehensive policies, regulations, standards, and guidelines for data collection, sharing, accessibility, quality, and privacy.

2 Data Infrastructure and Management

Develop a framework architecture & corresponding implementation for operating an efficient, distributed multi-user data infrastructure.

3 Data Standards and Interoperability

Defining national Geospatial data standards to ensure seamless data integration and interoperability across systems & applications.

4 Collaboration and Partnerships

Advance partnership efforts for data-sharing, joint research and development, participation in global Geospatial initiatives.

5 Geospatial Technology Infrastructure

Invest in the necessary Geospatial technologies, software platforms, and infrastructure to support the Geospatial Ecosystem.

6 Data Sharing and Open Data Initiatives

Establish mechanisms for data sharing with appropriate access controls while encouraging release of non-sensitive data as open data.

7 Stakeholder Engagement and Awareness

Engage with various stakeholders to raise awareness about importance and potential applications of Geospatial information.

8 Continuous Monitoring and Evaluation

Periodic data quality assessments, usability, accessibility, and feedback mechanisms for continuous improvement.

9 Human Capacities

Develop a plan to build national Geospatial data management, processing, and presentation capacity.

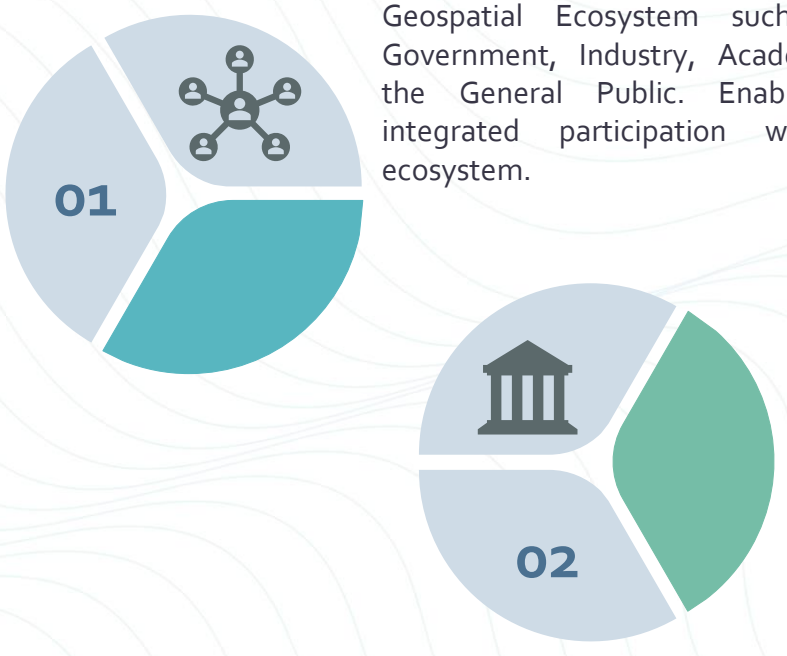
Saudi Arabian Geospatial Ecosystem High-Level Components

Consumer Engagement

Developing a network of engagement between the various stakeholders of the Geospatial Ecosystem such as the Government, Industry, Academia, and the General Public. Enabling their integrated participation within the ecosystem.

Technology Components

Serves as the infrastructure backbone enabling the operationalization of elements of the ecosystem concerning spatial data acquisition, the design and development of geospatial data products and services, and their subsequent dissemination and delivery. This would involve technology components such as automation, integrated platforms, cloud computing, connectivity solutions, and emerging technologies.



Policy, Standards and Governance

A governance framework for the ecosystem at large, guiding and structuring the interaction between the various stakeholders, inclusive of policies and standards for the design, use, and sharing of Geospatial data, products, and services.

Data Management

The establishment of a centralized data platform to handle the vast volume of geospatial data that flows through the ecosystem, in terms of consolidation, storage, cataloging, access, and retrieval.

Products and Services

Value-added Geospatial products and services developed and delivered by members of the SANGE representing government, industry, and academia to other users both general and within governments, industry, and academia.

NATIONAL GEOSPATIAL ECOSYSTEM

VISION

A sustainable, active, and nationally relevant Geospatial Ecosystem that contributes to real-world applications that require an element of Geospatial knowledge by interconnecting people, policies, practices, and processes.

MISSION

Provides a ubiquitous network of interconnected Geospatial information, products, technology, and services, enabling the delivery of knowledge-based insights to facilitate a bottom-up approach to problem-solving and decision-making.

OBJECTIVES

- Create a secure, shared network based on commonly agreed-upon Geospatial principles, policies, and standards.
- Connect diverse stakeholders for Geospatial data and solutions partnerships.
- Integrate existing datasets within the Saudi Arabian Geospatial network by adopting a shared semantics-based architecture.
- Deliver knowledge-oriented analytics and solutions for real-world problems leveraging many Geospatial infrastructures and services.
- Provide advanced visualization options to experience the Ecosystem's Geospatial data and associated non-spatial attributes.
- Adopt an intelligent automated approach limiting human interventions.
- Embrace a user-centric approach to deliver personalized Geospatial products and services.

VALUES

SYSTEMIC I DYNAMIC I USER-CENTRIC I KNOWLEDGE-BASED I AUTOMATED I SECURE I COLLABORATION & COMPETITION I FUTURISTIC

Saudi Arabian National Geospatial Ecosystem Functions

Geospatial Data

This function manages, and coordinates efforts related to Geospatial data, interoperability, semantics, streaming, processing, ontology management, and linked data management, amongst others. It also ensures the quality control of geospatial data.

Geospatial Intelligence

This function is responsible for Geospatial data analytics, visualization, and automation in the Ecosystem.

National Geospatial Platform

This function manages the National Geospatial Platform, including cloud computing, enterprise architecture, AI/ML, Big Data processing, Geospatial solutions, and user support. It includes live geospatial data activities like streaming, publishing, and managing real-time data.

Geospatial Governance

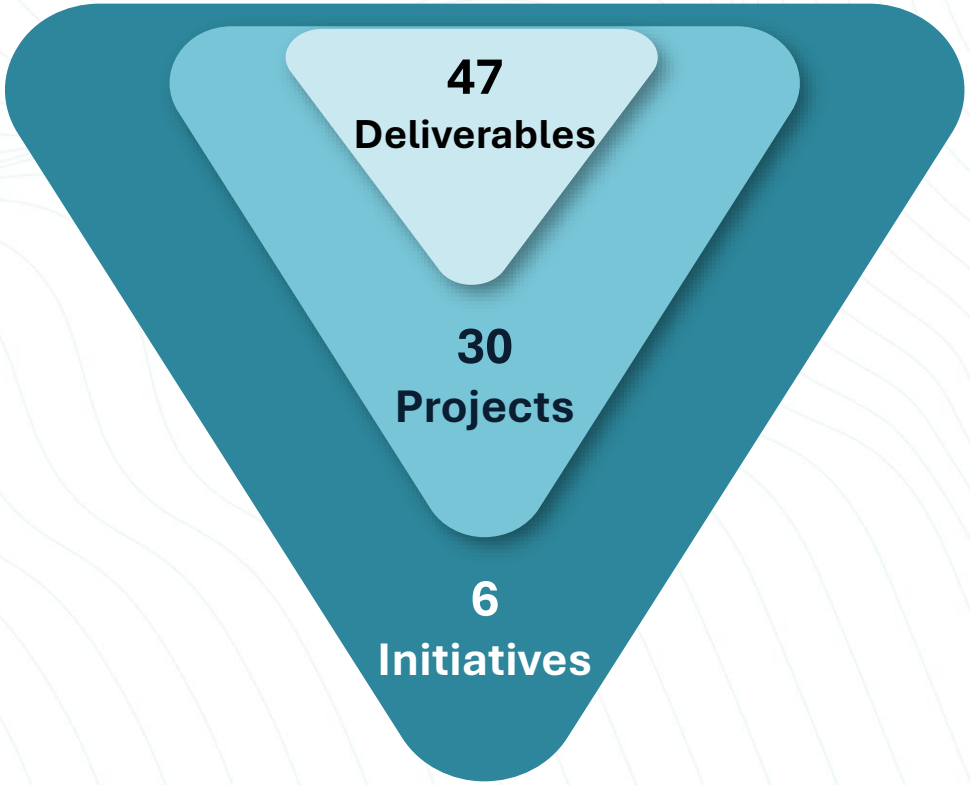
This function manages Geospatial policies, standards, advocacy, and outreach.

Geospatial Security

This function takes care of Geospatial data security, creating frameworks for data protection.

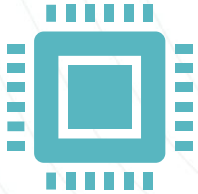
The National Geospatial Ecosystem plan is structured as **6 high-level Initiatives** with **30 associated Projects**, that ultimately culminate in achieving **47 Deliverables**.

The Ecosystem Plan



High-level Initiatives

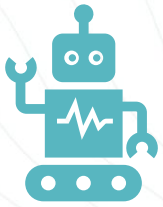
1. ENABLE ECOSYSTEM **PRACTICES**



2. OPERATIONALIZE ECOSYSTEM **SHARED INFRASTRUCTURE**

3. ENABLE ECOSYSTEM **DATA MANAGEMENT**

4. ENHANCE ECOSYSTEM **DATA ANALYTICS**



5. **AUTOMATE** ECOSYSTEM FUNCTIONALITIES

6. DELIVER AN INTEGRATED ECOSYSTEM **ARCHITECTURE**

Annual Focus Areas

Year 1 – 2024

Laying the Ecosystem Foundation

Year 1 Key Deliverables

- An informed, engaged, and supportive partner and end user ecosystem.
- A clear definition and understanding of the foundational building blocks of the geospatial ecosystem.

Year 2 – 2025

Building Infrastructure and Data Capabilities

Year 2 Key Deliverables

- A fully operational system underpinning the Geospatial Ecosystem concept.
- The core NGC capabilities established and delivering valuable services to end users and consumers.

Year 3 – 2026

Delivering Intelligence and Value

Year 3 Key Deliverables

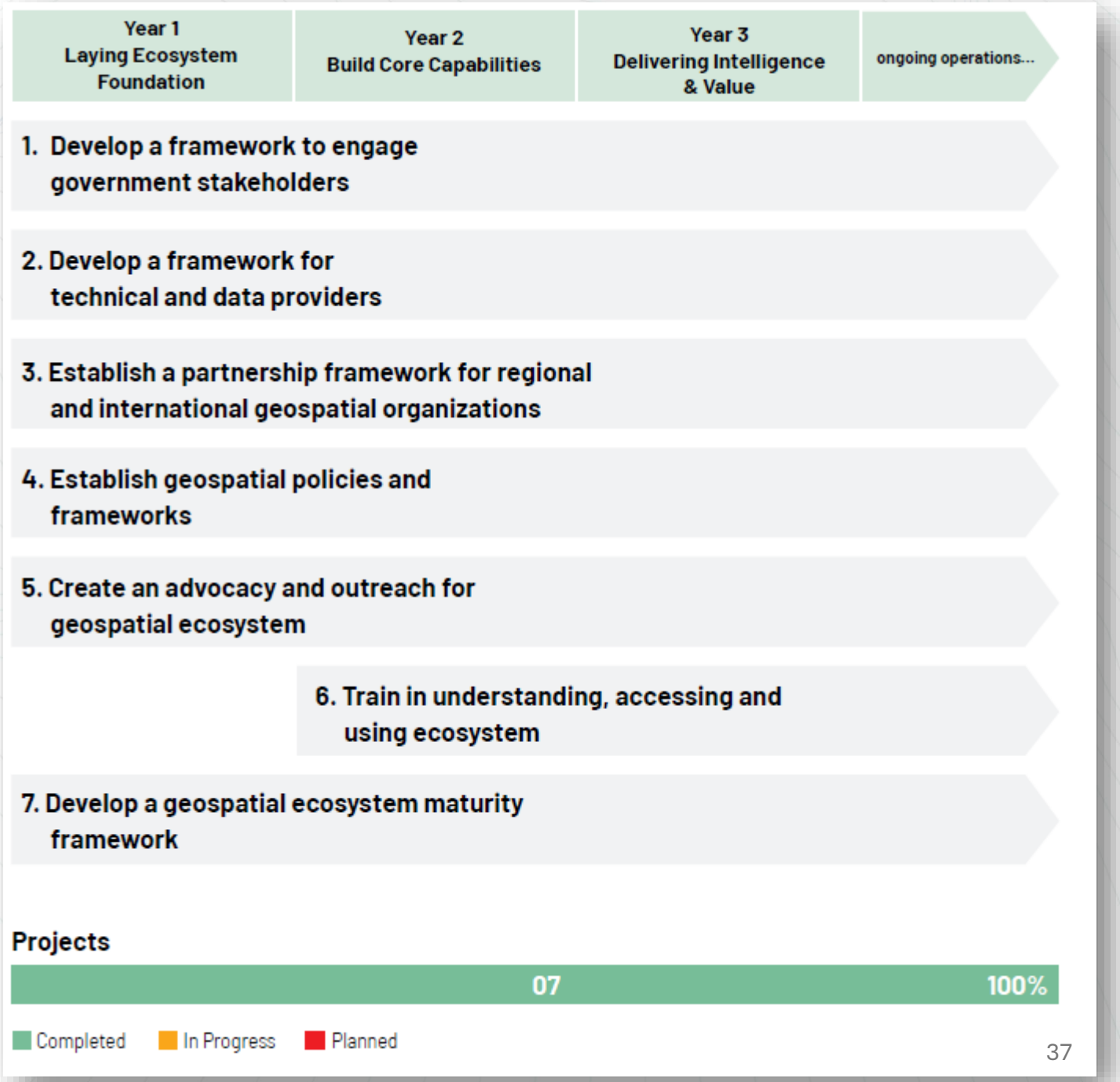
- Advanced analytics (such as MaaS, MaaT, MaaP).
- Advanced visualization (such as Digital Twins, extended reality and metaverse.

High-level Roadmap Schedule by Initiatives

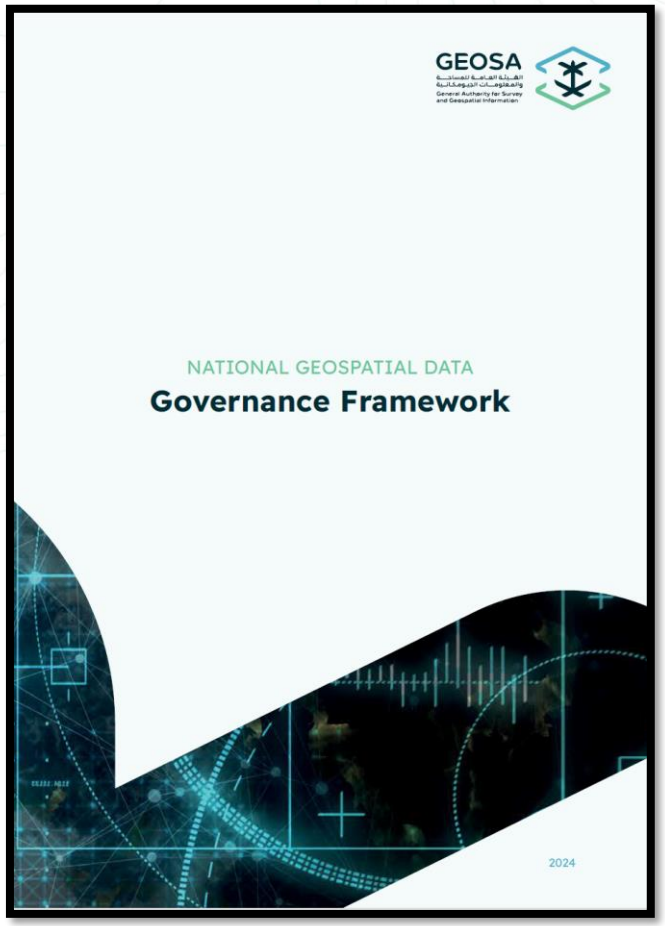
	Year 1 Laying Ecosystem Foundation	Year 2 Build Core Capabilities	Year 3 Delivering Intelligence & Value	ongoing operations...
1. ENABLE ECOSYSTEM PRACTICES	ENABLE ECOSYSTEM PRACTICES	Maintain, Monitor & Evolve		
2. OPERATIONALIZE ECOSYSTEM SHARED INFRASTRUCTURE	OPERATIONALIZE ECOSYSTEM SHARED INFRASTRUCTURE	Maintain, Monitor & Evolve		
3. DELIVER AN INTEGRATED ECOSYSTEM ARCHITECTURE	DELIVER AN INTEGRATED ECOSYSTEM ARCHITECTURE	Maintain, Monitor & Evolve		
4. ENABLE ECOSYSTEM DATA MANAGEMENT	ENABLE ECOSYSTEM DATA MANAGEMENT & INTEROPERABILITY	Maintain, Monitor & Evolve		
5. ENHANCE ECOSYSTEM DATA ANALYTICS		ENHANCE ECOSYSTEM DATA ANALYTICS & ADVANCED VISUALISATIONS	Maintain, Monitor & Evolve	
6. AUTOMATE ECOSYSTEM FUNCTIONALITIES		AUTOMATE ECOSYSTEM FUNCTIONALITIES	Maintain, Monitor & Evolve	

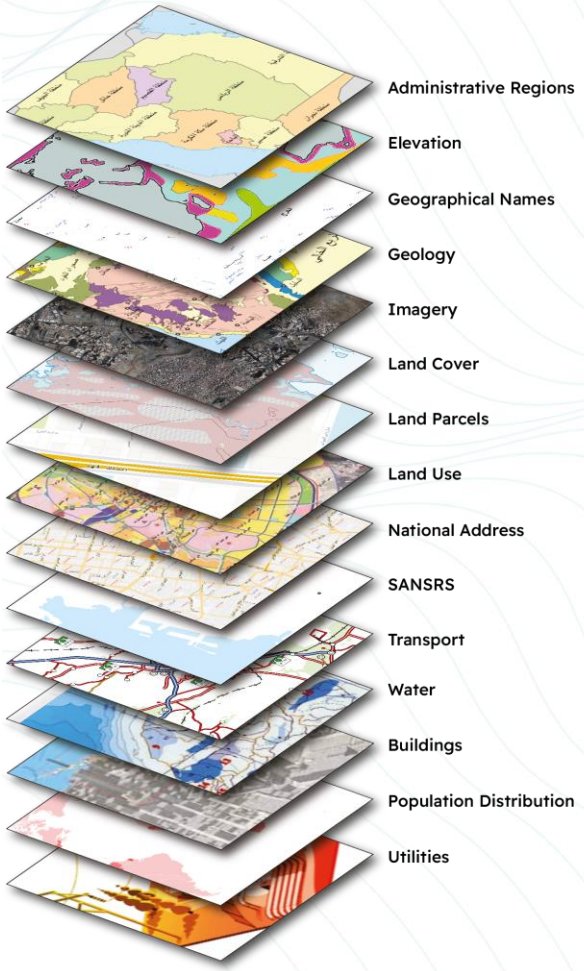
Initiative 1

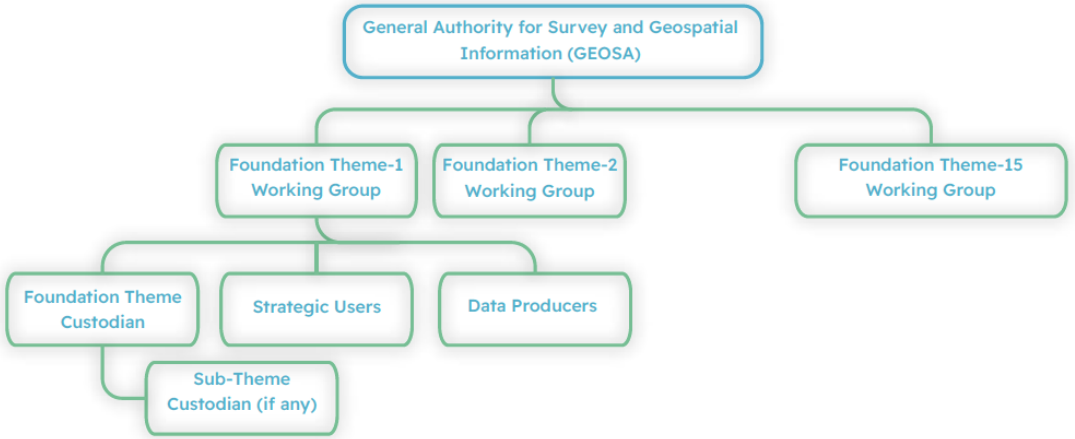
Enable Ecosystem Practices



PR1: Develop a framework to engage government stakeholders







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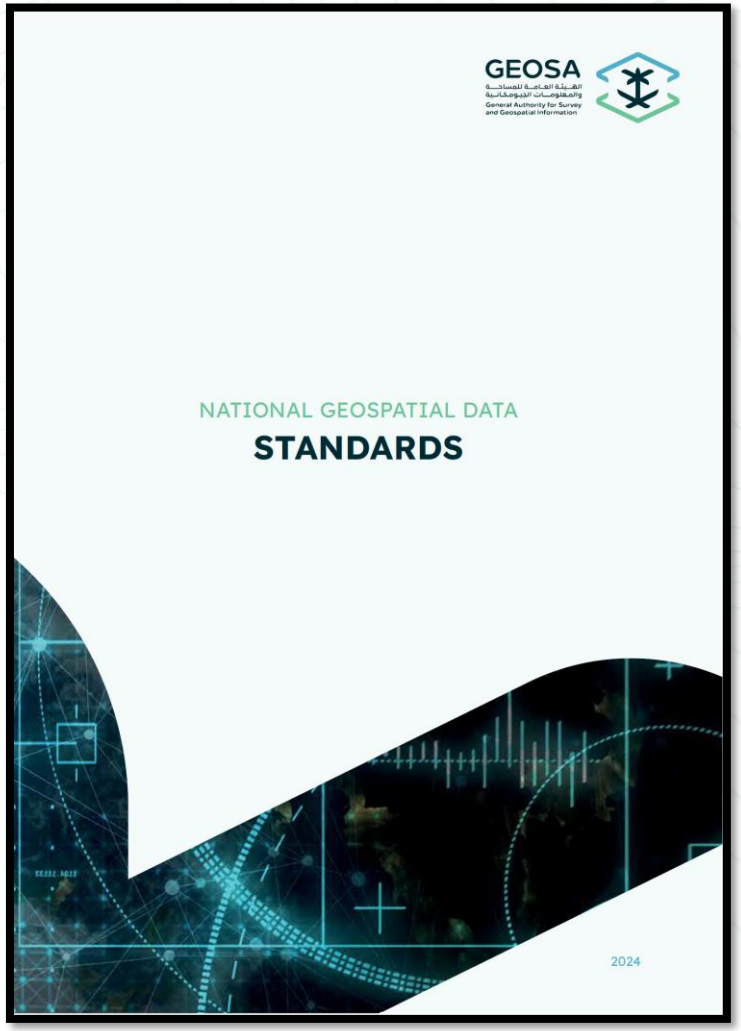
PR2: Develop a framework for technical and data providers



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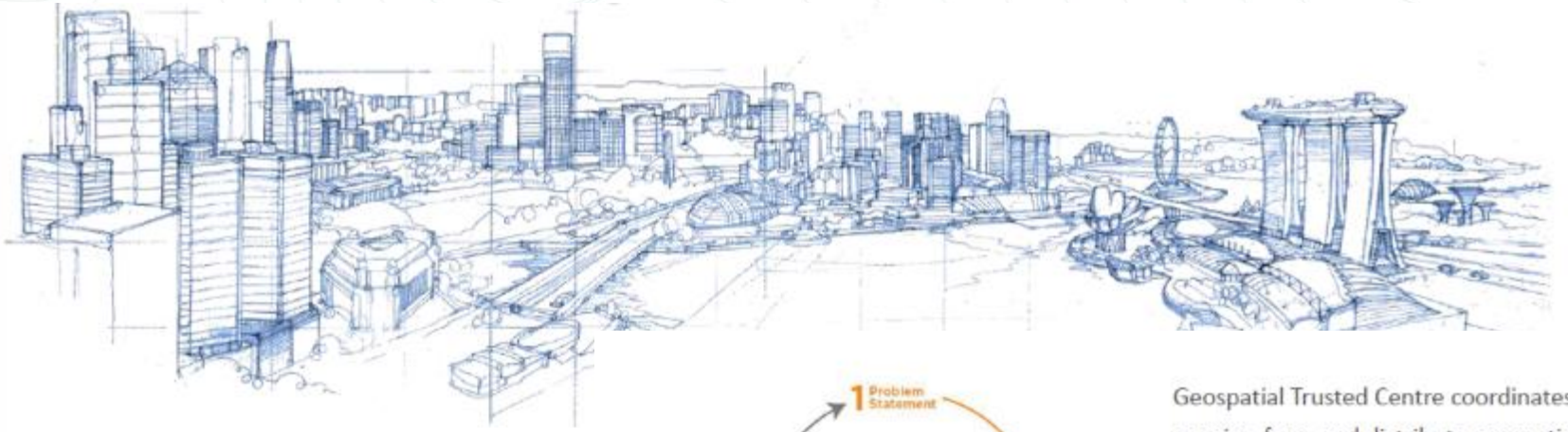
PR2: Develop a framework for technical and data providers

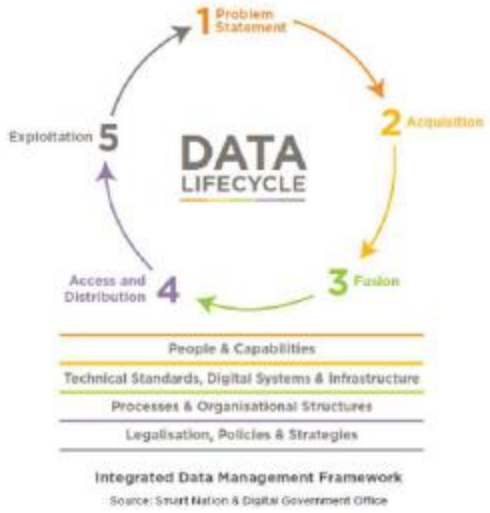
100 %

Completed

PR3: Establish a partnership framework for regional and international geospatial organizations

SLA & GEOSA Collaboration

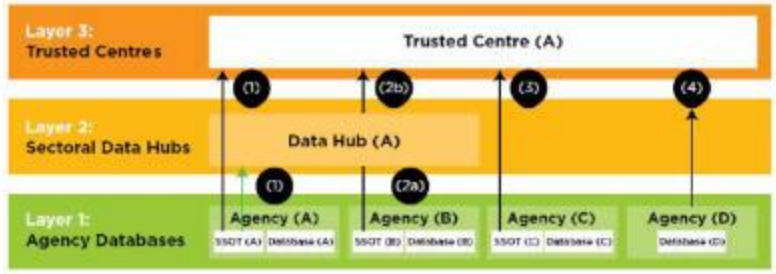




Integrated Data Management Framework

Source: Smart Nation & Digital Government Office

Geospatial Trusted Centre coordinates data source agencies to acquire, fuse, and distribute geospatial data via GeoSpace for Whole-of-Government use.



Overview of the new Government Data Architecture

Source: Smart Nation & Digital Government Office

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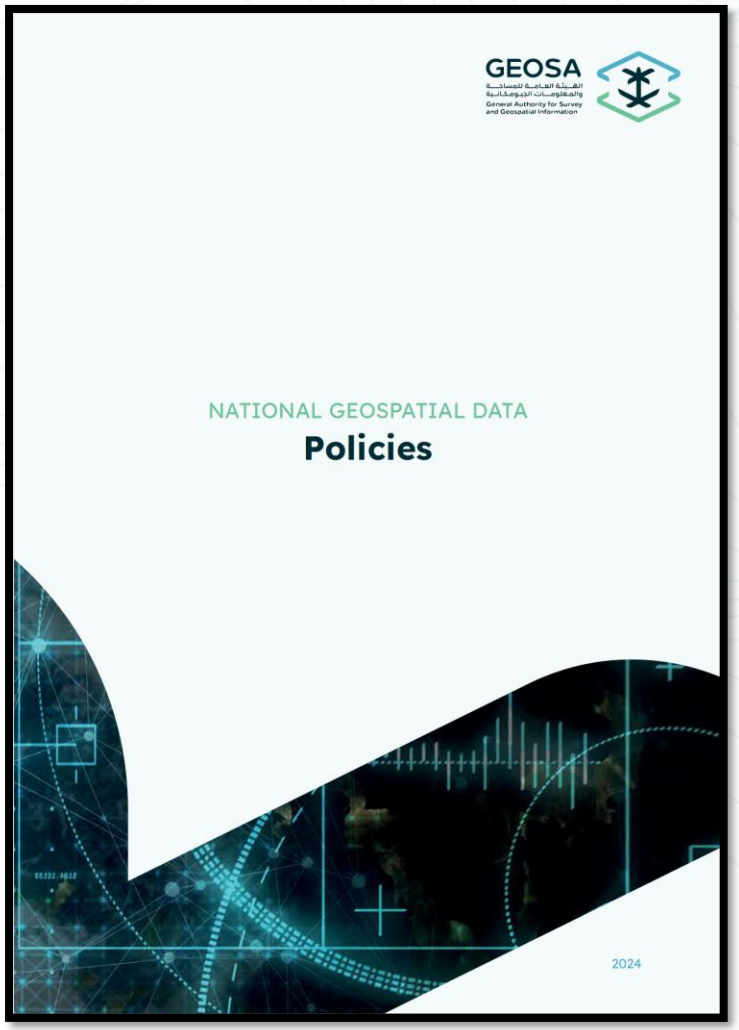
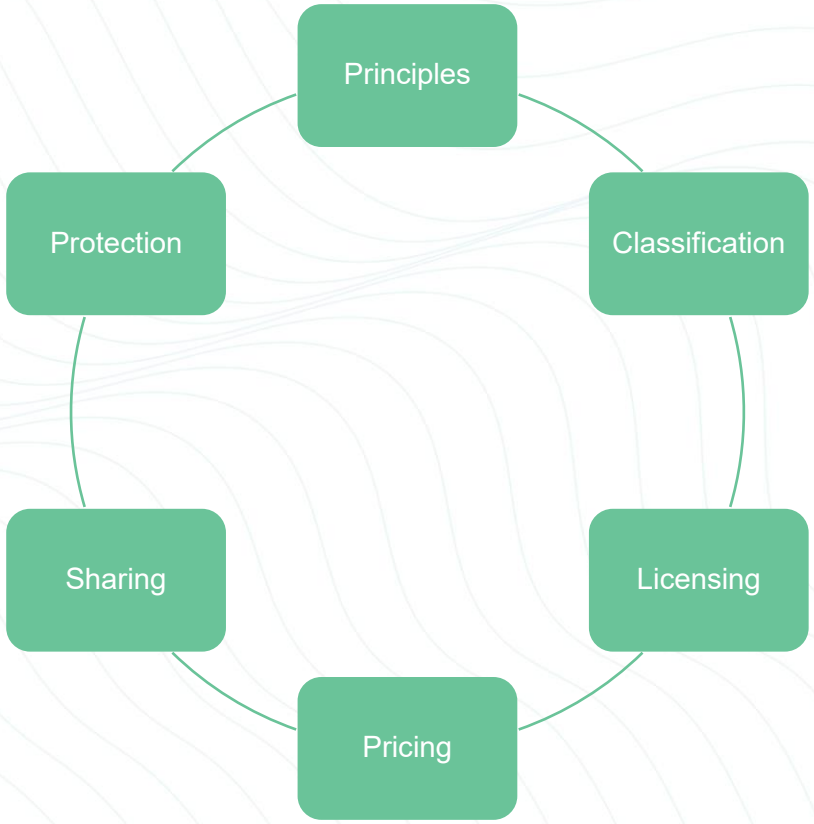
Completed

PR4: Establish geospatial policies and frameworks





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PR5: Create an advocacy and outreach for geospatial ecosystem

S. No.	Event Name	Date	Place	Participation
1.	OGC Saudi Arabia Forum	December 2023	Riyadh, Saudi Arabia	Presentation
2.	World Defense Show	February 2024	Riyadh, Saudi Arabia	Exhibit only
3.	UN-GGIM: AS Plenary Meeting	February 2024	Doha, Qatar	Presentation
4.	UN-GGIM WG on Policy and Legal Frameworks	February 2024	Leuven, Belgium	Presentation
5.	LEAP24	February 2024	Riyadh, Saudi Arabia	Present and exhibit
6.	Geospatial World Forum 2024	May 2024	Rotterdam, The Netherlands	Present and exhibit
7.	UN-GGIM 14th Plenary Meeting	August 2024	New York, United States	Presentation
8.	Saudi Infrastructure EXPO	September 2024	Riyadh, Saudi Arabia	Present and exhibit
9.	National Geospatial Platform Forum 2024	October 2024	Riyadh, Saudi Arabia	Presentation
10.	ISO/TC 211 Meeting	November 2024	Sydney, Australia	Presentation
11.	GeoWorld 2024	November 2024	Dubai, UAE	Present and exhibit
12.	UN-GGIM: AP 13th Plenary Meeting	November 2024	New Delhi, India	Presentation
13.	COP16	December 2024	Riyadh, Saudi Arabia	Exhibit only

100 %

Completed

PR5: Create an advocacy and outreach for geospatial ecosystem

S. No.	Event Name	Date	Place	Participation
14.	ESRI Saudi Arabia User Conference	January 2025	Riyadh, Saudi Arabia	Present and exhibit
15.	UN-GGIM: AS 12th Plenary Meeting	February 2025	Jeddah, Saudi Arabia	Presentation
16.	LEAP24	February 2025	Riyadh, Saudi Arabia	Exhibit only
17.	Geospatial World Forum 2025	April 2025	Madrid, Spain	Present and exhibit
18.	ISRPRS Geospatial Week	April 2025	Dubai, UAE	Exhibit only
19.	ESRI User Conference	July 2025	Sandiego, USA	Exhibit only

PR5: Create an advocacy and outreach for geospatial ecosystem

National Geospatial Governance Awareness-Raising Workshops

40	6	+1200	+100	2	16	20
Hours	Regions	Participants	Organizations	Months	Workshops	Sectors

Raise Awareness of Geospatial Governance

- Enhance participants' understanding of national geospatial governance concepts and their importance in organizing spatial data

Geospatial Governance Framework overview

- Provide a detailed explanation of policies, standards, and guidelines related to national geospatial governance

Empower Entities for Effective Participation

- Build capabilities and provide effective communication channels to enhance the participation of various entities in the geospatial governance system

PR5: Create an advocacy and outreach for geospatial ecosystem

National Geospatial Governance Awareness-Raising Workshops

100 %

Completed

PR5: Create an advocacy and outreach for geospatial ecosystem

National Geospatial Governance Awareness-Raising Workshops

100 %

Completed

PR5: Create an advocacy and outreach for geospatial ecosystem

National Geospatial Governance Awareness-Raising Workshops

100 %

Completed

PR6: Train in understanding, accessing and using ecosystem

GEOSA
الهيئة العامة للمساحة والمعلومات الجيومكانية
General Authority for Survey and Geospatial Information

Open Geospatial Consortium

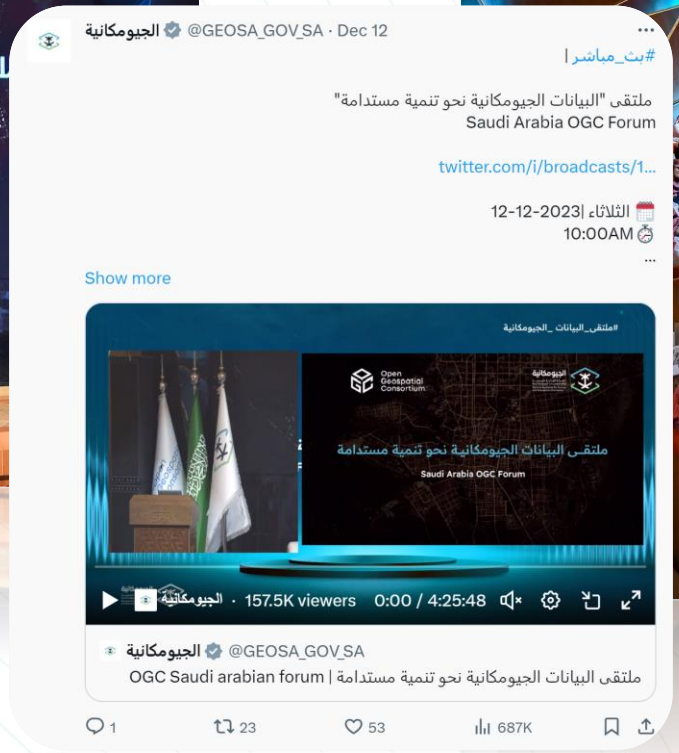
Participants

+2000

100 %

Completed

PR6: Train in understanding, accessing and using ecosystem



Participants

687k +

100 %

Completed

PR6: Train in understanding, accessing and using ecosystem

UNIVERSITY OF Redlands

Trainees

23

100 %

Completed

PR6: Train in understanding, accessing and using ecosystem

Module 1

Geo AI Fundamentals

- High-level introduction to Geo AI and Geo AI concepts, techniques, and technologies.

Module 2

Geo AI Trends

- Latest innovations in Geo AI, including knowledge graphs, generative Geo AI, and AI orchestration.

Module 3

Geo AI Governance

- Sustainable Geo AI ecosystem, including AI ethics and inclusion, data sovereignty, and organizational AI policies.

Module 4

Geo AI investment

- Workforce development, AI readiness, digital infrastructure.

Trainees

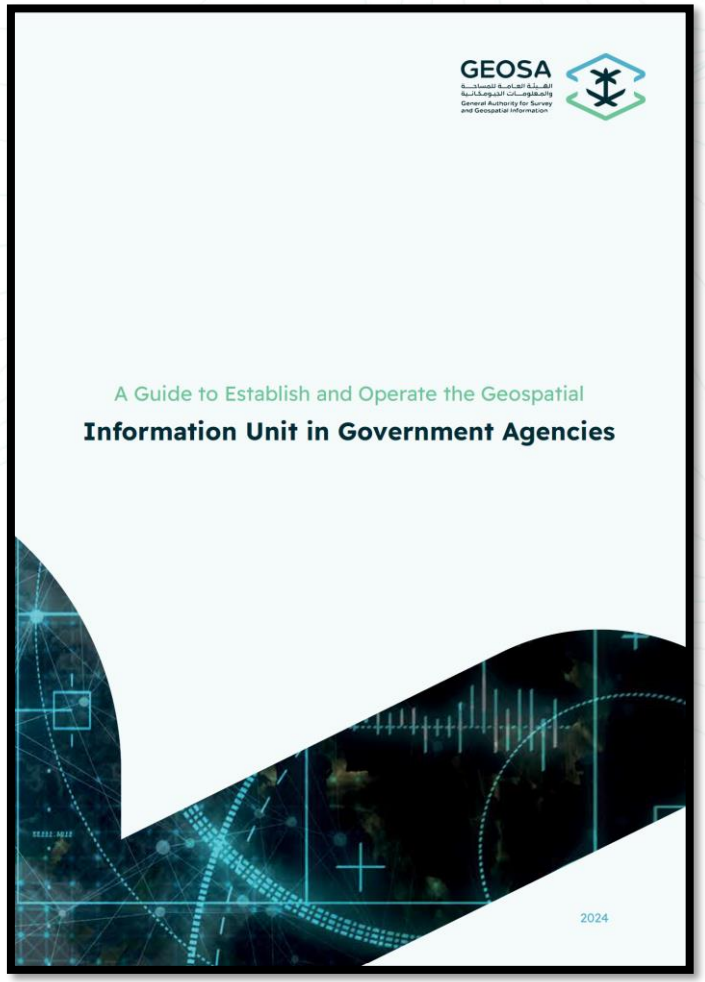
25

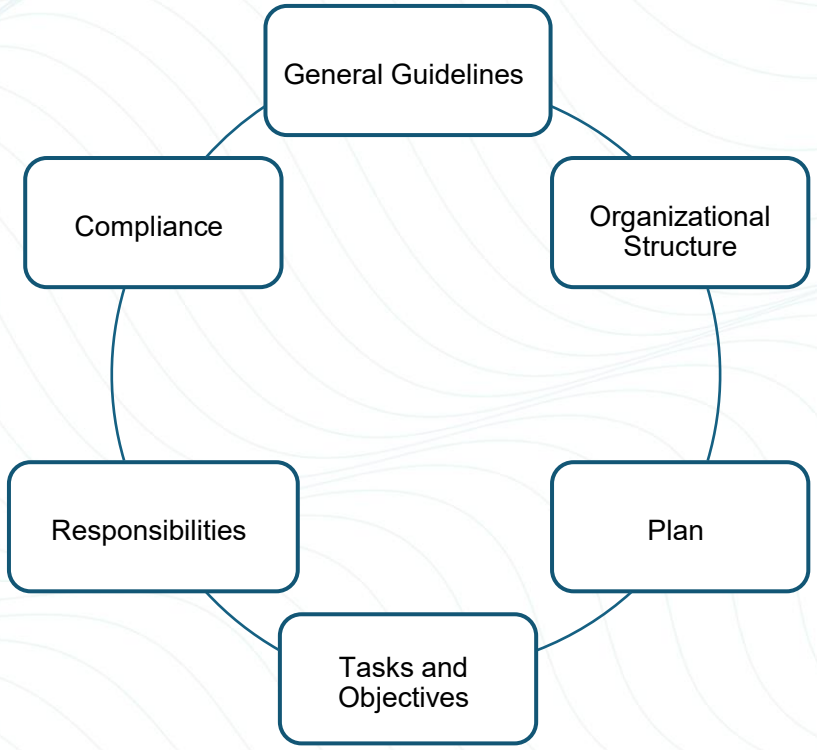
RMIT UNIVERSITY

100 %

Completed

PR7: Develop a Geospatial Ecosystem Maturity Framework





Measuring Commitment

Raising the levels of commitment of entities to the controls and conditions issued by the GEOSA regarding the establishment and operation of the Geospatial Information Unit in government agencies.

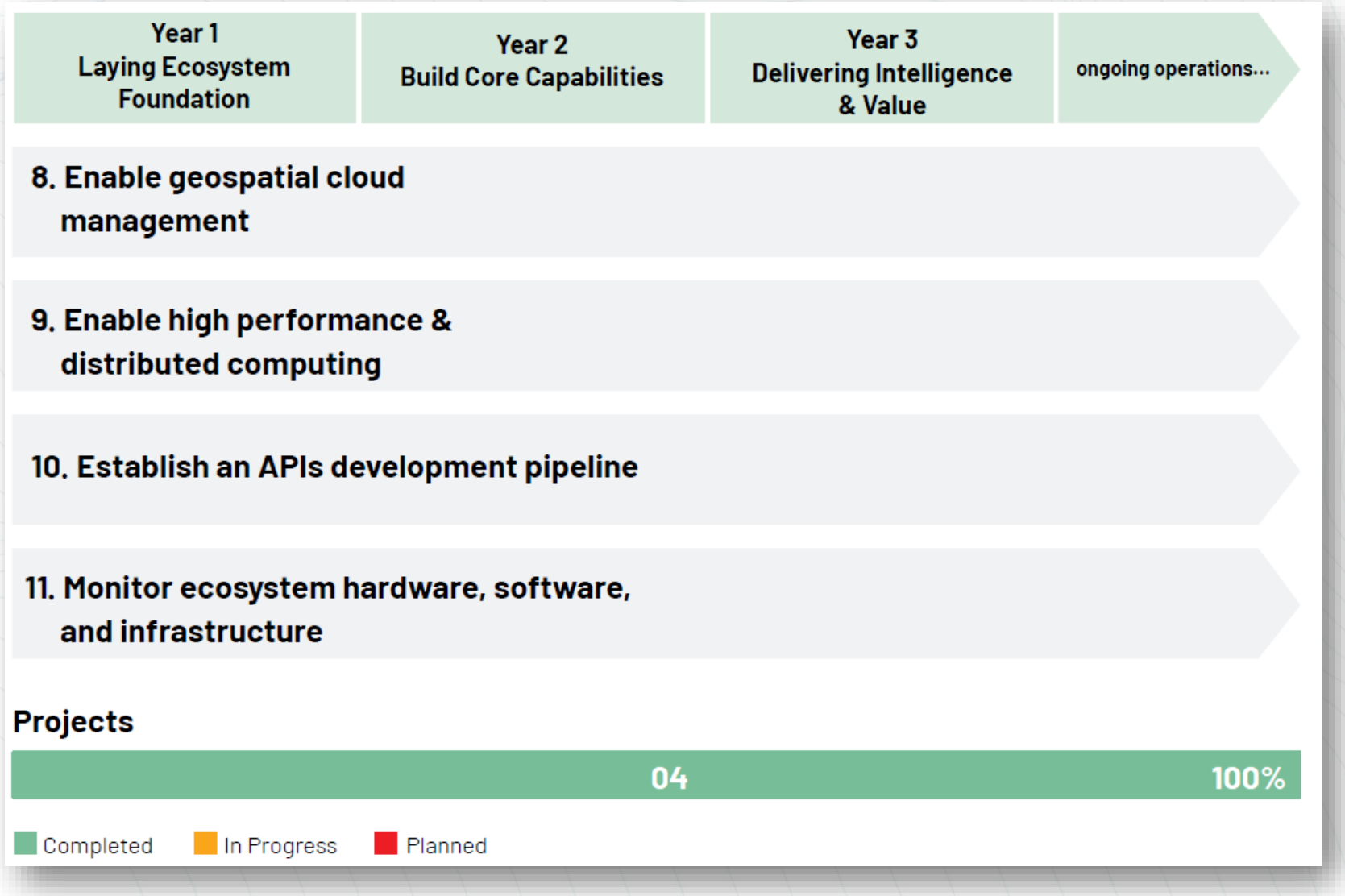
Compliance Mechanism | Compliance Matrix | Compliance Standards | Compliance Cycle

100 %

Completed

Initiative 2

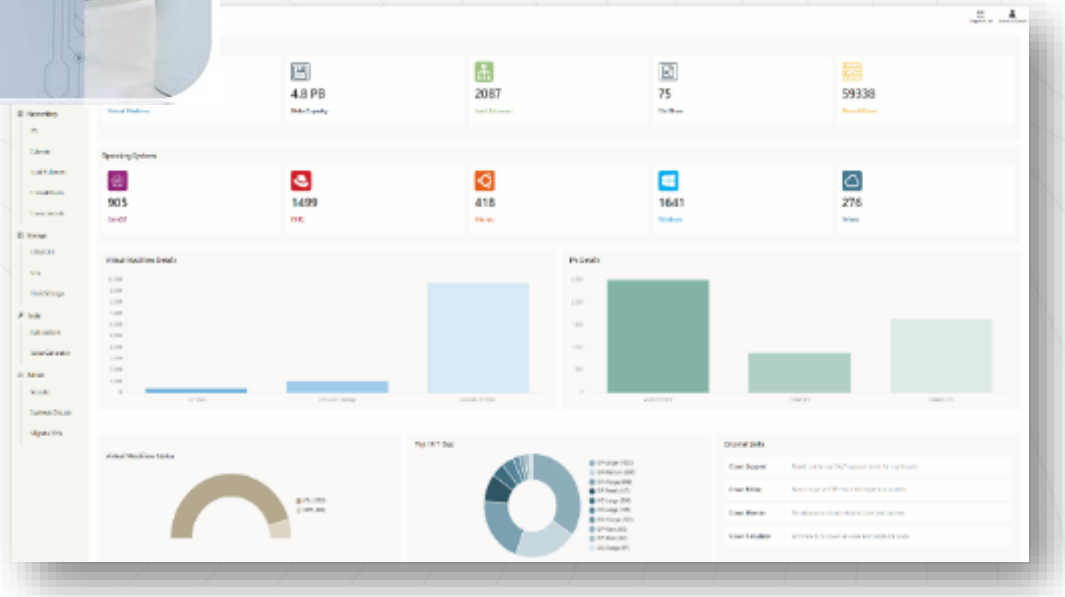
Operationalize Ecosystem Shared Infrastructure



PR8: Enable Geospatial Cloud Management

Geospatial Cloud Portal

Cloud offers an automated marketplace with a variety of cloud products, which can be accessed directly from the portal. It enables the client to **provision infrastructure resources, enforce security polices,** optionally assign public IP and many other services. Clients are also able to track all **changes and requests** within the portal.

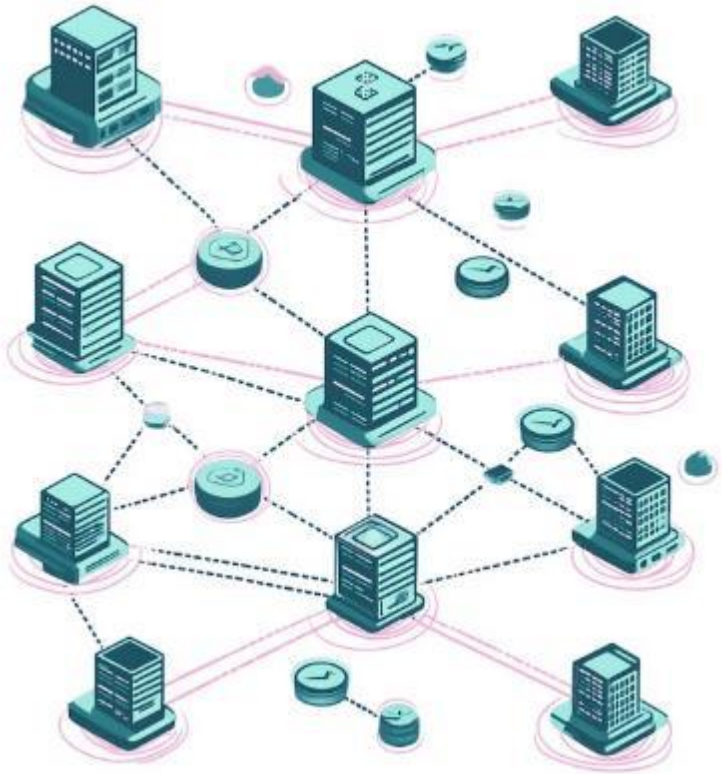


100 %

Completed

PR9: Enable high performance & distributed computing

Cloud currently does not offer distributed computing as a dedicated service. However, **clients can utilize Cloud's virtual machine (VM)** offerings to configure **clusters** for **running distributed computing** workloads.
Alternatively, for clients with existing distributed computing environments on-premises, **Cloud provides bare metal services**, including the Bring Your Own Bare Metal (BYO-BM) option, allowing them to move their on-premises setup in the cloud.



Distributed Computing

100 %

Completed

PR10: Establish an APIs development pipeline

Academia

+22

Private

+52

Government

+90

Web Service

+500

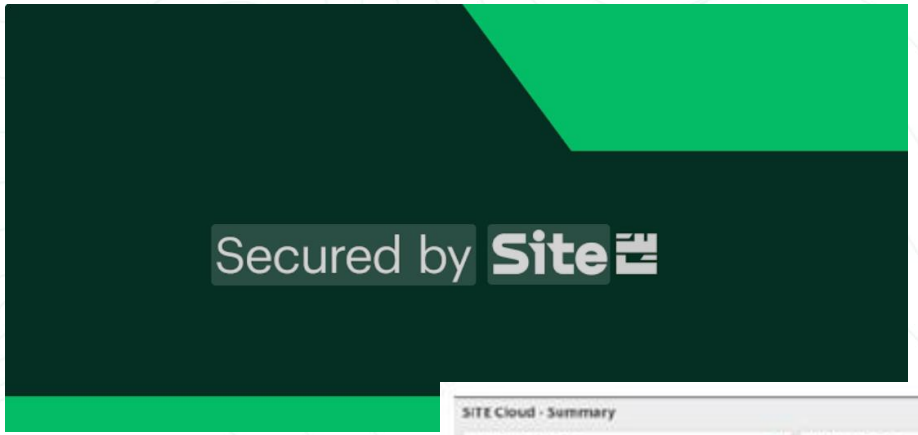
Data Request

+2K

100 %

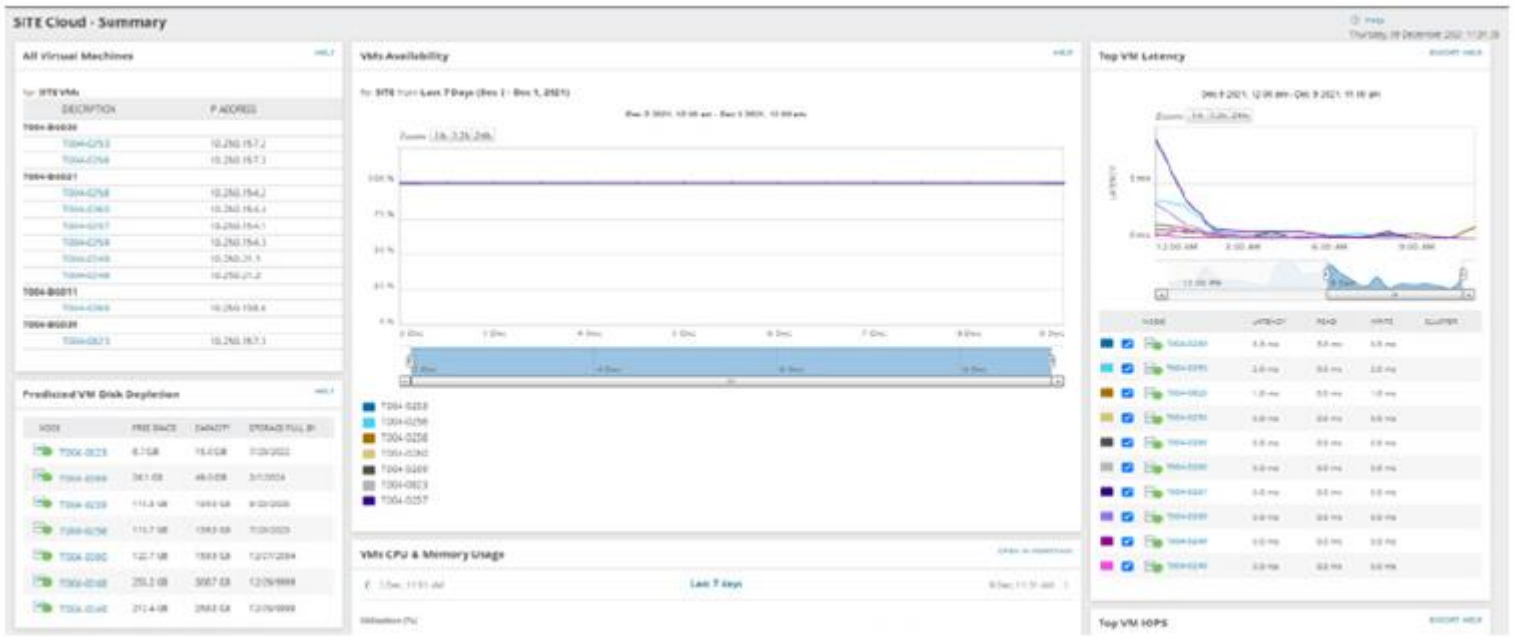
Completed

PR11: Monitor Ecosystem hardware, software, and infrastructure



Monitoring Portal

Monitoring Tool to view and monitor the availability and utilization of the client's provisioned resources such as CPU, RAM, Storage and capacity.

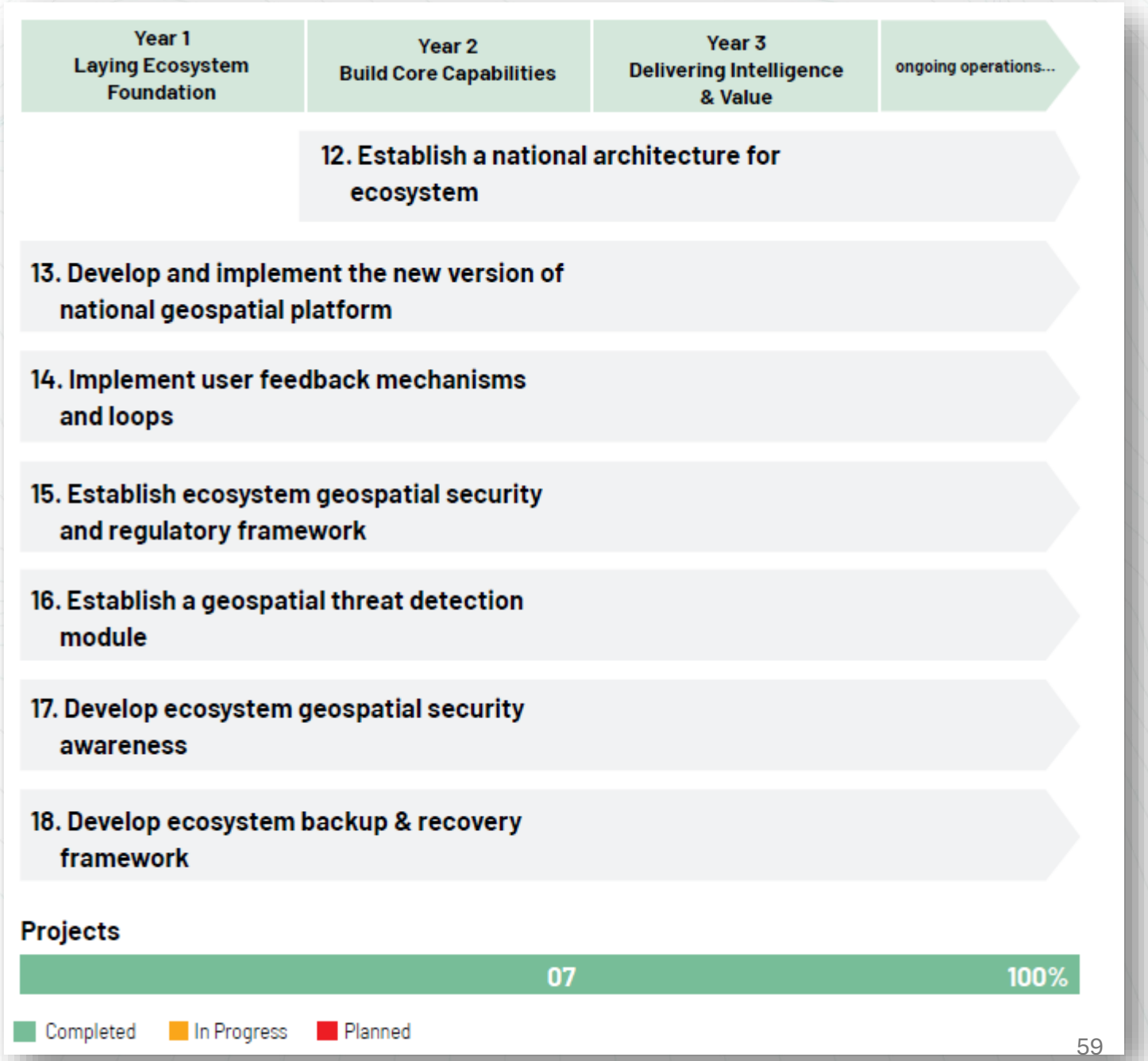


100 %

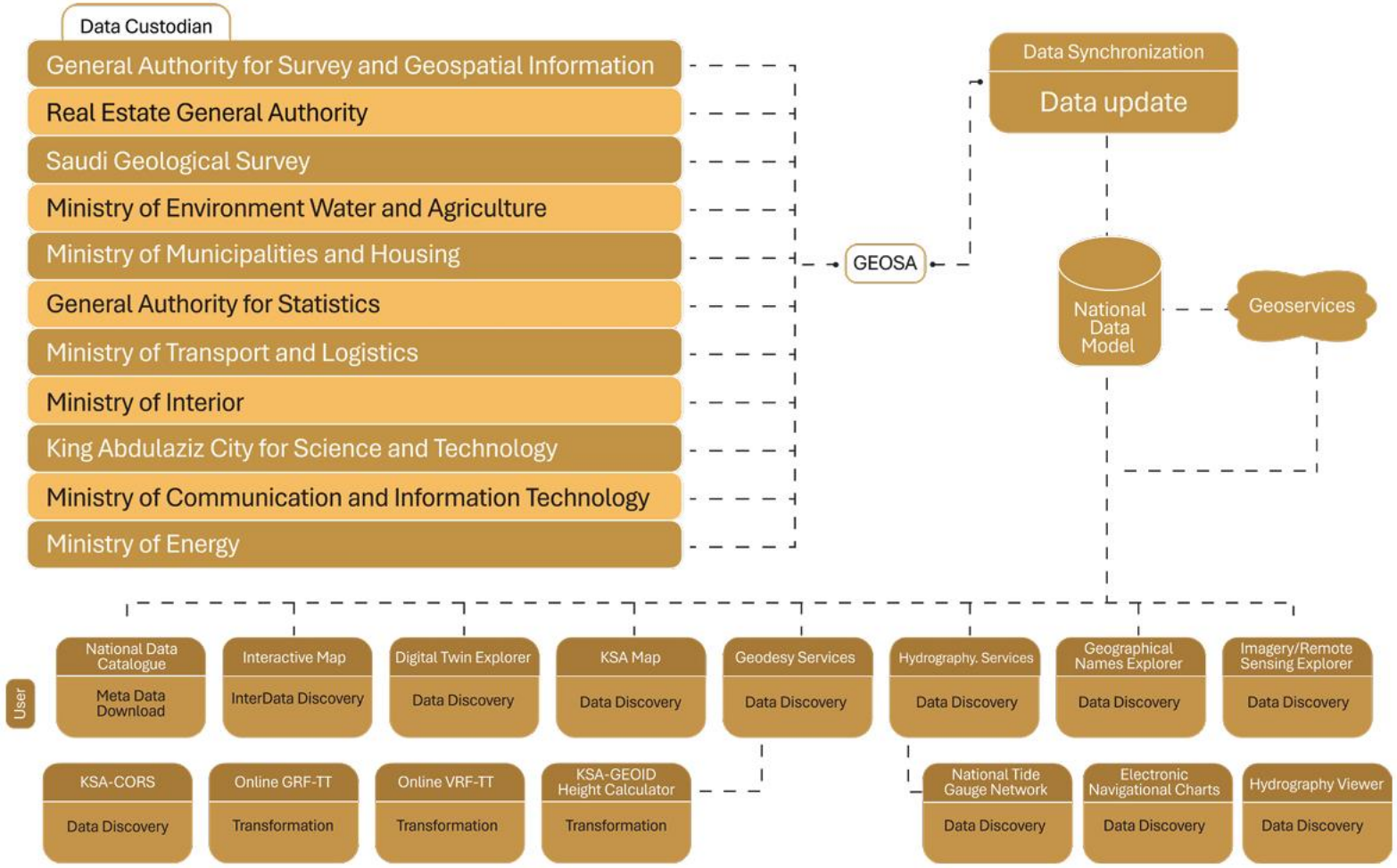
Completed

Initiative 3

Deliver an Integrated Ecosystem Architecture



PR12: Establish a national architecture for ecosystem

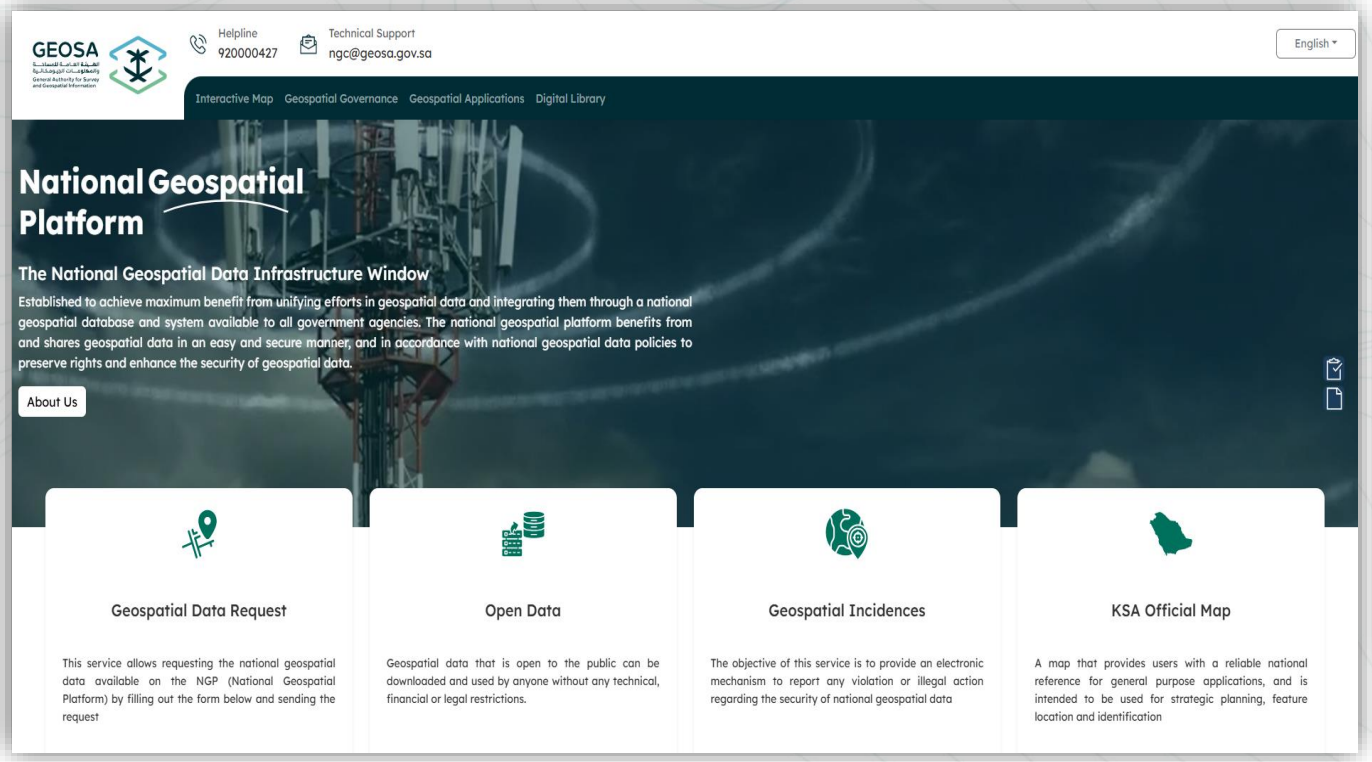


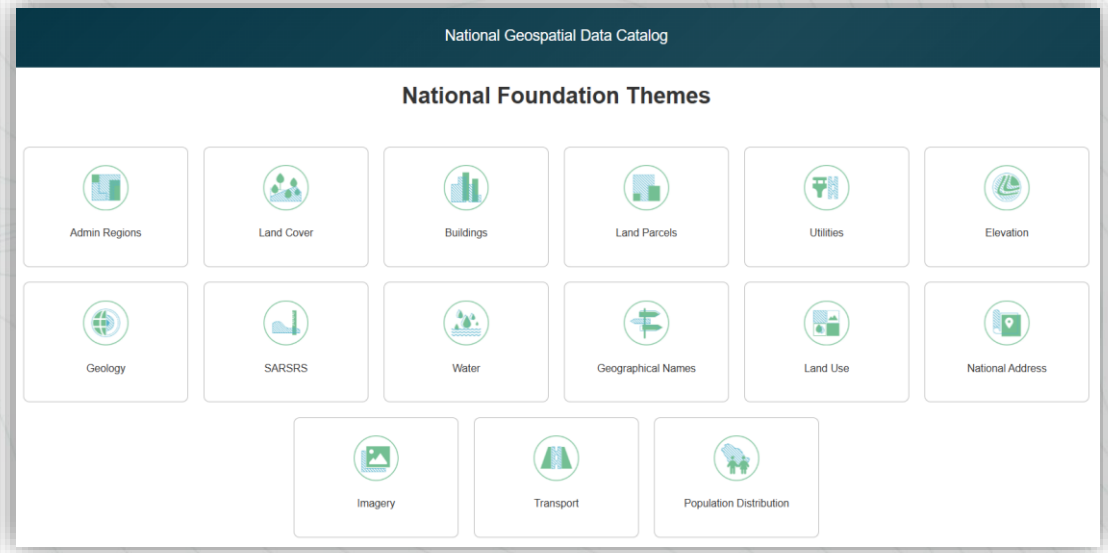
Open Geospatia Consortium.

100 %

Completed

PR13: Develop and implement the new version of national geospatial platform

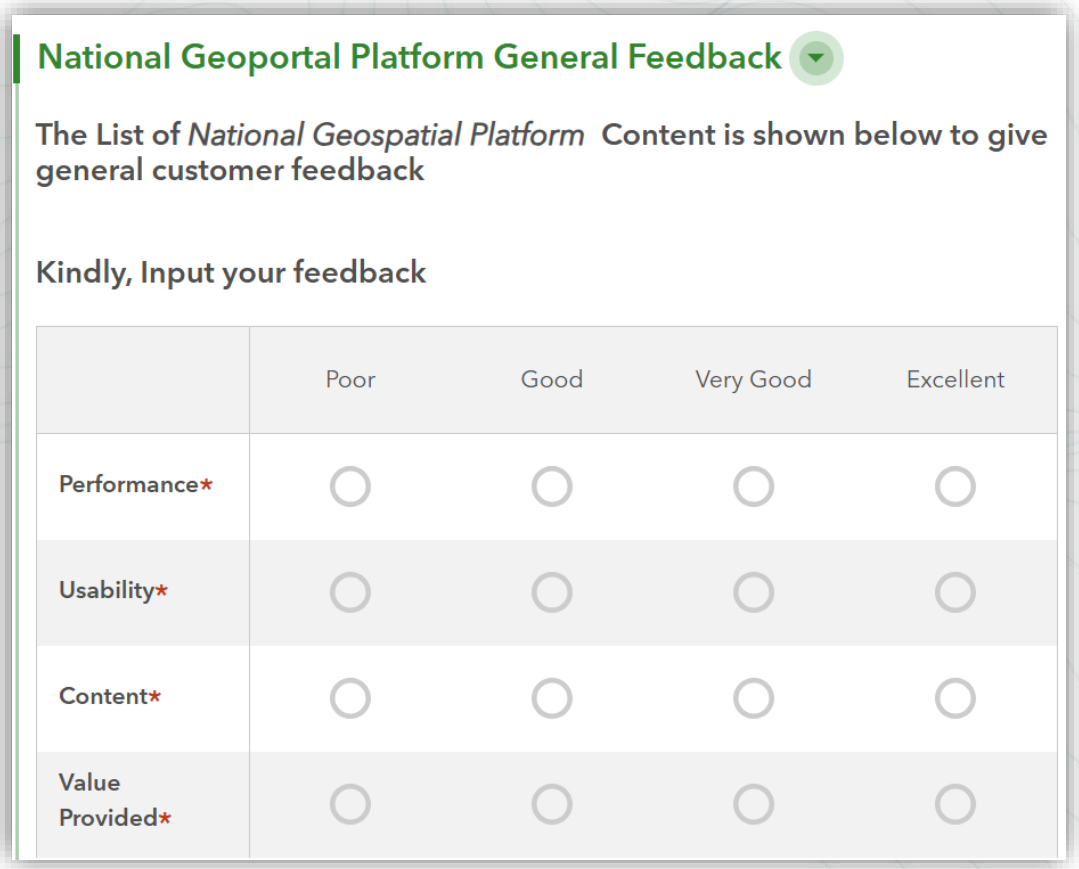


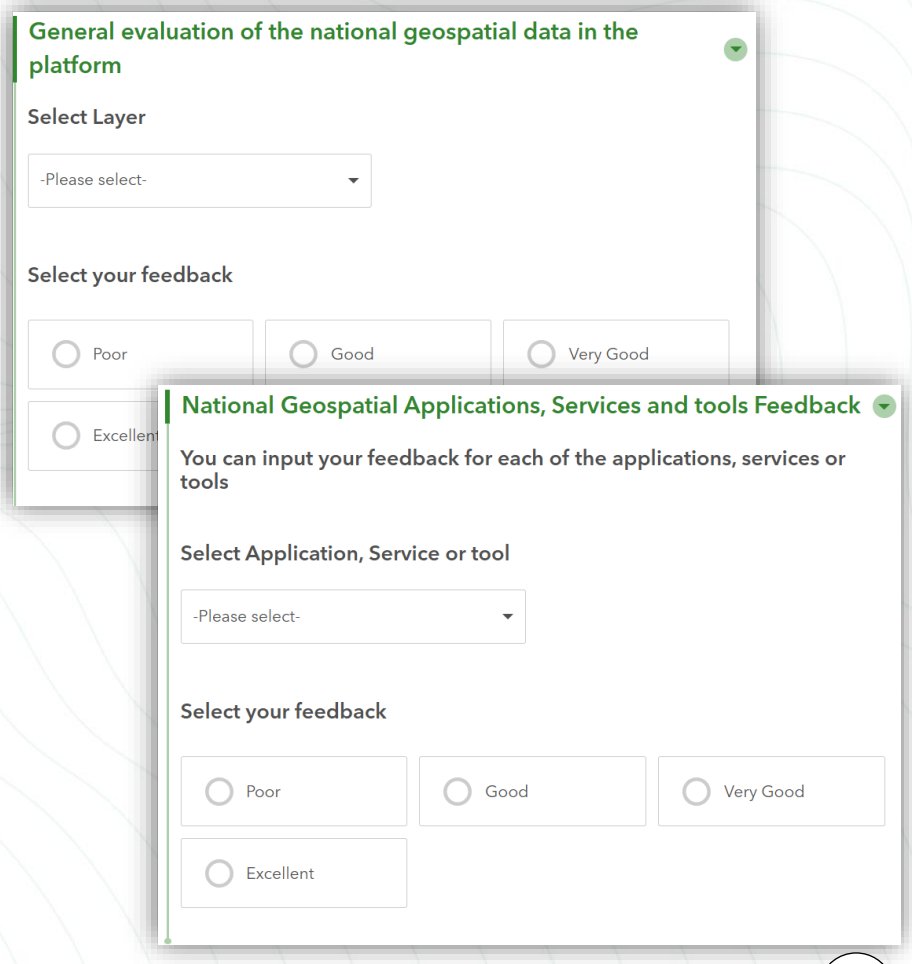


100 %

Completed

PR14: Implement user feedback mechanisms and loops





100 %

Completed

PR15: Establish Ecosystem Geospatial Security and Regulatory Framework

Objective

To build a robust geospatial security and regulatory framework ensuring data protection, national compliance, and risk mitigation across the Geospatial Ecosystem.

National Framework for Geospatial Security	SLA Recommendations	NGP Protection Policy Highlights	Security Awareness Program
• Developed to safeguard sensitive geospatial data and align with national standards.	• Adoption of Commercial Off-The-Shelf (COTS) software for secure API development and deployment within the National Geospatial Platform (NGP).	• Priority to national companies for geospatial data production. • Mandatory data storage & processing within Saudi Arabia. • Strict data protection protocols against unauthorized access and misuse.	• Educates stakeholders on emerging threats and best practices to foster a culture of geospatial security.

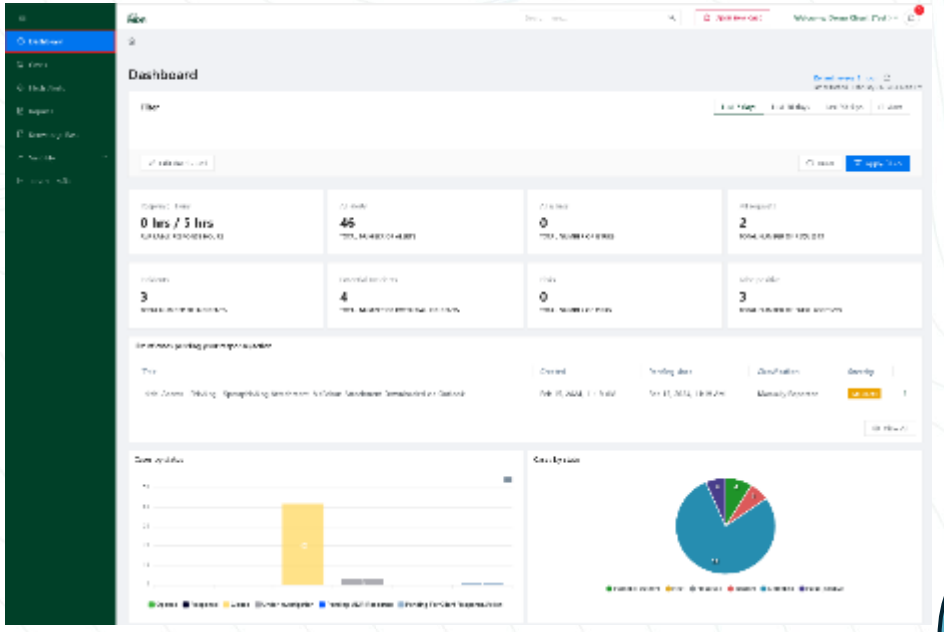
Data Classification Aligned with SDAIA's National Data Governance Policies (2020)

PR16: Establish a geospatial threat detection module

Geospatial Cloud (environment)	Free Cloud Built-ins	Cloud Product Built-ins
Micro-segmentation Firewall (NGFW)	●	
Physical Perimeter Firewall (NGFW)	●	
DDoS Protection	●	
Email Sandboxing		●
End-Point Application Control	●	
Endpoint Detection and Response (EDR)		●
Endpoint Protection - Anti-Malware (EPP)		●
Host Intrusion Detection System (HIDS)	●	
KMS	●	
MDR - Managed Detection and Response	●	
MDR Incident Response	●	
Network Application Control	●	
Network Intrusion Detection System (NIDS)	●	
Network Intrusion Prevention System (NIPS)	●	
Network Sandboxing	●	
Network Threat Detection	●	
Network Anti-Virus (AV)	●	
Network Web filtering	●	
NOC - Network Operation Center	●	
OS Hardening		●
SIEM	●	
SOAR	●	
Threat Intelligence Feeds Enrichment	●	
Vulnerability Assessment	●	
Audit Trail	●	
Identity Management	●	
Certificate Manager	●	
Virtual Machine Encryption		●
SD3: Secure by Design, by Default, and in Deployment	●	
Exchange Server		●
SharePoint Server		●
SQL License		●

MDR Portal

The MDR Portal provides a unified platform for managing, **detecting**, and responding to **security threats across your cloud environment**.



100 %

Completed

PR17: Develop ecosystem geospatial security awareness

+100 Trainees

Introduction to National Geospatial Security

Riyadh

+20 Trainees

Advanced National Geospatial Security Course

University of Portsmouth

UK

Advanced Workshop on Geospatial Security and Ecosystem

Jeddah (Feb 2025)

100 %

Completed

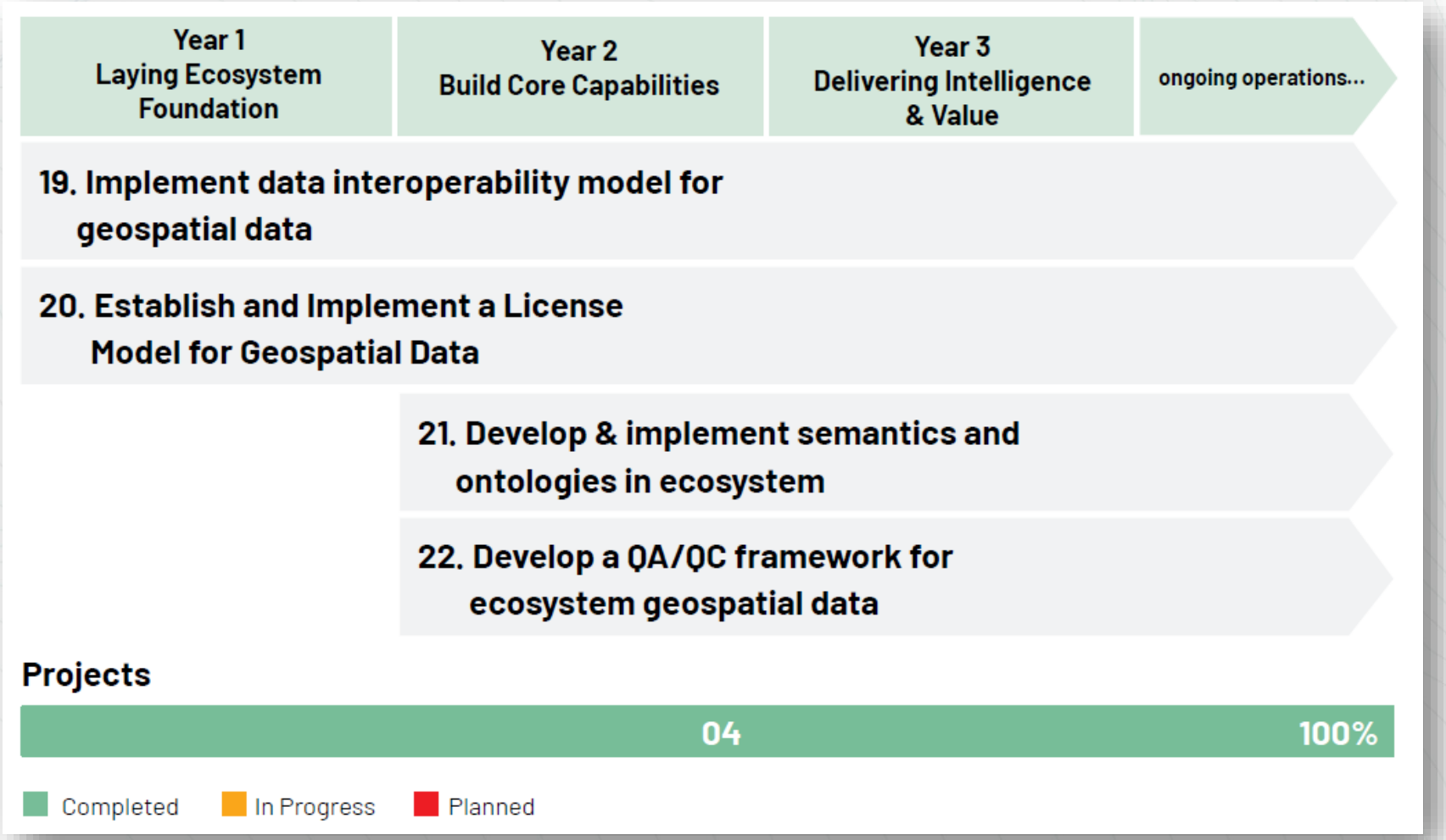
PR18: Develop ecosystem backup and recovery framework

Backup
Secure and reliable **IaaS-based backup** for all VMs with the desired retention period.

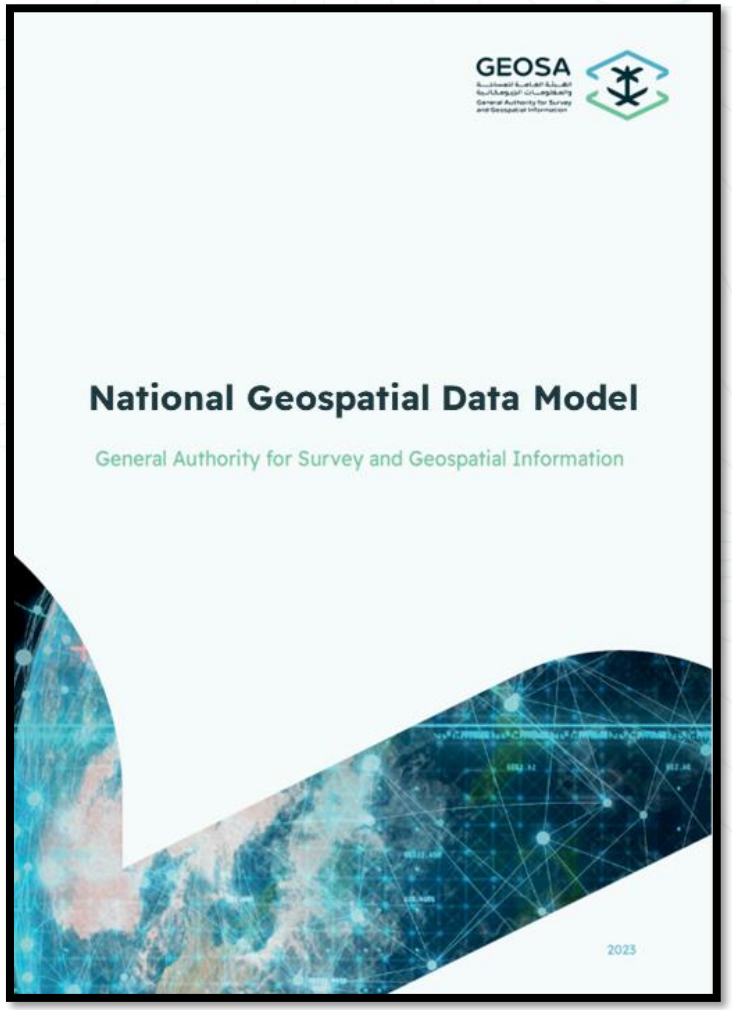
Cloud Replication Design
Cloud team provides replication Design services for seamless data and system recovery in critical situations.

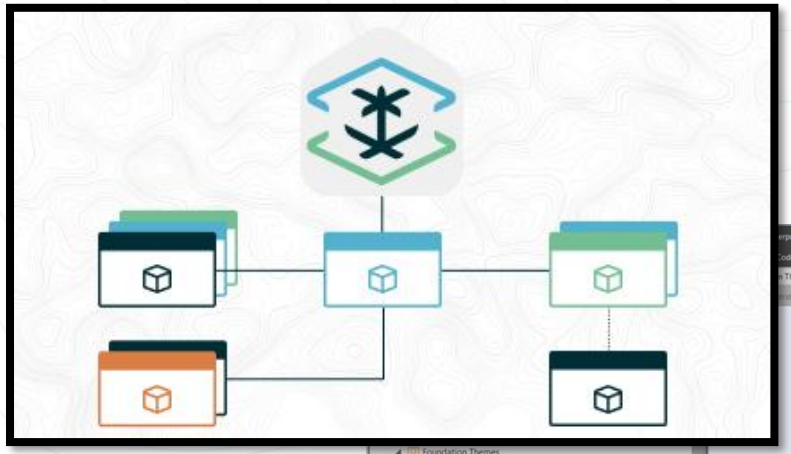
Initiative 4

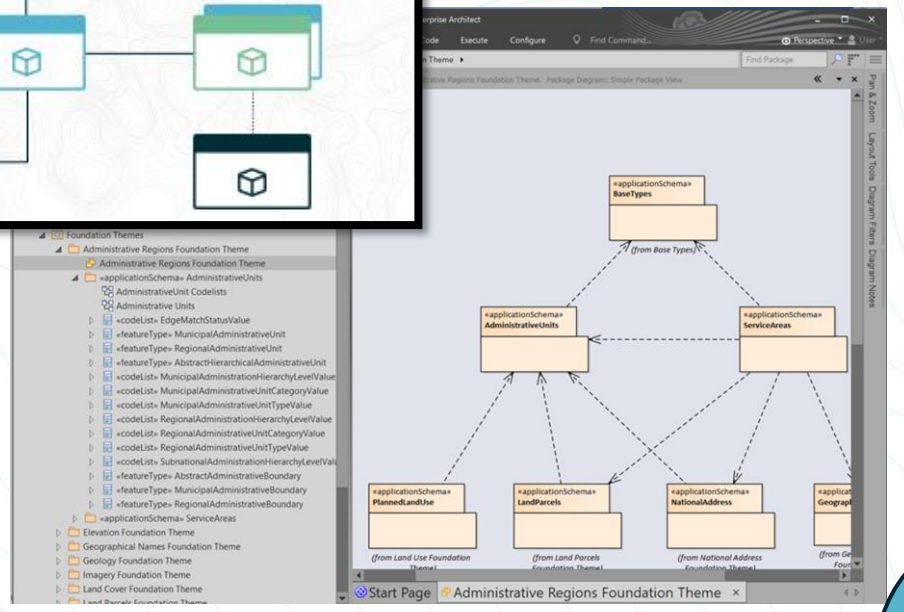
Enable Ecosystem Data Management



PR19: Implement data interoperability model for geospatial data



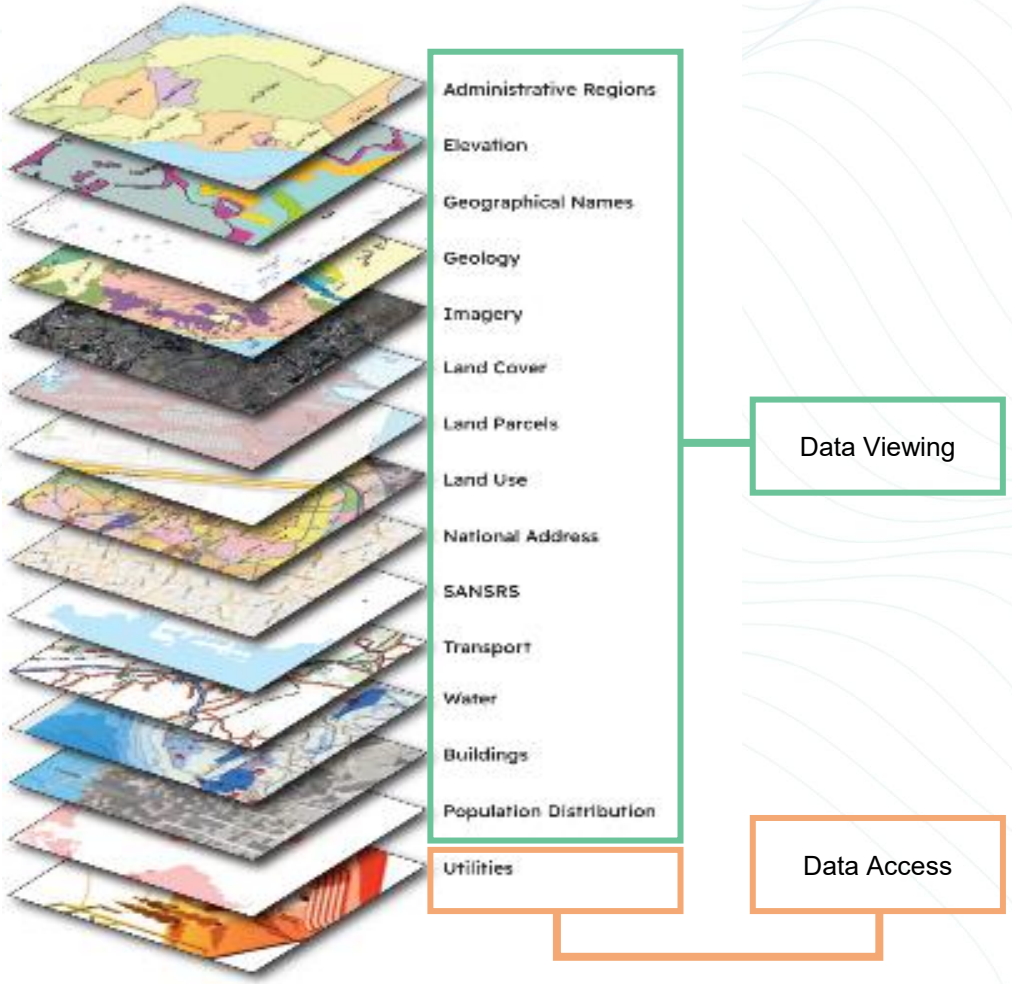




100 %

Completed

PR20: Establish a License Model for Geospatial Data



The minimum Licensing for the Foundation geospatial data is set; however different licensees can be granted based on the required use case.

Derivative Data/App. Production

Data Access

Data Viewing

100 %

Completed

PR21: Develop & implement semantics and ontologies in ecosystem

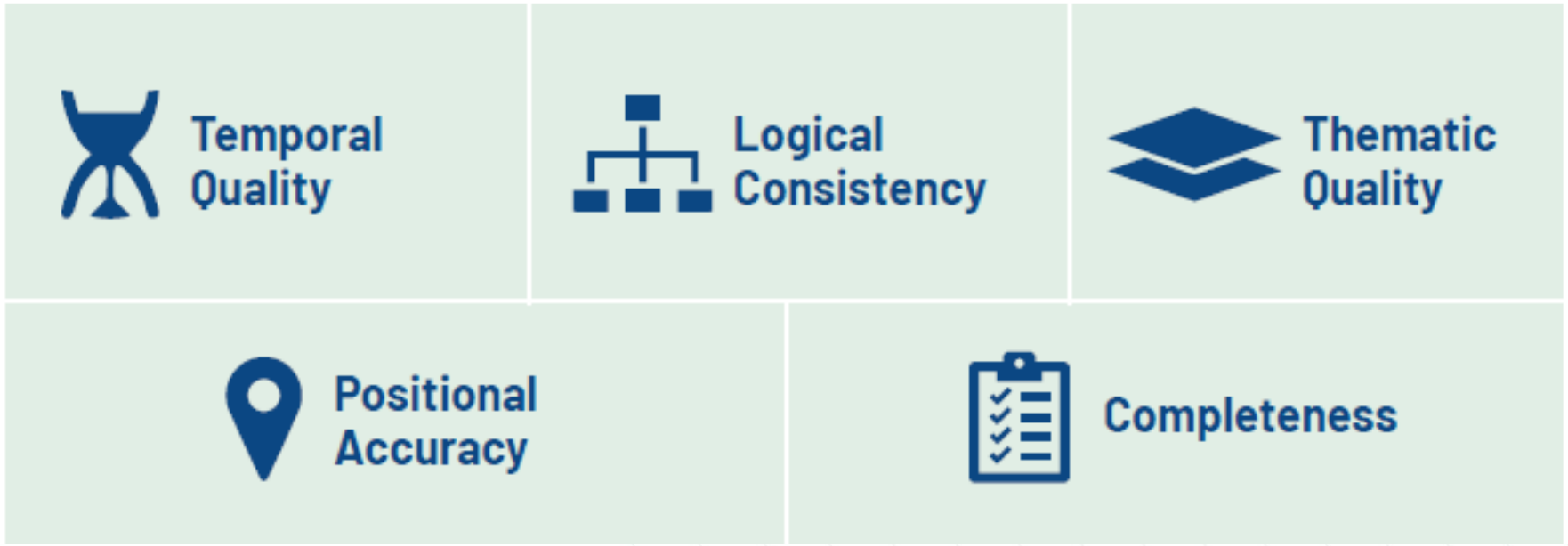
Advancing the NGC's capabilities in geospatial data management by establishing a robust framework with Semantic Web approach, standardized ontologies, controlled vocabularies, and tools to create and access its complex data formats.

100 %

Completed

PR22: Develop a QA/QC Framework for Ecosystem Geospatial Data

GEOSA developed the quality assurance framework for the Geospatial Ecosystem touching upon five factors:



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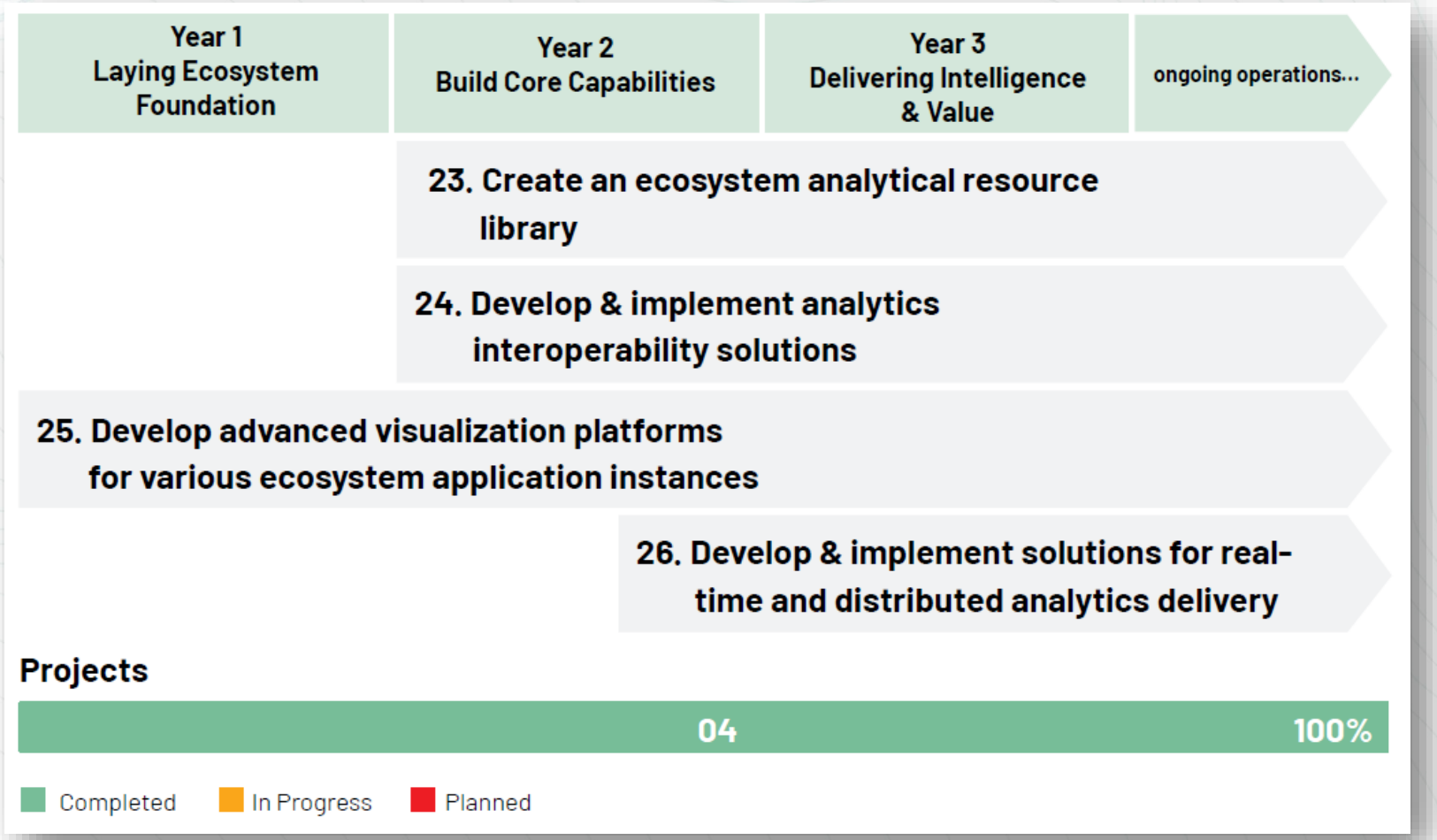
Completed

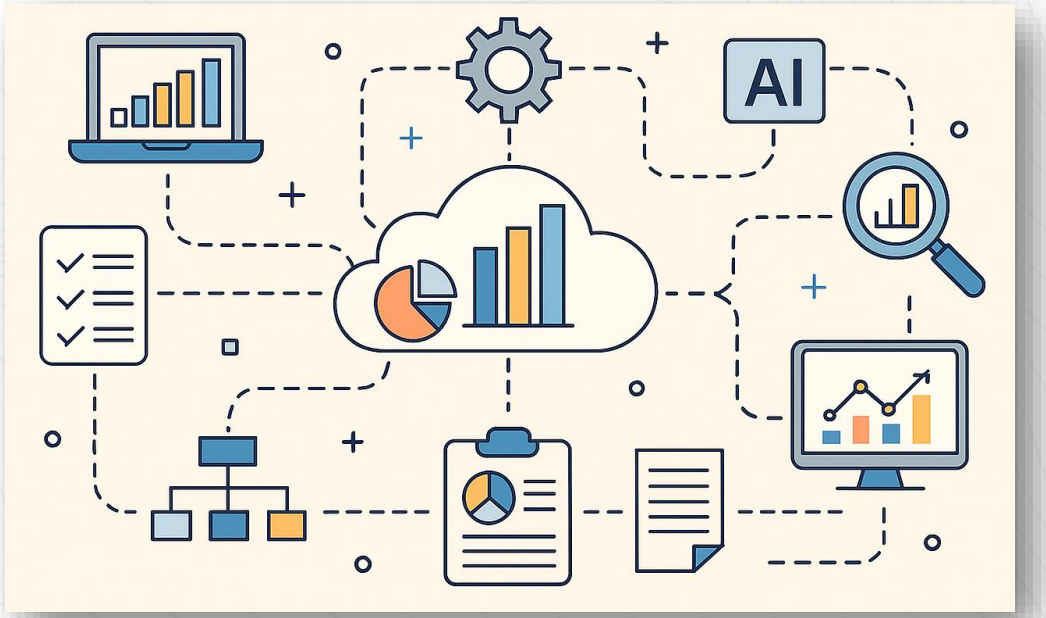
Initiative 5

Enhance Ecosystem Data Analytics



PR23: Create an ecosystem analytical resource library

- Building the required **analytical capacities and capabilities** to develop and **deploy the AI-powered** data analytical tools and resources.
- Integrate and **consolidate analytical workflows** across the ecosystem
- **Catalog and benchmark tools** using metadata for easy retrieval
- Build **spatial analytics** across **prescriptive, predictive, and reporting** dimensions
- Host **trainings, testing datasets** as prerequisites for analytical tools

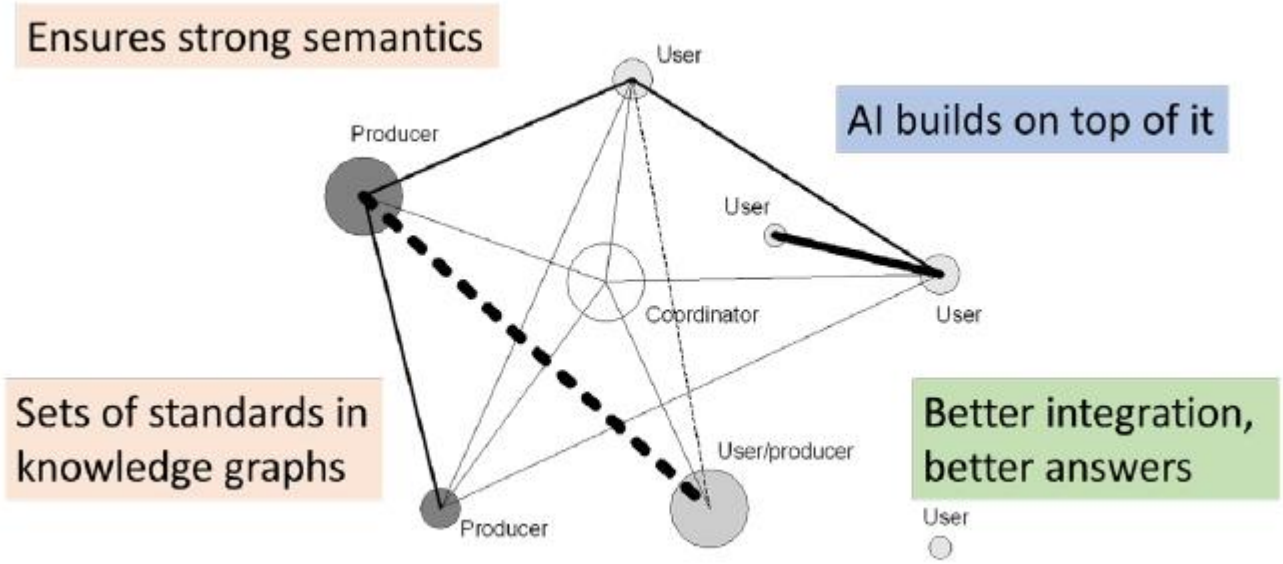


100 %

Completed

PR24: Develop & implement analytics interoperability solutions

- Develop solutions to enable seamless interoperability and mobility of the ecosystem's analytical tools and resources.
- Implement the required service-oriented architectures to support shared access to workflows, algorithms, and software tools across diverse platforms and users.



100 %

Completed

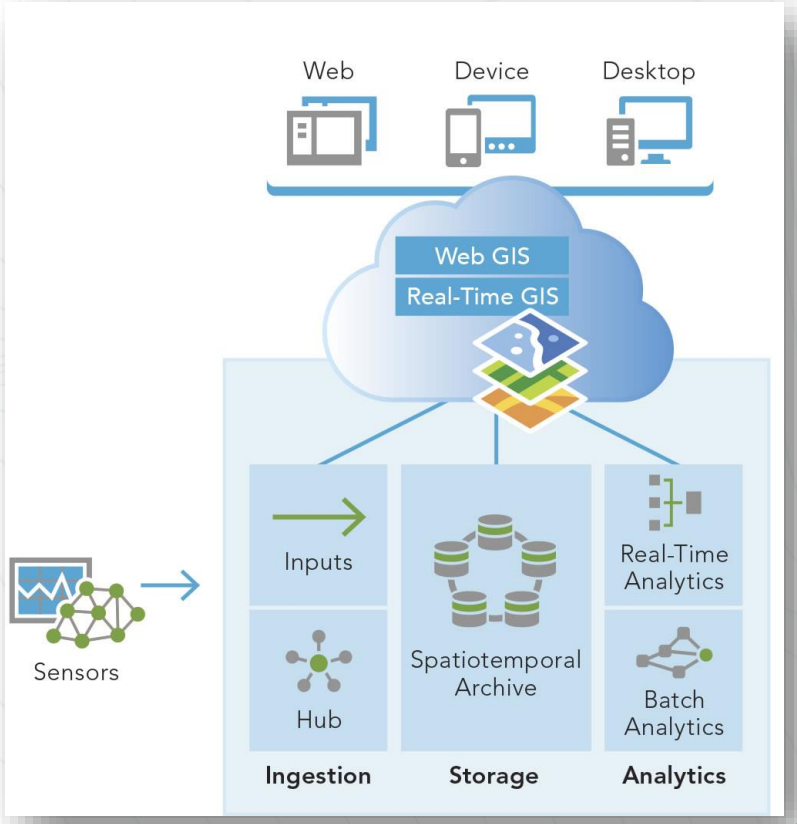
PR25: Develop advanced visualization platforms for various ecosystem application instances

GeoHub Saudi Arabia

uses geospatial information to support decision-making in three main areas: **improving quality of life** through demographic data analysis and environmental improvement, planning **transportation networks** and traffic analysis to enhance mobility, in addition to identifying **tourist sites** and improving visitor experience to enhance tourism, and we aim to include other topics in the future.

PR26: Develop & implement solutions for real-time and distributed analytics delivery

- **Enable Real-Time Analysis** - Deliver analytics in real-time or near real-time to maximize the value of geospatial products and services.
- **Support Distributed Execution** - Execute analytics across the ecosystem's computational network for optimized performance.
- **Adopt Modular Architecture** - Design tools to run in parts closer to data sources or user devices for flexibility and efficiency.
- **Build Service-Oriented Solutions** - Develop architectures that support modular, distributed analytics across platforms and nodes.



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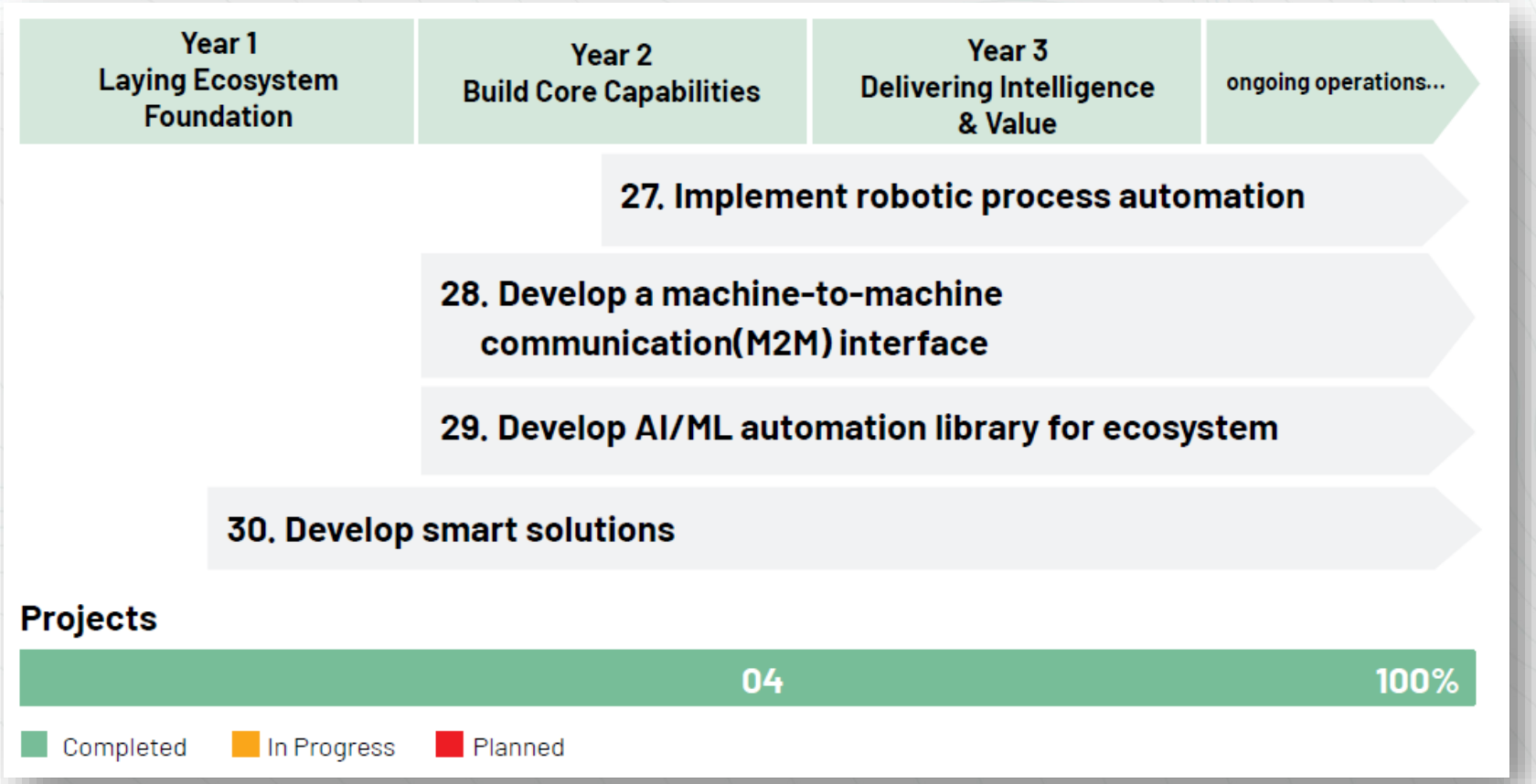
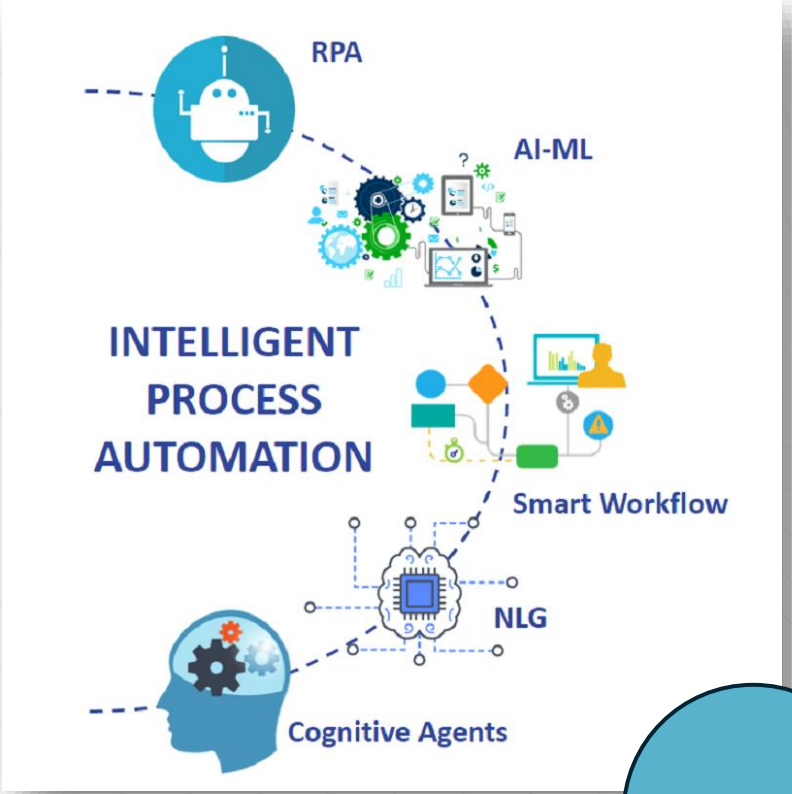
Initiative 6

Automate Ecosystem Functionalities



PR27: Implement Robotic Process Automation

- Establish intelligent process automation across the Geospatial Ecosystem, enhancing efficiency and optimization through Robotic Process Automation (RPA) that includes:
  - Develop and implement an enterprise automation plan for SANGE
  - Identify and standardize identified processes to enable RPA
  - Procure IT resources and Build proof-of-concept and final automation products
  - Monitor benefits and ROI to ensure continuous improvement and optimization

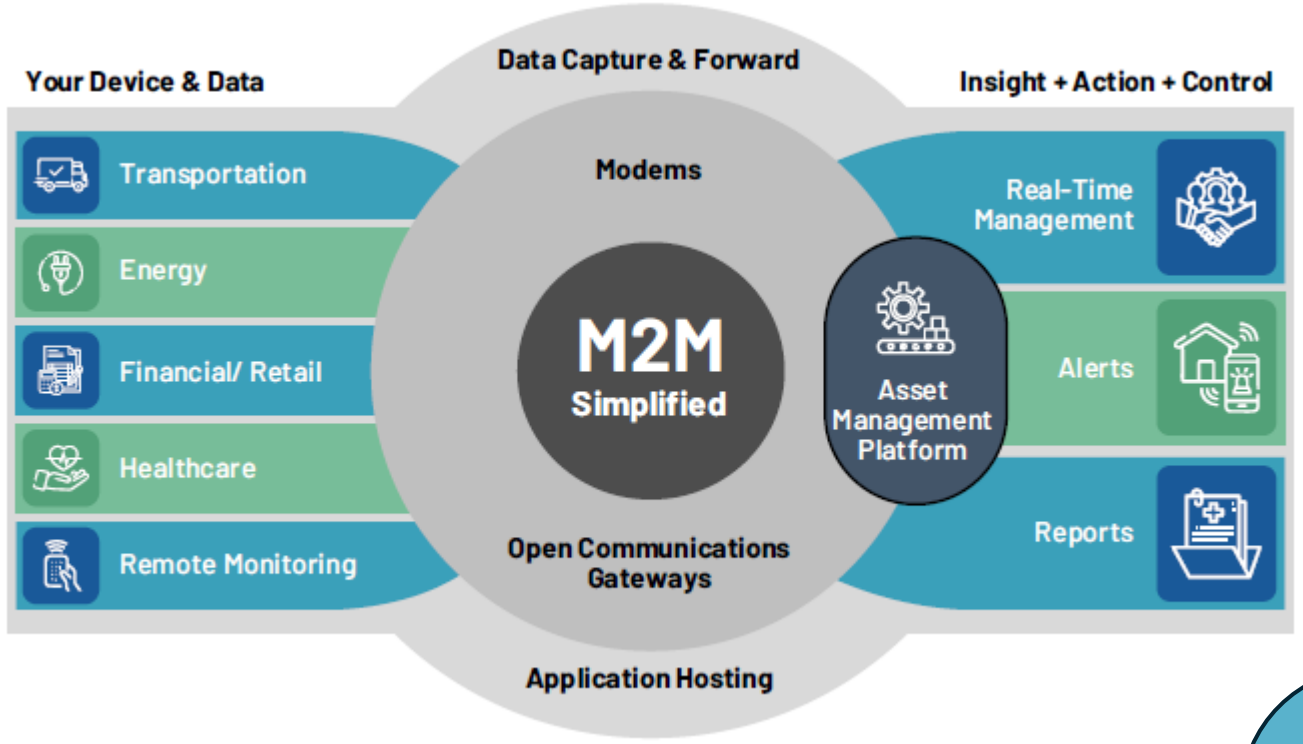


100 %

Completed

PR28: Develop a machine-to-machine communication(M2M) interface

- Reduce human intervention by allowing machines to exchange tasks and outputs autonomously.
- Deploy a scalable M2M system within the national ecosystem cloud infrastructure.
- Modify ecosystem machines and devices to support seamless machine communication.
- Align M2M capabilities with broader enterprise automation and optimization efforts.



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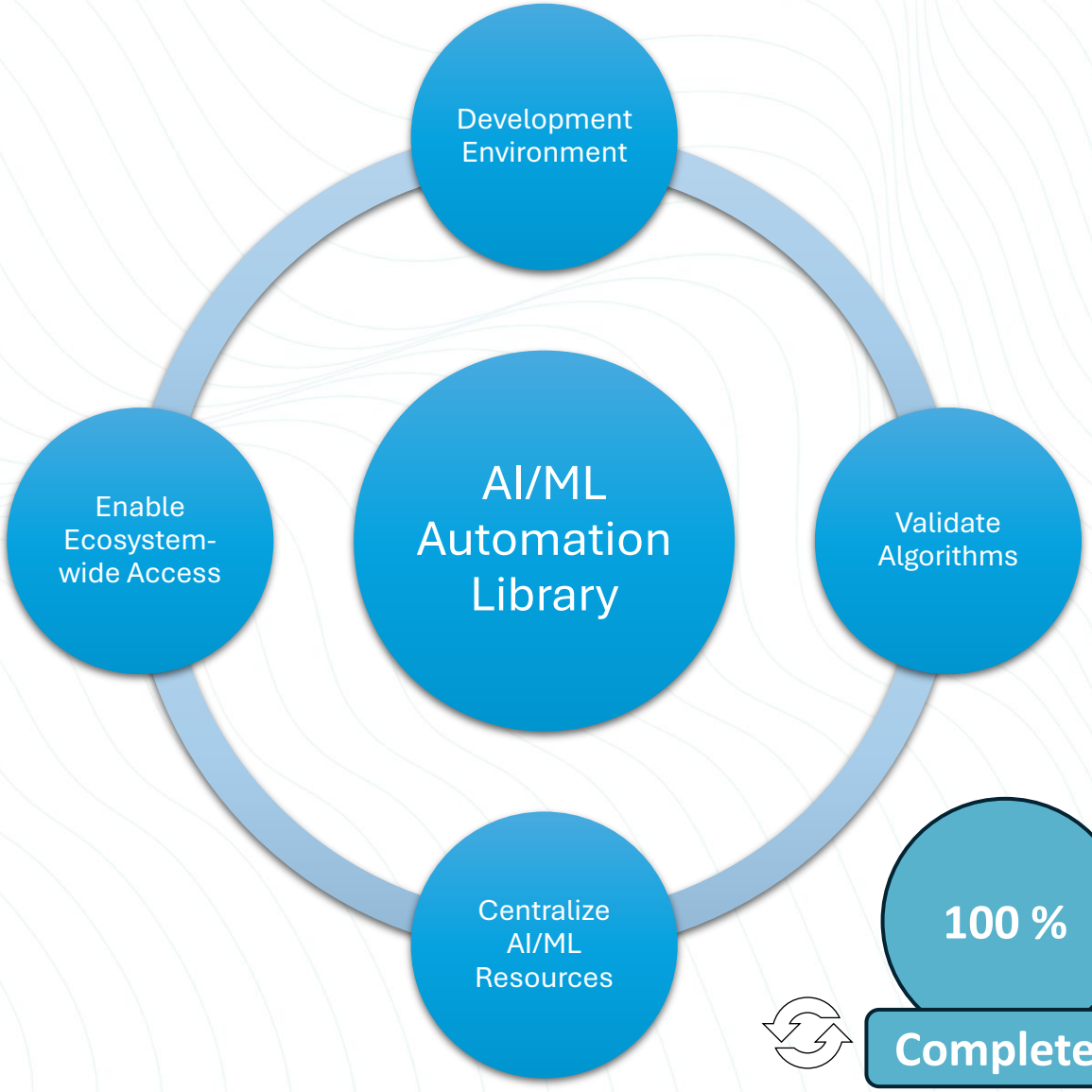
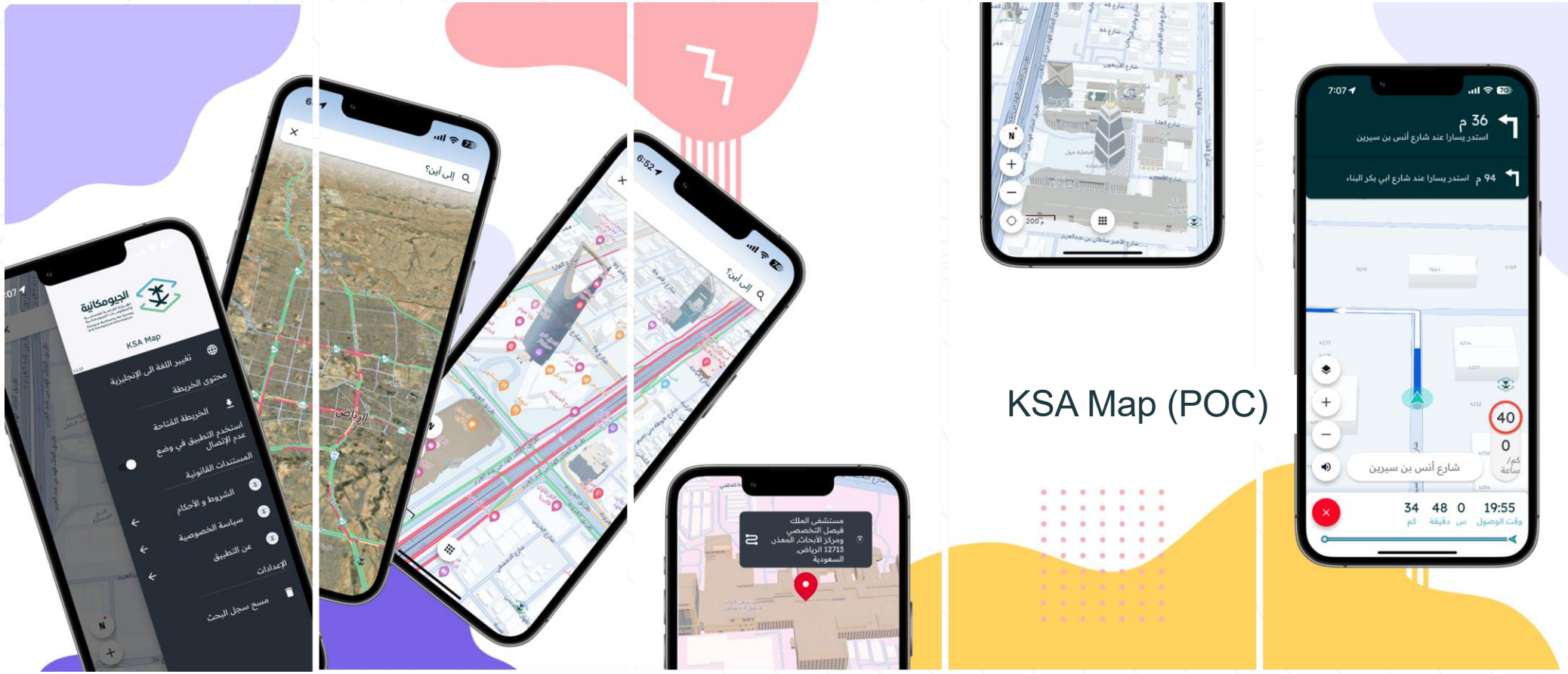
Completed

PR29: Develop AI/ML Automation Library for Ecosystem

- **Establish Development Environment** - Deploy an integrated platform for building AI/ML algorithms.
- **Validate Algorithms** - Test models for accuracy, completeness, and reliability.
- **Centralize AI/ML Resources** - Build a shared library of algorithms for geospatial functionalities.
- **Enable Ecosystem-wide Access** - Ensure stakeholders can access and apply AI/ML tools across diverse use cases.



PR30:Develop Smart Solutions



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Key Outcomes of Operationalizing Geospatial Ecosystem

Stakeholder Integration: A collaborative environment now exists, enabling seamless engagement across government entities, private sector participants, and civil society for geo-enabled decision-making.

End-User Platform Availability: A resilient and scalable technology infrastructure supports a high-availability platform, ensuring consistent access to geospatial services.

Enterprise Architecture Deployment: A unified enterprise architecture underpins the Ecosystem, promoting interoperability and strategic alignment across all components.

Data Environment Maturity: A contextualized and integrated data environment has been established, ensuring data consistency, relevance, and accessibility.

Analytical Resource Enablement: Advanced analytical tools and spatial intelligence capabilities empower stakeholders to make informed, data-driven decisions.

Process Automation: Automated workflows and geospatial solutions enhance operational efficiency and reduce manual intervention.

Thank you

Third expert meeting of the working group on policy and legal frameworks for geospatial information management, including addressing issues related to authoritative and reliable geospatial data and emergent technologies

1. Opening of the third expert meeting, welcome and introductions
2. Agenda, organization of the meeting and setting the scene
3. Policy and legal developments – national and regional
4. Workplan and deliverables for 2025 – 2027
5. Awareness, communication, engagement, developing and sustaining legal-policy capacity
6. Evolving geospatial and technological landscape, artificial intelligence, and its regulation
7. UN-IGIF strategic pathway on Policy and Legal frameworks
8. **Collaboration with partnering international organizations and other functional groups**
9. Sixteenth session of the Committee of Experts
10. World Geospatial Information Congress 2026
11. Summary, next meeting and close

Strengthening the Role of the Private Sector in Proactive Geospatial Policy Development

Prof. Dr. Zaffar Sadiq Mohamed-Ghouse

Chair, UN-GGIM Geospatial Societies
Former Chair UN-GGIM PSN & Board Member
Chair of Policy Committee, World Geospatial Industry Council

UN-GGIM 3rd Working Group, Policy and Legal, Riyadh, 9/10/2025

The Case for a Collaborative Approach

Collaboration Enables Faster Innovation, Inclusive Policies, and Better Data Quality

Government Role

- Sets **policies** and **regulatory frameworks**
- **Custodian** of foundational geospatial data
- Ensures **public interest** and **national priorities**

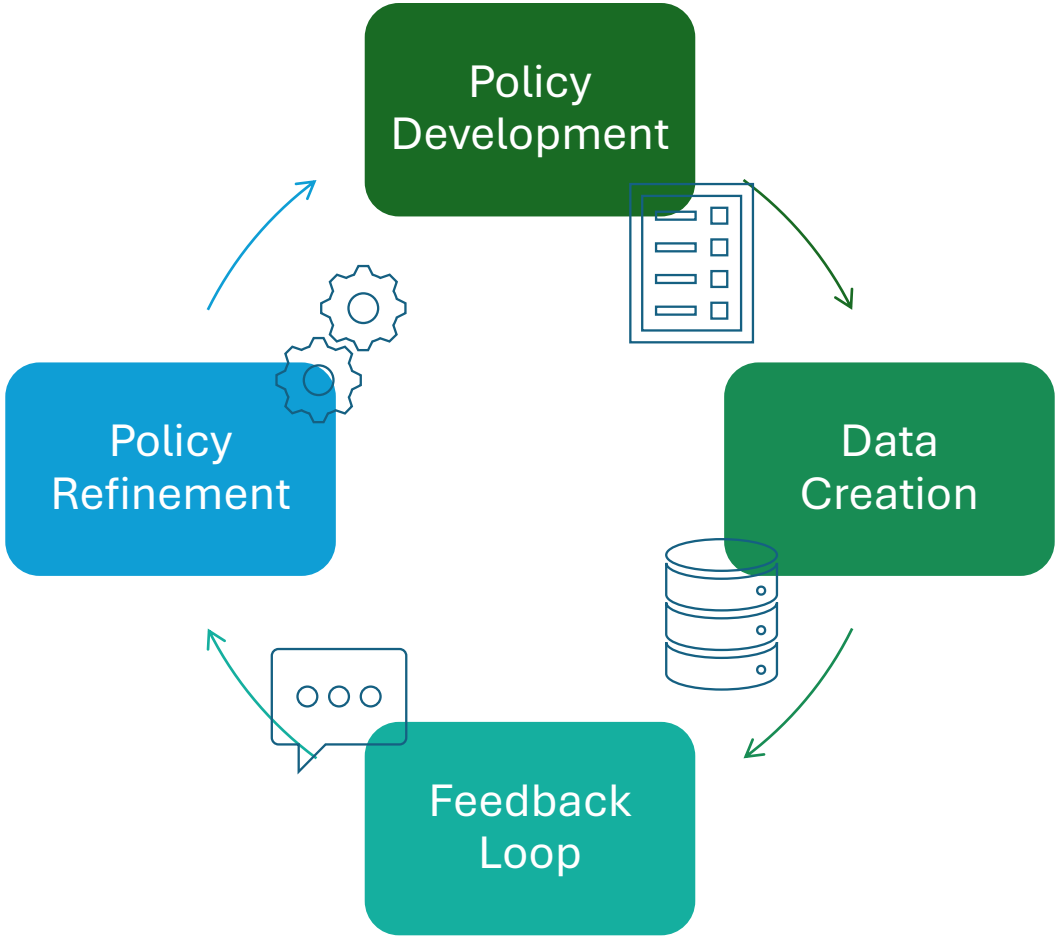
Private Sector Role

- Drives **innovation** and **scalability**
- Develops **value-added data** products
- Offers technical expertise and real-world insights

Towards Co-Designed Geospatial Policies

Challenges

- Public data often outdated
- Feedback mechanisms are weak or missing



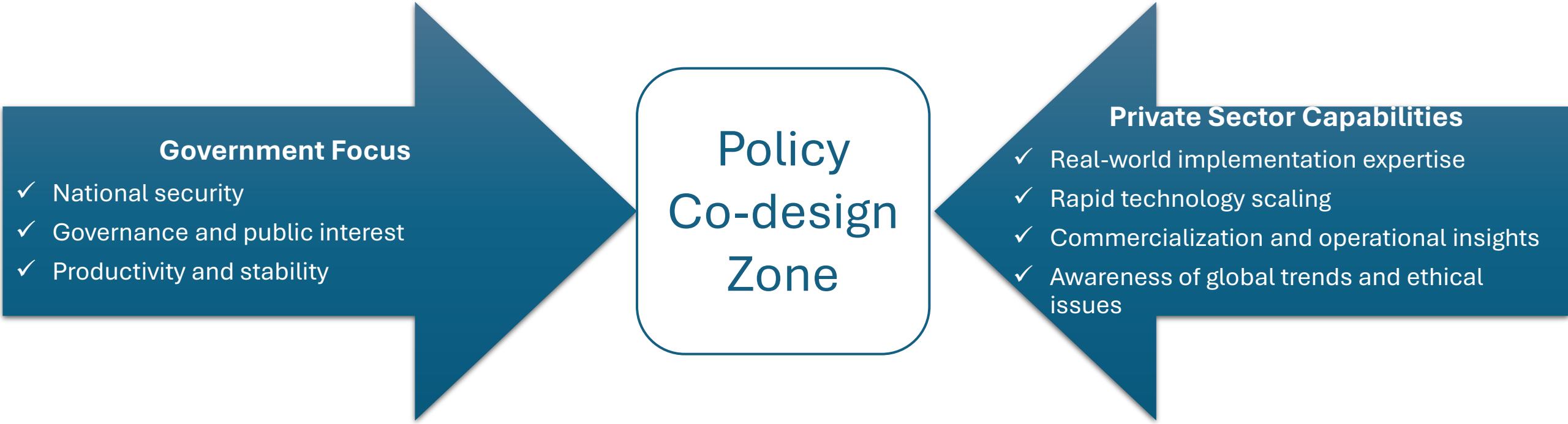
Opportunities

- Democratization of geospatial data
- Private sector as co-developer, not just implementer

Early collaboration with the private sector ensures relevance, agility and inclusivity

Private Sector's Critical Role in Policy Development

Building Practical, Scalable, and Innovation-Friendly Policies



Policies are most effective when shaped with those who bring them to life

Enabling Responsive and Inclusive Policy through Early Collaboration

Despite being most affected by regulation, the private sector is often consulted too late—leading to misalignment between policy intent and real-world outcomes.

Key Issues

- Consultation happens after policies are drafted
- Outdated PPP frameworks limit flexibility
- Overemphasis on control vs. collaboration

Opportunities

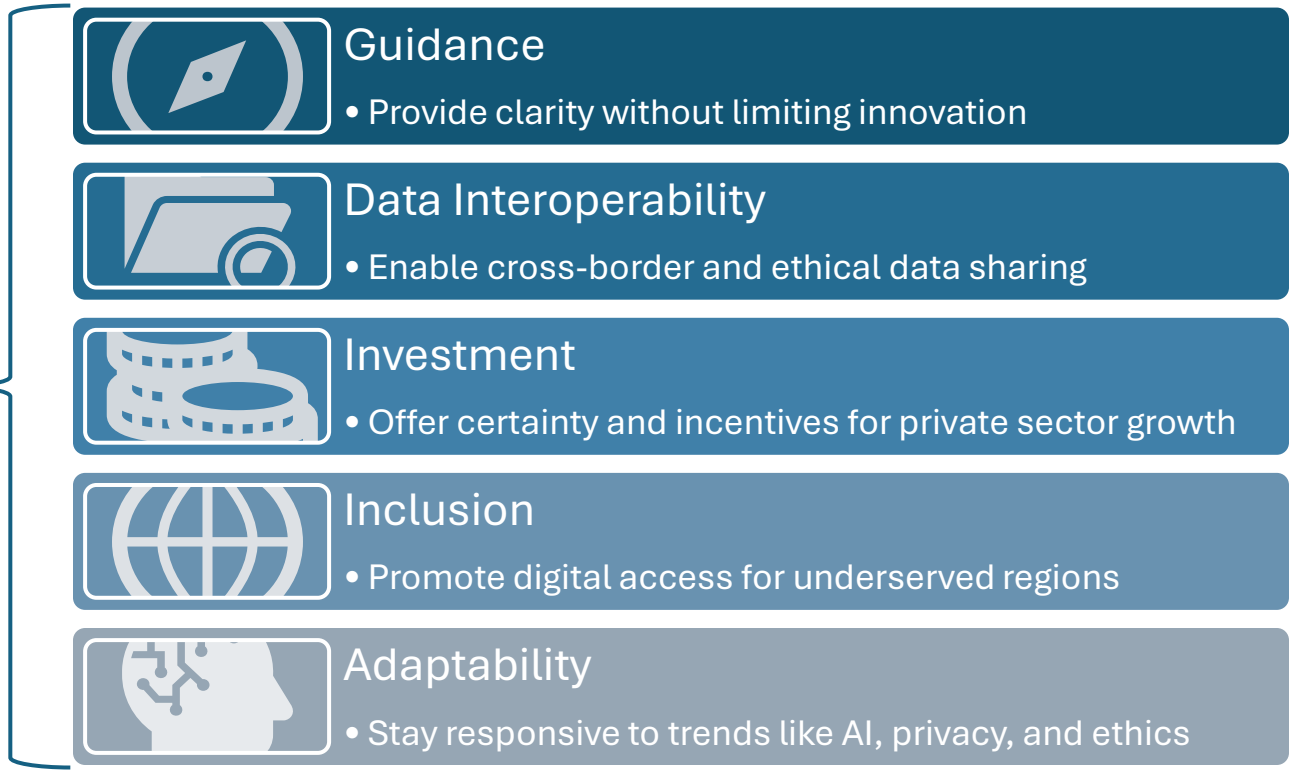
- Balance security, governance, and innovation
- Modernize procurement and regulatory feedback
- Bridge the digital divide through inclusive deployment
- Co-design adaptive, data-informed frameworks

Early public–private collaboration ensures relevance, agility, and inclusivity in policy outcomes

Policy as an Enabler, Not a Constraint

Policy should evolve from a **reactive regulator** to a **strategic enabler** of responsible innovation.

What Enabling Policy Should Do



Effective geospatial policy creates an ecosystem that encourages innovation, investment, and equitable access

Why Proactive Policy Design Matters

Silent disruptions require visible foresight.

🔍 The Challenge

- Geospatial technologies create **invisible disruptions** — privacy risks, unregulated data flows, and ethical concerns.
- Unlike other sectors, **impacts emerge subtly**, making reactive policies insufficient.

🤝 The Solution

- Industry collaboration provides **evidence-based insights**.
- **Policy reports and white papers** translate operational realities into **actionable frameworks**.
- Governments gain understanding, industry gains predictability, and citizens gain trust.

Proactive, co-designed policy ensures that innovation remains responsible, inclusive, and sustainable.

Example : USA

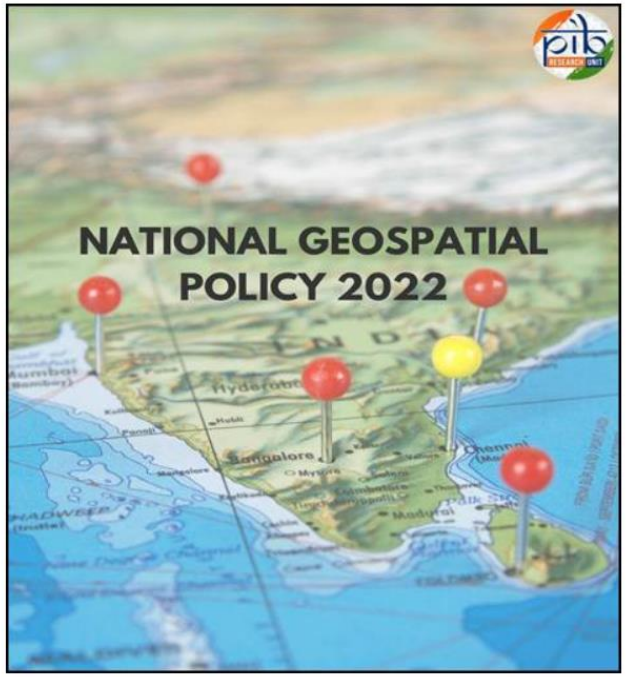
Let me take this opportunity to highlight a positive example where commercial companies are working closely with policymakers.

- The development of the new National Spatial Reference System (NSRS), which replaces the NAVD 88 and NAD 83, for the United States is such a case.
  - NAD 83 is misaligned to the earth's center by about 2.2 meters, and
  - NAVD 88 is both biased (by about one-half meter) and tilted (about 1 meter coast to coast) relative to the best global geoid models available today.
  - Correcting these two issues will mean that every existing latitude, longitude, ellipsoid height, and orthometric height in the United States (as reported in the current NSRS) will change by as much as four meters (as reported in the modernized NSRS)
  - Currently, the NSRS is realized by a combination of over 1,000 continuously operating GNSS stations and an aging network of over 1,000,000 geodetic survey marks.

- The National Geodetic Survey (NGS) collaborates closely with the industry in the development.

- As part of the process, they ask for feedback on how the implementation will work with the new definitions

Example: INDIA



Recent Allocations and Trends from the Union Budget 2025

In the Union Budget for the **fiscal year 2025-26,** the government has reinforced its commitment to the geospatial sector:

- Government of India has allocated ₹100 crore for the **National Geospatial Mission**. This mission aims to **develop foundational geospatial infrastructure and data**, playing a crucial role in **modernizing land records, urban planning, and infrastructure design**. By leveraging **PM Gati Shakti**, the initiative will facilitate integrated planning, enhance data-driven decision-making, and improve the efficiency of infrastructure projects across the country. This strategic investment underscores the government's focus on harnessing geospatial technology for economic growth, governance, and sustainable development.
- **To enhance public-private partnerships (PPPs) and support the private sector in project planning, access to relevant geospatial data and maps from the PM Gati Shakti portal will be made available. This initiative aims to streamline infrastructure development, improve decision-making, and foster greater collaboration between the government and private enterprises.**

Vision of the National Geospatial Policy

To position India as a global leader in the geospatial sector by fostering a world-class innovation ecosystem, leveraging geospatial technology for economic growth, and

To enhance **public-private partnerships (PPPs) and support the private sector in project planning**, access to relevant geospatial data and maps from the PM Gati Shakti portal will be made available. This initiative aims to streamline infrastructure development, improve decision-making, and foster greater collaboration between the government and private enterprises.

Example: INDIA…

Key Focus Areas of the National Geospatial Policy, 2022

- **Geospatial for Transformation & SDGs** – The policy positions **geospatial technology and data** as key drivers for **achieving Sustainable Development Goals (SDGs)**, enhancing **efficiency** across sectors, and ensuring **transparency** in governance.
- **Atmanirbhar Bharat & Self-Reliance** – Recognizing the need for **locally relevant geospatial data**, the policy aims to foster a **self-reliant geospatial ecosystem**, empowering **Indian companies** to compete globally and reduce dependency on foreign providers.
- **Global Best Practices & IGIF** – Adopting international frameworks like the **Integrated Geospatial Information Framework (IGIF)** under **UN-GGIM**, the policy strengthens India's **national spatial information management**.
- **Robust Geospatial & ICT Infrastructure** – Establishing a **well-defined data custodianship model** to ensure the collection, management, and real-time accessibility of **high-quality geospatial data** for cross-sector collaboration.
- **Fostering Innovation & Startups** – Encouraging **startups, R&D, and emerging technologies**, the policy promotes **regulatory modernization** and bridges the **geospatial digital divide**.
- **Standards & Interoperability** – Advocating **open standards, open data, and compliance frameworks**, the policy ensures **seamless integration and interoperability** of geospatial information.
- **Capacity Development & Education** – Promoting **geospatial education from school levels**, alongside **standardized certifications** and **skill development programs** to sustain long-term industry growth.
- **Ease of Doing Business** – Continued **policy liberalization** to attract investment, facilitate **business-friendly regulations**, and support **geospatial enterprises**.
- **Democratization of Data** – **Survey of India (SoI) and other publicly funded geospatial data** will be treated as a **public good**, ensuring **easy access and utilization** for all stakeholders.

Building a Framework for Proactive Policy Co-Design

Early and Meaningful Engagement
Early private sector involvement makes policies more practical, forward-looking, and technology-aware.

Institutionalized Co-Design Mechanisms
Create permanent government–industry collaboration bodies within the UN-GGIM framework.

Agile and Impact-Driven Communication
Produce short, timely outputs (policy snapshots, blogs, podcasts) to keep industry and government responsive and aligned.

Balanced and Ethical Policy for Emerging Technologies
Generative AI demands ethical frameworks shaped by the private sector to balance innovation and public trust.

Supportive Procurement and Investment Policies
Governments should update procurement models to match today's fast, complex tech landscape, with private-sector input based on global experience.

STEPS TO TRANSITION TO A MORE COLLABORATIVE POLICY-MAKING MODEL

A collaborative, forward-looking policy framework will enhance national productivity and digital equity and position geospatial technologies as a cornerstone of sustainable development and technological leadership.

Thank You

Third expert meeting of the working group on policy and legal frameworks for geospatial information management, including addressing issues related to authoritative and reliable geospatial data and emergent technologies

1. Opening of the third expert meeting, welcome and introductions
2. Agenda, organization of the meeting and setting the scene
3. Policy and legal developments – national and regional
4. Workplan and deliverables for 2025 – 2027
5. Awareness, communication, engagement, developing and sustaining legal-policy capacity
6. Evolving geospatial and technological landscape, artificial intelligence, and its regulation
7. UN-IGIF strategic pathway on Policy and Legal frameworks
8. Collaboration with partnering international organizations and other functional groups
9. **Sixteenth session of the Committee of Experts**
10. **World Geospatial Information Congress 2026**
11. Summary, next meeting and close

GEOSA
الهيئة العامة للمساحة والمعلومات الجيومكانية
General Authority for Survey and Geospatial Information

16 – 19 November 2026

Hilton Riyadh Hotel & Residences

UNWGIC

Third United Nations World Geospatial Information Congress

Hosted by the General Authority for Survey and Geospatial Information (GEOSA)
Kingdom of Saudi Arabia

Navigating the Next Frontier: *Embracing Digital Renaissance and a New Geospatial Paradigm*

Economic and Social Council of the United Nations (ECOSOC) mandated the Committee of Experts to convene global forums that promote comprehensive dialogue on global geospatial information management with all governments, relevant international organizations, non-governmental organizations, academia and the private sector.

In Decisions 15/101 and 15/116, adopted at its fifteenth session (6–8 August 2025), the Committee of Experts welcomed the offer of the Kingdom of Saudi Arabia, through its General Authority for Survey and Geospatial Information, to host the Third United Nations World Geospatial Information Congress from 16 to 19 November 2026. The Committee further welcomed the presentation on the Kingdom's plans and preparations for the Congress, acknowledged the early and well-considered preparatory efforts already undertaken, and appreciated the thoughtful approach being taken to lay a strong foundation for its successful organization.

Oversight, Coordination and Organization

The **Congress Coordinating Committee** (CCC) will oversee the organization of the 3rd UNWGIC, ensuring it provides a dynamic platform for dialogue, knowledge exchange, and inclusive collaboration across sectors and regions.

The **International Advisory Committee** (IAC) will guide the development of a substantive programme that is representative, forward-looking, and aligned with the Congress theme and objectives.

The **Local Organizing Committee** (LoC), convened by the host, serves as the primary facilitator of all on-the-ground arrangements and operations, coordinating logistics and services in close collaboration with local authorities, partners, and the United Nations to ensure a professional, participatory, and culturally relevant Congress.

Membership of the International Advisory Committee

1	Mohammed Yahya Al-Sayel	Co-Chair, UN-GGIM (Saudi Arabia)
2	Clinton Heimann	Co-Chair, UN-GGIM (South Africa)
3	Deidre Dalpiaz Bishop	Co-Chair, UN-GGIM (United States of America)
4	Meizyanne Hicks	Rapporteur, UN-GGIM (Fiji)
5	tbc	Chair, UN-GGIM: Africa
6	Sofía Nilo Crisóstomo	Chair, UN-GGIM: Americas (Chile)
7	Asim Ibrahim Al-Ghamdi	Secretary General, UN-GGIM: Arab States (Saudi Arabia)
8	Antonius Bambang Wijanarto	President, UN-GGIM-AP (Indonesia)
9	Ingrid Vanden Berghe	Chair (*a.i.)*, UN-GGIM: Europe (Belgium)
10	Mohamed Zaffar Sadiq Mohamed Ghouse	Chair, UN-GGIM Geospatial Societies
11	Songnian Li	Chair, UN-GGIM Academic Network
12	Valrie Grant	Chair, UN-GGIM Private Sector Network
13	Dejan Jakovlevic	Chair, UN Geospatial Network
14	Mohammad Almabrook	General Authority for Survey and Geospatial Information, Saudi Arabia
15	Shubha Pandey	Department of Science and Technology, India
16	Rolando Ocampo	Statistics Division, Economic and Social Commission for Americas and the Caribbean
17	Tim Trainor	International Cartographic Association

Theme

Navigating the Next Frontier: Embracing Digital Renaissance and a New Geospatial Paradigm

The substantive programme will feature high-level speakers, thought leaders, and recognized practitioners, including voices from under-represented groups and next generation contributors, to ensure the content is diverse, and forward-looking.

Participation

3rd UNWGIC is expected to draw more than 1,800 participants, representatives from Member States, international organizations, the private sector, academia, and civil society with the aim of deepening understanding and inspiring applications and actions that advance a future-ready geospatial ecosystem for the wellbeing of humanity.

The formal programme of the 3rd UNWGIC will be held over four days, from 16 to 19 November 2026. Embedded within a week-long series of events (15–19 November), the Congress will be complemented by global and regional meetings, knowledge-sharing activities, and an exhibition. It is also anticipated that the 3rd UNWGIC International Advisory Committee, together with the UN-GGIM Bureau and its expanded bureau, will convene in person during the week to support the substantive objectives of the Congress.

In this context, the Working Group is requested to contribute, in particular, it's future-facing perspectives to the 3rd UNWGIC.

General timeline – to be discussed by the IAC and approved

a) Provisional Timeline

- October 2025: First virtual meeting of the IAC, finalize ToR, working modalities, and initiate program planning.
- January 2025: Preliminary program structure with sub-themes.
- March/April 2026: Liaison with potential speakers, contributors and moderators
- June 2026: Initial draft organization of sessions and speakers for review.
- July 2026: Substantive program finalized in preparation for the Sixteenth Session of UN-GGIM.
- Sixteenth Session of UN-GGIM: Final program released and promoted.
- September 2026: Overall program finalized.

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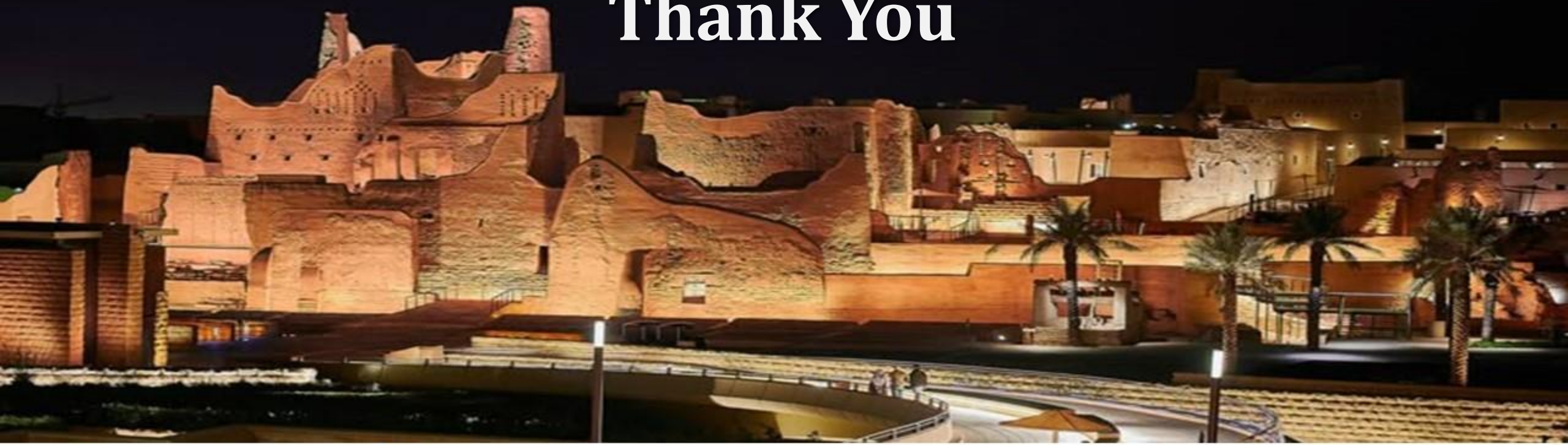
General Authority for Survey and Geospatial Information

Thank You



Third United Nations World Geospatial Information Congress
Hosted by the General Authority for Survey and Geospatial Information (GEOSA)
Kingdom of Saudi Arabia

Navigating the Next Frontier: *Embracing Digital Renaissance and a New Geospatial Paradigm*

A world **where** geospatial information solves local to global challenges