UNITED NATIONS
COMMITTEE OF EXPERTS
ON GLOBAL GEOSPATIAL INFORMATION
MANAGEMENT

The Future Geospatial Information Ecosystem

BACKGROUND

Future Geospatial Information Ecosystem Writing Team

Background

Decisions 13/104 on "The future geospatial information ecosystem"

(c) Agreed that the **definition and development of future geospatial ecosystems was an opportune activity** for the Committee of Experts to undertake but that it **required further scoping and consensus to identify and describe what the foundations of future geospatial ecosystems would encompass within the purview of the Committee**, and in that regard suggested that further structure and detailed work on defining the Committee's understanding could take place and progress into general principles, and that the further work on the concept should emphasize that geospatial information is an integrated component in different digital ecosystems and in many cases is not an ecosystem in itself;

(d) Supported the proposals to progress with option 2a set out in the report, namely to entrust the Bureau, supported by a writing team, with developing **a position paper on determining the scope and an outline on the fundamental elements and principles of the future geospatial information ecosystem for the consideration of the Committee** of Experts at its fourteenth session, and welcomed the multiple offers by Member States to support the Bureau;

CO-CONVENORS

Future Geospatial Information Ecosystem

Co-Convenors

Mohammad Almabrook

- Executive Director for International Collaboration and Partnerships
- GEOSA (General Authority for Survey and Geospatial Information)
- **Kingdom of Saudi Arabia**

Cindy Mitchell

- Senior Policy Advisor, GeoBase Division
- Canada Centre for Mapping and Earth Observation
- Natural Resources Canada
- **Government of Canada**

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- Deputy Director General
- Branch: Spatial Planning and Land Use Management
- National Department of Land Reform and Rural Development
- **South Africa**

https://ggim.un.org/UNGGIM-WTFGIE/

25 WEEK PROGRAMME ON THE FUTURE GEOSPATIAL INFORMATION ECOSYSTEM

The 25-week Future Geospatial Information Ecosystem programme

The 25-week Future Geospatial Information Ecosystem programme is designed to:

1. **Clarify and advance the concept Future Geospatial Information Ecosystem**
2. **Enhance Stakeholder Engagement**
3. **Promote Cross-Sectoral Value**
4. **Provide Practical Implementation**

The programme is organized into six phases, each with distinct activities, timelines, and deliverables:

- Phase 1: Online workshop: Foundation and Planning on the FGIE (Weeks 1–2)
- Phase 2: Seminar Design and Execution (Weeks 3–8)
- Phase 3: Survey Rollout and Analysis (Weeks 3–14)
- Phase 4: Mapping the Digital Ecosystem (Weeks 9–18)
- Phase 5: Drafting and Review (Weeks 15–22)
- Phase 6: Finalization and Submission (Weeks 23–25)

SURVEY BACKGROUND

Survey Background, Objectives and Implementation Strategies

Background

- The Kingdom of Saudi Arabia (KSA) proposed a questionnaire to map the broader digital ecosystem as part of advancing the Future Geospatial Information Ecosystem.
- This effort builds on discussions from UN-GGIM and the global push to integrate geospatial information into the wider digital landscape.
- The initiative is informed by key documents, including the Future Geospatial Information Ecosystem report and the 25-week Future Geospatial Information Ecosystem program.
- Aligns with the UN Integrated Geospatial Information Framework (UN-IGIF) principles to ensure a structured approach.

Objectives

The survey aims to understand interoperability, challenges, and opportunities within the digital ecosystem beyond geospatial.

Supports the UN's Sustainable Development Goals (SDGs) by fostering digital inclusivity and interoperability.

This survey builds upon previous work, particularly the Survey discussions from June 2023, which emphasized structuring fundamental elements of the geospatial ecosystem around the strategic pathways of UN-IGIF.

Key Focus Areas

Governance & Policy Needs:

- Identifying institutional gaps, legal frameworks, and regulatory challenges.

Technological Trends:

- Role of AI, big data, and cloud computing in reshaping digital ecosystems.

Cross-sectoral Integration:

- Examining how geospatial information interfaces with other digital domains such as AI, statistics, and infrastructure.

Challenges & Opportunities:

- Addressing barriers to adoption and exploring enablers of digital geospatial transformation.

Positioning within the Digital Ecosystem:

- The survey also seeks to determine how the geospatial ecosystem fits within the broader digital economy, ensuring it is adaptable and forward-thinking.

SURVEY RESULTS

Survey conducted online from
12 May to 12 June 2025

Respondent Landscape

Grounded Perspectives

41% of inputs came from public agencies - those closest to implementation pain points

Global South in Focus

Over 70% of responses came from Africa, Asia-Pacific, and Latin America

Diverse Expertise

Technical, policy, civil, and private-sector voices all shaped the findings

Voices from the Field

232 stakeholders in 6 regions have responded to the survey and voiced their opinions

Region	Number of respondents	Percentage
Africa	88	38%
Asia-Pacific	49	21%
Latin America and the Caribbean	30	13%
Europe, North America, Arab States	65	28%
Total	232	100%

- **41% (95 respondents)**: National and local government agencies
- **23% (54 respondents)**: Universities and research institutions
- **18% (41 respondents)**: Private sector geospatial and ICT firms
- **12% (27 respondents)**: Civil society or NGOs
- **6% (15 respondents)**: Multilateral agencies and UN bodies

Respondent Landscape

Figure 1

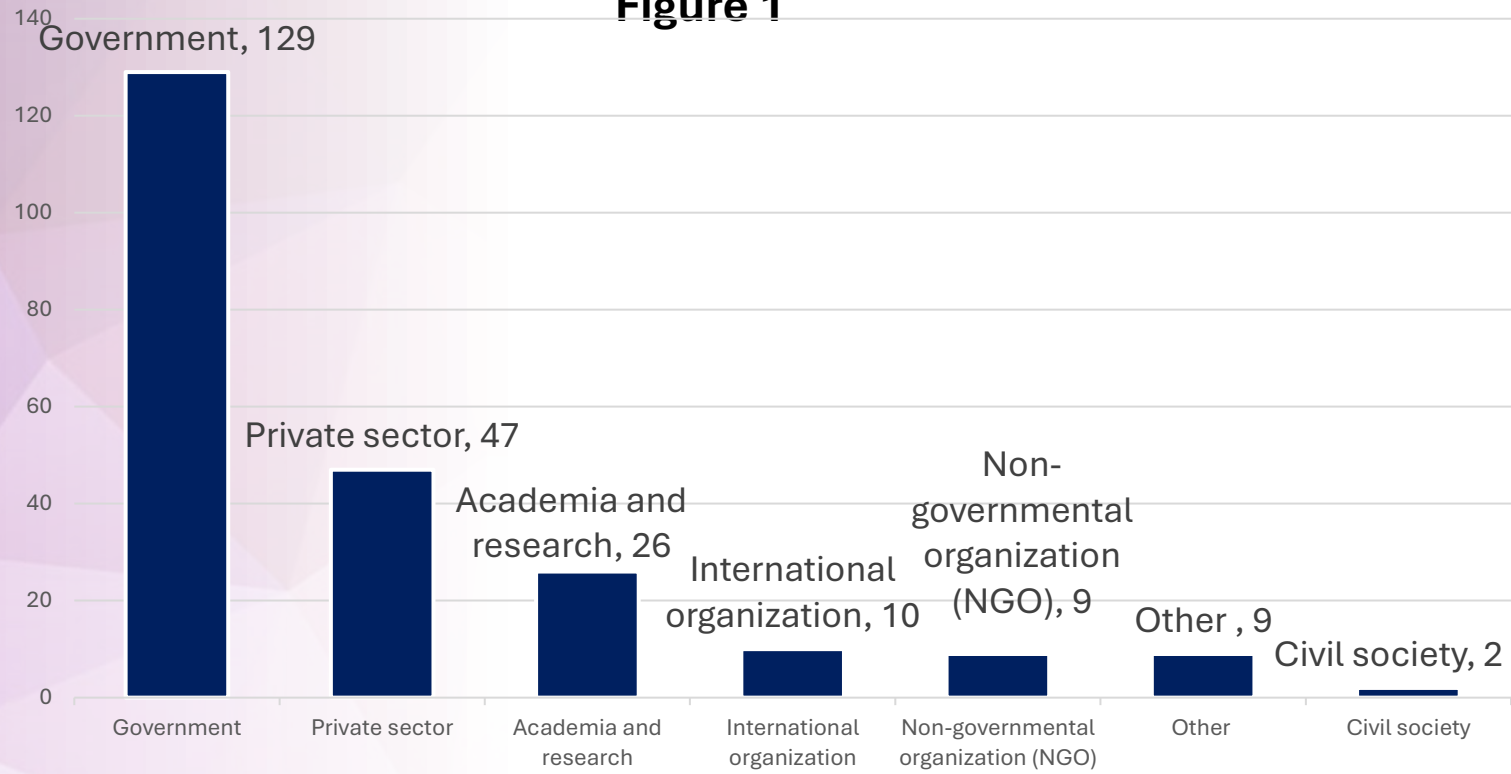


Figure 2

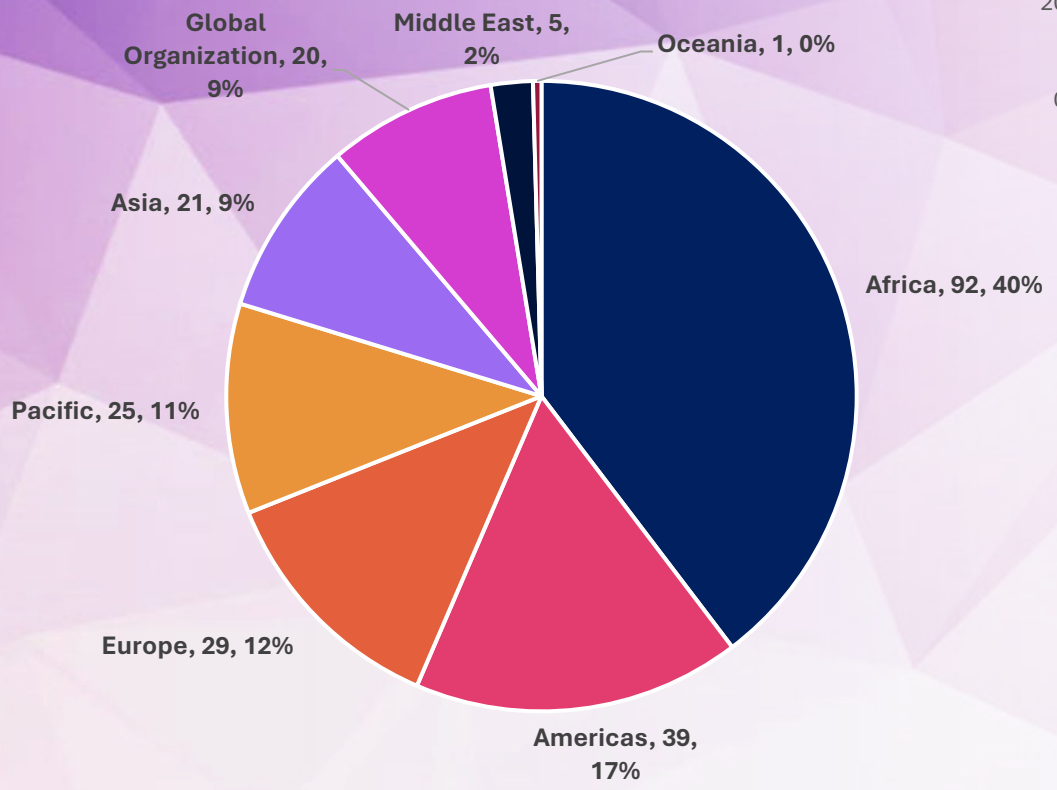
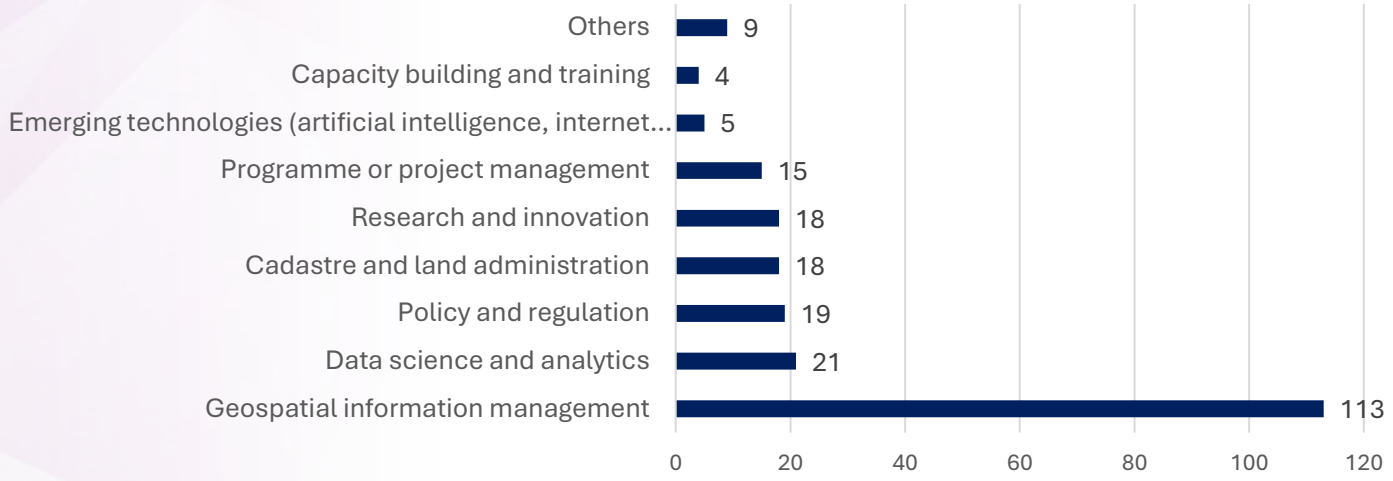


Figure 3 What is your primary professional area?



Key findings (1/4)

What's Broken and What Needs Fixing?

1. Siloed Systems

Fragmentation of institutional architectures across agencies delays decisions and blocks innovation

147 out of 232 respondents (63%) described their national or institutional geospatial systems as fragmented across multiple ministries, sectors, or governance tiers.

2. Missing Legal Guardrails

Legal and normative gaps: No clarity on who owns what data—or who's accountable for misuse

119 respondents (51%) flagged the absence of legally enforceable norms governing spatial data ownership, AI usage in public systems, ethical safeguards, and public accountability

3. Skills Without Systems

Disparities in readiness: Tech exists, but capacity and coordination lag far behind

130 respondents (56%) reported significant disparities in institutional and technological readiness, both across and within countries.

Key findings (2/4)

What's Broken and What Needs Fixing?

4. Value based Governance

Human rights principles need to be Integrate into the design of the future geospatial ecosystem, with safeguards against exclusion, surveillance, and elite data monopolies.

40% of respondents (n=92) explicitly emphasized the need for geospatial systems to embed ethics, rights, equity, and inclusion.. Failure to serve marginalized communities, including: (1) Indigenous populations; (2) Informal settlement dwellers; (3) Rural and underrepresented groups

5. Delivery over theory

A recurring pattern across the survey was a strong sense of frustration with conceptual frameworks that fail to translate into operational tools.

119 respondents (51%) flagged the absence of legally enforceable norms governing spatial data ownership, AI usage in public systems, ethical safeguards, and public accountability. This underscores the need for tools such as budget alignment models, procurement-ready templates, and regionally adapted toolkits.

6. Interoperability

Interoperability must be designed into future geospatial ecosystem, at multiple layers and not only technical, but also legal and procedural.

75 respondents (32%) cited interoperability as an essential but underachieved principle of digital transformation. Government respondents emphasized the absence of shared definitions, inconsistent metadata protocols, and legal fragmentation across departments. Meanwhile, private sector participants called attention to the lack of integration between proprietary platforms and public systems.

Key findings (3/4)

What's Broken and What Needs Fixing?

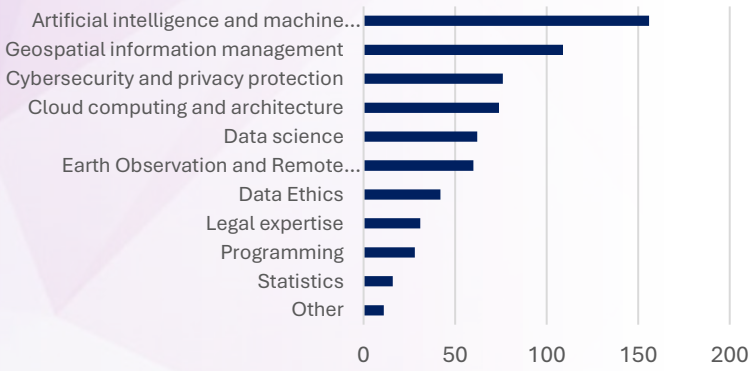
7. AI and new technologies

25% of respondents cited AI and blockchain as both transformative and risky, with divergent regional priorities and ethical concerns.

58 respondents expressed a spectrum of positions: (1) Some emphasized potential benefits such as predictive analytics, workflow automation, and real-time data enhancement. (2) raised concerns about ethical risks, algorithmic opacity, and (3) over-reliance on unregulated private-sector platforms.

8. Capacity gaps in key skills

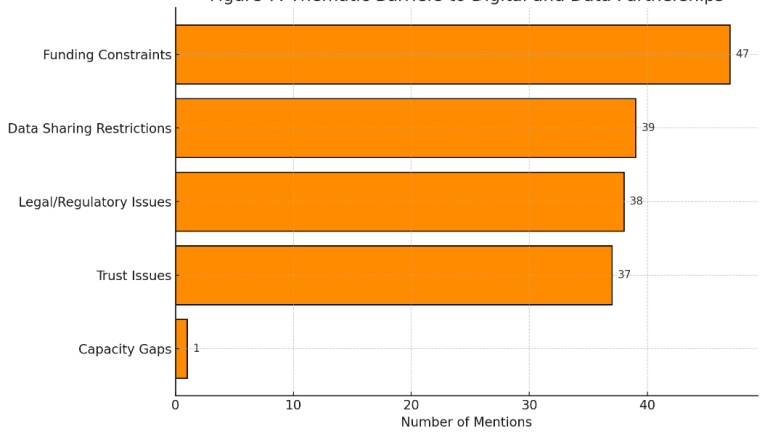
AI/ML, GIS, and legal expertise were most cited; respondents stressed multi-domain training for spatial governance.



9. Barriers to partnerships

Funding constraints (47%), Data sharing restrictions (39), Legal and Regulatory Issues (38). Trust Issues (37). Capacity Gaps (1).

Figure 7: Thematic Barriers to Digital and Data Partnerships



Key findings (4/4)

What's Broken and What Needs Fixing?

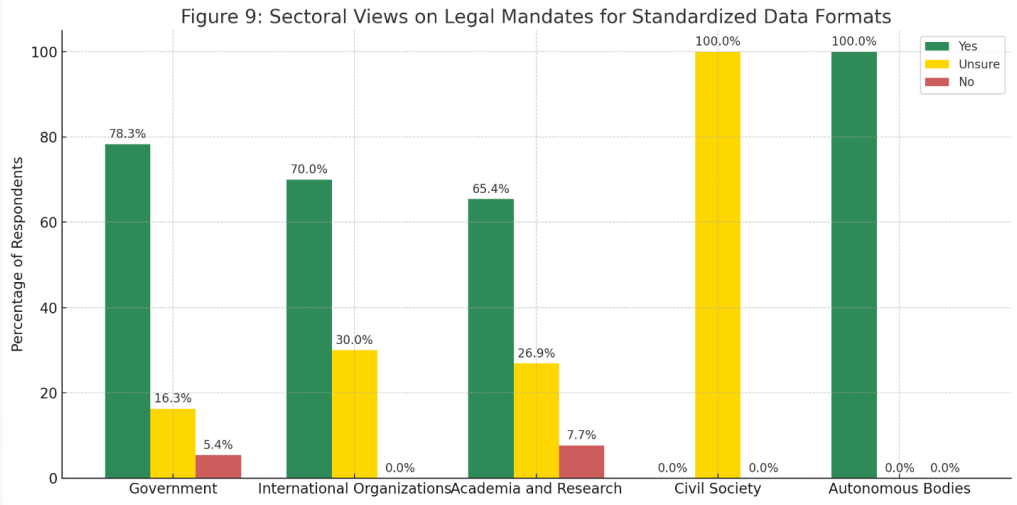
10. Emerging Technologies for impact

AI will dominate the digital geospatial agenda - many of these technologies are not equally accessible or deployable, particularly in low-connectivity contexts

Artificial Intelligence (135) Automation (50), Geolocation & Mapping (49), and IoT (48). Blockchain (28) and Digital Twins (26): Big Data, Remote Sensing, and Cloud Computing each cited by fewer than 20 respondents, suggesting they are now considered enabling infrastructure rather than "emerging" frontiers.

11. Legal Data Format Standardization

Strong cross-sectoral consensus on data standardization, legal enforcement remains a contentious or unfamiliar concept in non-governmental domains.



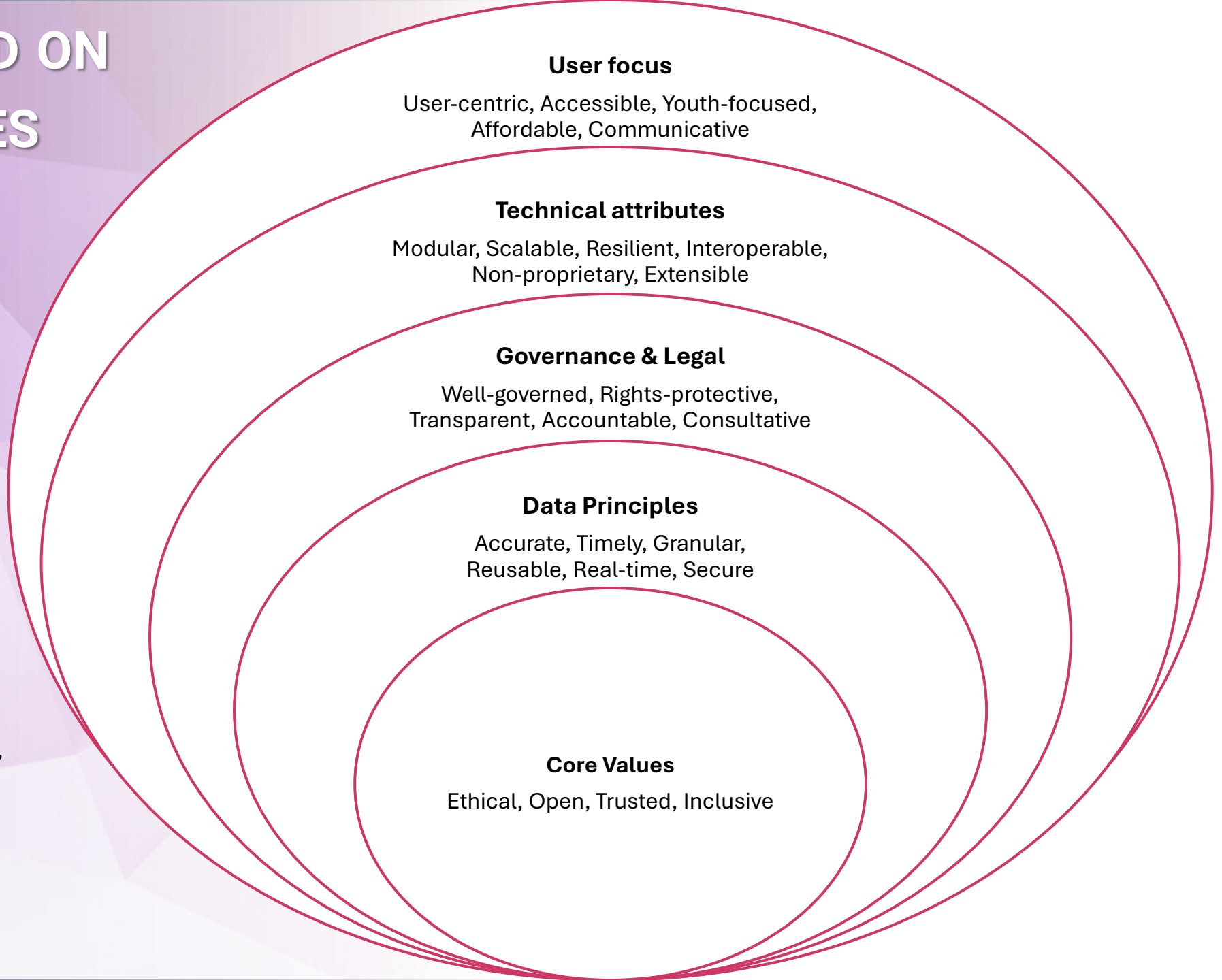
Critical Data Required for Future Geospatial Information Ecosystem Based on Survey Outcomes

Participants highlighted a diverse range of data types essential to shaping the future digital geospatial ecosystem. These include both **traditional sources** such as **geospatial and environmental data**, as well as **dynamic inputs** like **real-time data** and Earth observation data. Integrating these various data streams will enable richer insights, enhanced decision-making, and more responsive digital services across sectors.

Real-time data	Geospatial data	Earth observation data	Environmental data
Sector-related data	Statistical data	Socioeconomic data	Demographic data
Mobility data	Health data	Imagery	Survey data
Administrative data	Geodetic data	Geographic names information	Open data

Principles Based on Survey Outcomes

Apart from being ***Reliable, Sustainable, Interoperable, Integrated, Collaborative, Inclusive, Automated, Transformative and Agile***, **Future Geospatial Information Ecosystem should also be *inclusive, ethical, open, and adaptable*, enabling mutual collaboration across sectors while safeguarding privacy, security, and rights.** It should prioritize accessibility, affordability, and ease of use, ensuring that data is accurate, trusted, and continuously updated. Rooted in creative commons principles, it should combat misinformation, promote transparency, and foster innovation through decentralized, modular, and interoperable systems. The ecosystem must be governed by strong legal frameworks and ethical safeguards, support youth leadership, and enable real-time, evidence-based insights that drive value generation and informed



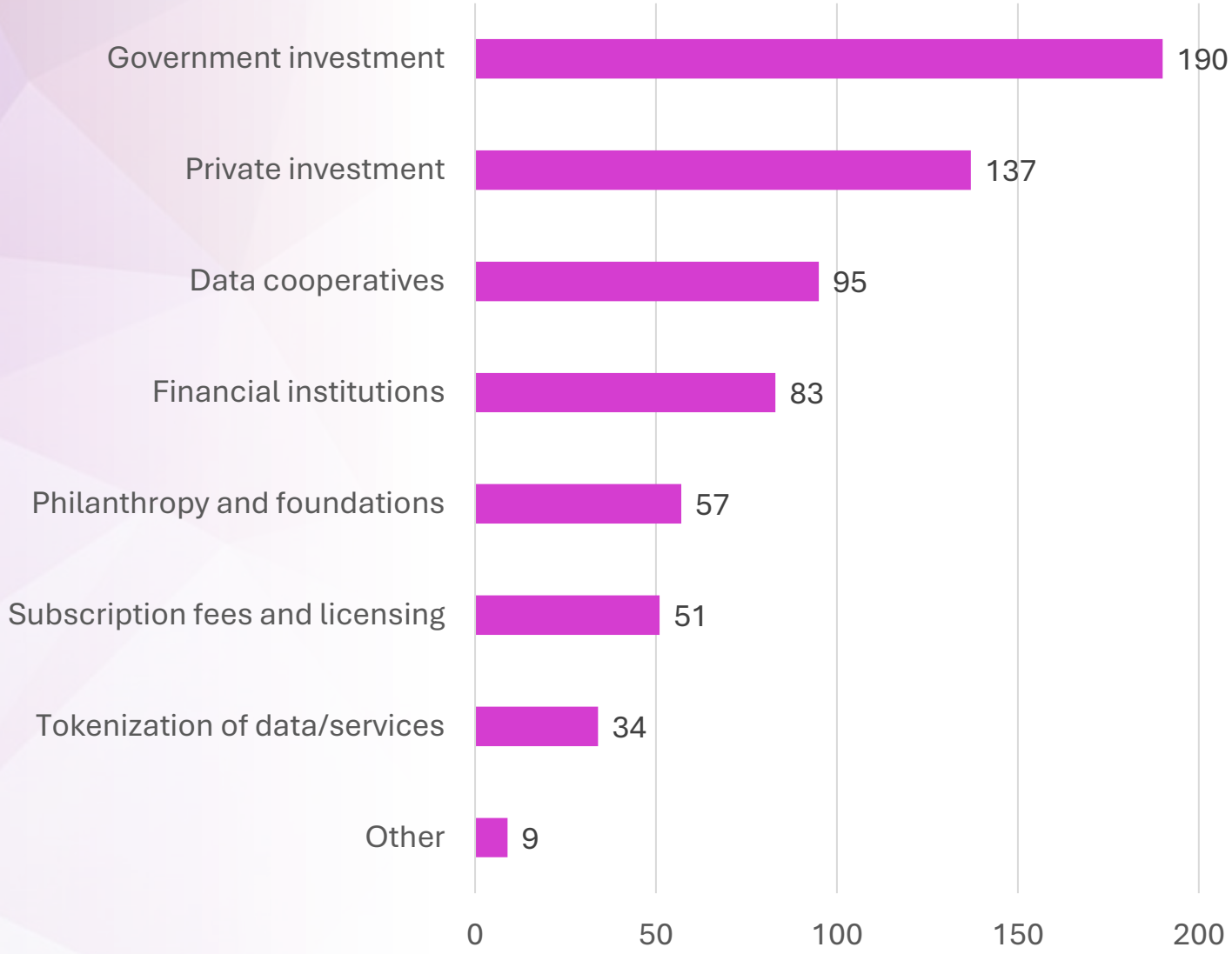
Investment Priorities Based on Survey Outcomes

Stakeholders identified a wide array of critical priorities for investing in a digital ecosystem that is not only technologically advanced, but also inclusive, ethical, and sustainable. Key focus areas include building robust digital infrastructure, fostering digital skills across all segments of society, establishing strong governance frameworks, promoting open standards, driving innovation, ensuring equitable access, and embedding environmental sustainability into digital developments. These priorities aim to create a future-ready ecosystem that benefits all communities and supports long-term resilience.

Priority Area	Focus Points
Digital Infrastructure & Connectivity	Broadband and connectivity, Data centers and cloud infrastructure, Secure, resilient, and sustainable infrastructure
Digital Skills & Capacity Building	Digital literacy and upskilling, Workforce development (AI, EO, geospatial), Public awareness and engagement
Data Governance & Policy	Ethical, participatory data governance, Privacy, cybersecurity, and trust frameworks, Legal and regulatory frameworks
Open Standards & Interoperability	Open data platforms, Open-source technologies, Interoperability and standards
Innovation & Entrepreneurship	Support for local innovation and entrepreneurship, Public-private partnerships (PPP), Community-driven innovation
Equity & Inclusion	Bridging the digital divide (rural, marginalized groups), Ensuring diverse participation and representation, Gender equity and accessibility
Environmental Sustainability	Climate-conscious infrastructure, Green and sustainable technologies

Key Financial Mechanisms Based on Survey Outcomes

A variety of **financial mechanisms** can help increase and **drive data accessibility and capacity within the digital ecosystem**. **Government investment** plays the most significant role, followed by **private investment**. Other important mechanisms include data cooperatives, support from **financial institutions, philanthropy and foundations, subscription fees and licensing models, and the tokenization of data and services**. Additionally, there are emerging and alternative approaches being explored to further enhance the ecosystem.



Equitable Access and Participation Based on Survey Outcomes

Ensuring equitable access and participation in the global digital ecosystem demands more than just infrastructure. It requires an intentional, multi-dimensional strategy that bridges connectivity gaps, promotes digital literacy, fosters inclusive governance, and empowers marginalized communities. Key priorities include expanding affordable digital infrastructure, ensuring access to devices and connectivity, and building local capacity through education and skills development. Policies must **safeguard privacy, promote open data, and reflect diverse voices in governance frameworks**. Platforms should be **user-centric, accessible in multiple languages, and culturally relevant**. **Public-private partnerships, global cooperation, and open standards will be critical** to enabling equitable participation for all. Ultimately, a fair and inclusive digital ecosystem is built on trust, transparency, and shared benefit.

Affordable & Inclusive Infrastructure

- Expand reliable internet access
- Lower costs for devices & connectivity

Digital Literacy & Skills

- Promote inclusive education & capacity building
- Support lifelong learning for all communities

Inclusive Governance & Policies

- Foster open, transparent, and fair data governance
- Embed equity, ethics, and human rights in policy frameworks

Localization & Relevance

- Provide multilingual, culturally relevant content
- Support community-led platforms & innovation hubs

Collaboration & Partnerships

- Strengthen public-private-community partnerships
- Encourage global cooperation & support for developing regions

Open Standards & Interoperability

- Promote open-source tools & open data
- Ensure platforms are accessible, user-centric & interoperable

Survey Highlights – Key Insights & Summary

- Top Issues:
  - Fragmented systems delay decisions
  - Legal gaps in data ownership & AI use
  - Capacity gaps in tech & governance
  - Urgent need for ethics, inclusion, and equity
  - AI & emerging tech: transformative but risky
  - Partnership barriers: funding, legal, trust

- Future Ecosystem Priorities:
  - Interoperable, inclusive, ethical, adaptable.
  - Open standards, strong legal frameworks & ethical safeguards.
  - Rooted in creative commons; combat misinformation; promote innovation.
  - Prioritize accessibility, affordability, and ease of use.
  - Support youth leadership and real-time insights.
  - Foster public-private partnerships for equitable access.

- Equitable Access and Participation:
  - Beyond infrastructure: digital literacy, inclusive governance, empower marginalized communities.
  - Expand affordable infrastructure, device access, local capacity.
  - Policies must prioritize privacy, open data, diverse governance.
  - Platforms should be user-centric, multilingual, culturally relevant.
  - Public-private partnerships and global cooperation are critical.

- Invest Priorities:
  - Digital infrastructure
  - Digital skills
  - Strong governance
  - Open standards
  - Innovation
  - Equitable access
  - Environmental sustainability
  - Financial mechanisms: Govt & private investment, cooperatives, philanthropy.

POSITION PAPER: ELEMENTS

Outline and elements of the position paper on the Future Geospatial Information Ecosystem

Core Concept

- Knowledge-Centric
- Data as Foundational infrastructure
- Ecosystem thinking
- Community engagement
- Systemic reciprocity
- Data values and ethics
- Inclusive innovation
- Semantic and institutional Interoperability
- Resilience and adaptability
- Machine-Readable and actionable by design
- Human-Centric Governance

Strategic Imperatives

- **Digital Transformation and Technological Convergence:** Rapid advancements in digital technologies, including AI, IoT, cloud computing, and advanced analytics, are transforming how data is created, managed and utilized. Geospatial information must evolve to remain an integral component of this wider digital transformation, enabling real-time decision-making, predictive modeling and dynamic service delivery.
- **Climate Change and Resilience:** Climate change presents an urgent global challenge requiring immediate, coordinated action. Location-based data is fundamental to understanding climate impacts, managing risks and building resilient societies. The future geospatial information ecosystem must empower decision-makers with integrated, geospatially enabled insights to drive mitigation, adaptation and resilience efforts.
- **Data as a foundational for Public Good:** Geospatial information increasingly underpins critical public services, from health and transportation to disaster response and resource management. Recognizing geospatial data as a foundational public good promotes equitable access, fosters ethical use, and advances broad societal benefit, strengthening the role of national and global data infrastructures.
- **Bridging the Geospatial Digital Divide:** Despite technological progress, significant disparities in geospatial capabilities persist between countries and regions. The future geospatial information ecosystem must prioritize inclusivity, capacity development and equitable access to technologies and data, ensuring that all Member States, especially developing countries and small island developing States, can participate in and benefit from the evolving ecosystem.
- **Strengthening Governance and Trust in the Digital Era:** As data ecosystems become increasingly complex, maintaining public trust, upholding ethical governance and safeguarding data sovereignty are emerging as critical imperatives. The future geospatial information ecosystem must embed strong governance frameworks that prioritize transparency, accountability, inclusivity, and the protection of human rights, building and sustaining trust in the management and use of geospatial information.

Pillars of Change

- **Purpose-driven | Solutions to Global Challenges:**

  Global progress is stalling at a time when compounding crises are pushing development closer to the precipice. Climate instability, economic volatility, political fragmentation, and the lasting impacts of COVID-19 are undermining hard-won gains. The 2024 Sustainable Development Goals (SDG) Progress Report confirms that only 17% of targets remain on track. Reversing this trajectory requires urgent, integrated action - including stronger digital and data collaboration, and the use of geospatial insight to guide sustainable decision-making and resilience planning.

- **People-centered | Equitable Access to Knowledge:**

  The digital economy has expanded access to data and accelerated its reuse across sectors, generating new forms of insight and public value. Yet, access alone is not enough. The ability to work with geospatially integrated knowledge - particularly among underserved institutions and communities - remains uneven. Realizing the full potential of geospatial information depends on sustained investment in capabilities: individuals must be supported through continuous learning, organization's need the tools to interpret spatial intelligence, and governments must be positioned to act decisively on data-informed evidence. This shift is central to making geospatial knowledge relevant, inclusive, and actionable across all areas of society.

- **Partnership-oriented | Digital cooperation and bridging the divide:**

  Partnerships are a foundational element of the 2030 Agenda for Sustainable Development. The geospatial ecosystem itself reflects this logic - its effectiveness depends on cooperation across sectors, disciplines, and Member States. Enabling universal access to geospatial tools and services requires more than technical progress; it demands intentional collaboration to close persistent digital gaps. Bridging this divide is essential to ensuring all Member States can meaningfully engage in, and benefit from, a modern geospatial information ecosystem - advancing the commitment to leave no one behind.

Principles (1/2)

1. **Transformative:** Embraces innovative approaches, technologies and the power of data to drive significant improvements and advancements in geospatial information capacities that help transform society and bridge the geospatial digital divide.
2. **Agile:** Adapts dynamically to the continuously evolving and expanding nature of the wider digital ecosystem by incorporating new ideas, concepts, and elements as technologies and the role of the geospatial information ecosystem change within the broader digital landscape.
3. **Interoperable:** Promotes the development and use of independent yet interoperable systems that enable seamless data exchanges and compatibility across different platforms, applications, and jurisdictions.
4. **Sustainable:** Develops practices, capacities and systems that ensure efficient resources investments and sustainable efficiency gains.
5. **Automated:** Leveraging automation to enhance efficiency, accuracy, and scalability in geospatial information management systems of systems approach, building on SDIs.
6. **Inclusive:** Foster an environment that values and incorporates diverse perspectives and stakeholders and ensures universal and equitable access to geospatial data and information that empowers communities.

Principles (2/2)

7. **Reliable:** Promotes authoritative sources and reliable data, services, metadata, knowledge, insights and foresight, and an open, safe and secure ecosystem for the public good.
8. **Ethical and rights-based:** Uphold transparency, accountability, human rights, and ethical stewardship in the generation, sharing and use of geospatial information.
9. **Collaborative:** Encourages cooperation and partnership among various entities while considering the different roles various entities play within the ecosystem, to facilitate the development and availability of geospatial services, knowledge and insights for the benefit of the community, fostering participatory approach, multi-stakeholder and user feedback.
10. **Decentralized**: Engages multiple actors and domains that operate independently yet interactively, allowing each to evolve and influence the broader ecosystem. The geospatial information ecosystem serves as a mediator facilitating communication across these diverse communities while maintaining alignment with shared innovation goals.
11. **Integrated:** Prioritizes interconnectivity and integration weaving together the multifaceted of different systems and ecosystems and facilitating the mutual benefits and interlinkages for the benefits of all users, actors, and reciprocity of services.

ORIENTATIONS AND OBJECTIVES

Objectives towards the Future Geospatial Information Ecosystem

Goal 1| Promote Geospatial Information and knowledge as a Public Good

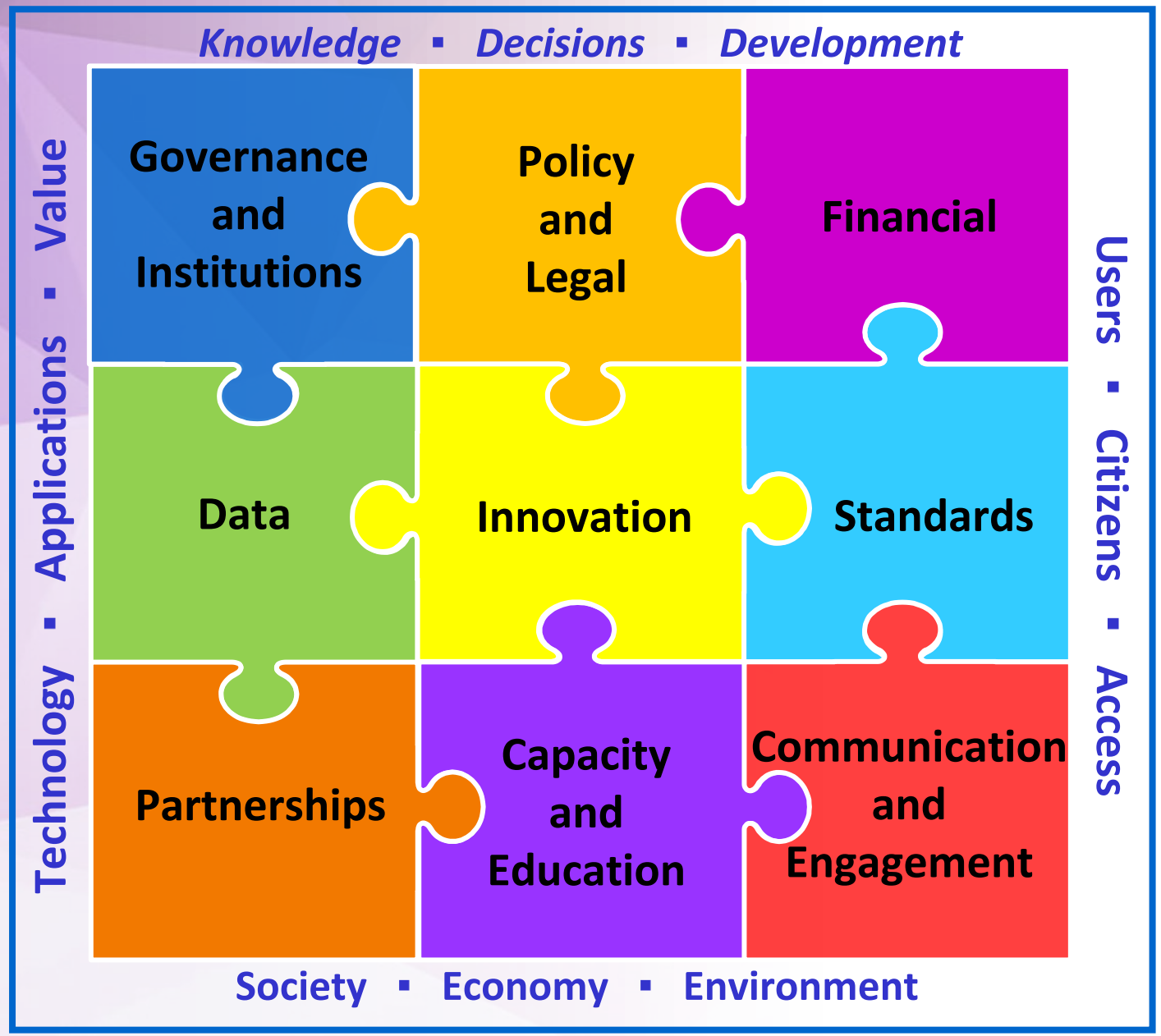
Goal 2 | Foster Digital Cooperation and Innovation

Goal 3 | Bridge the Geospatial Digital Divide

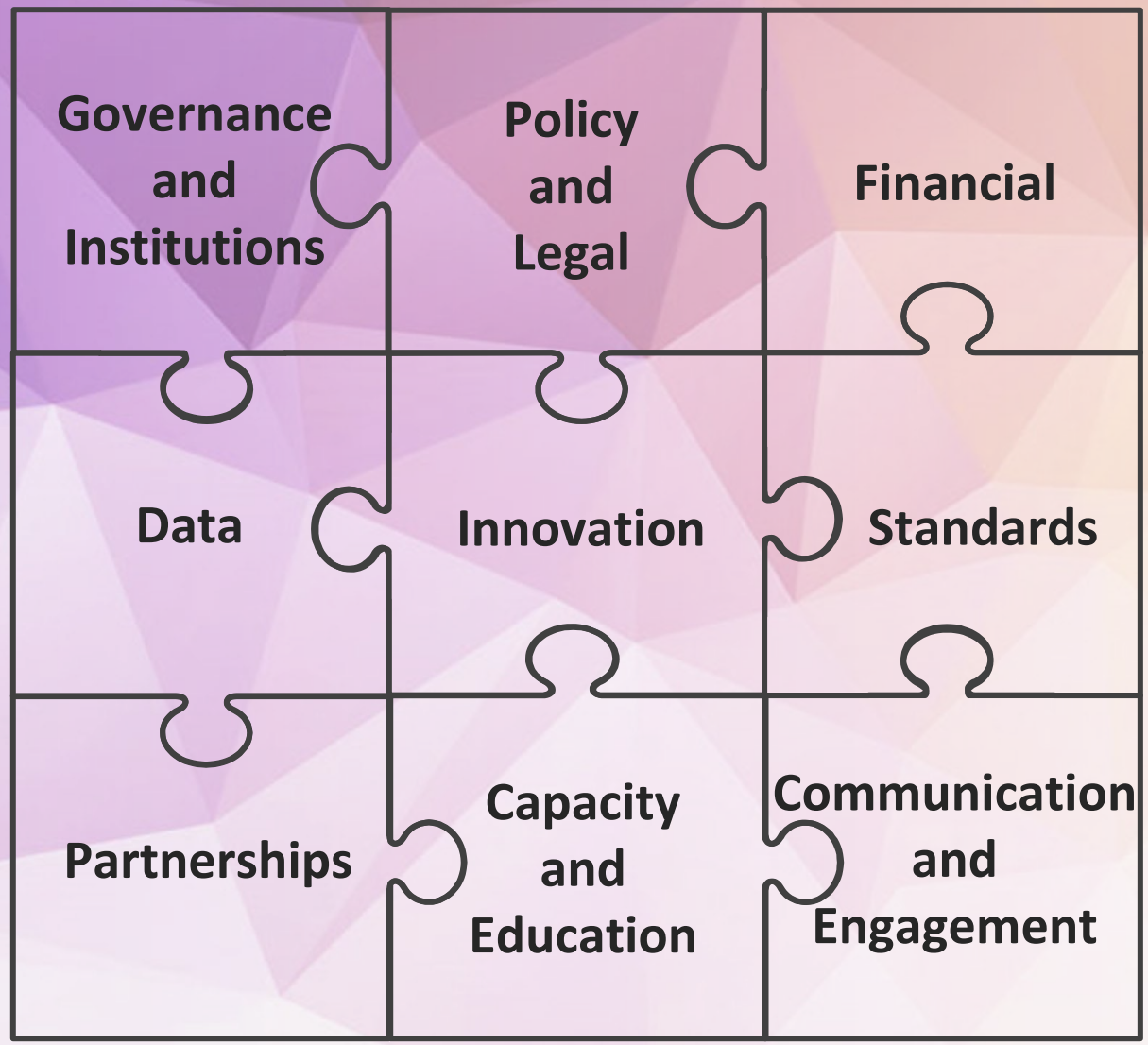
Goal 4 | Embed Anticipatory Governance and Adaptive Decision-Making

Goal 5 | Safeguard Trust, Human Rights, and Ethical Stewardship

BUILDING ON THE UN-IGIF



BUILDING ON THE UN-IGIF



BUILDING ON THE UN-IGIF

Governance

Policy and Legal

Financial

Data

Innovation

Standards

Partnerships

Capacity and Education

Communication and Engagement

BUILDING ON THE UN-IGIF

Principles-Based Policies

Cross-Sector Integration

Responsible Data Innovation

Policy and Legal

Public-private Co-investment

Anticipatory Risk

Governance

Multi-Stakeholder Collaboration

Adaptive and Dynamic Ecosystems

Financial

Tokenization

Cross-Sector Integration

Cross-Border Policy Cooperation

Decentralized finance

Blockchain technologies

Interconnected, Interoperable Data Networks

Technology Co-Development

Machine-Readable Metadata

Data

Innovation

Mutli-stakeholder innovation

Cross-domain standards integration

Dynamic, Real-Time Data

Integrated Innovation Networks

Standards

Evolving Standards

Inclusive multi-stakeholder

Ethical and Trusted Data

Continuous Innovation Ecosystems

Innovation enabling standards

Cross-Disciplinary Collaboration

Cross-Disciplinary Collaboration

Inclusive Participation

Holistic

Inclusive Participation

Capacity and Education

Communication and Engagement

Global Knowledge Exchange

Regional and Global Networks

Partnerships

Regional and Global Networks

Value-Driven Partnerships

Value-Driven Partnerships

Adaptative

Equitable and Inclusive Education

Advancing the Future Geospatial Information Ecosystem

Towards the Future Geospatial Information Ecosystem….

Align with broader global digital agendas

Cross-Sector Collaboration

Deepen Engagement and Dialogue

Pilot Innovative Approaches

Develop priority use cases

Strengthen Capacity and Knowledge Sharing

Questions & Discussion

UNITED NATIONS
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