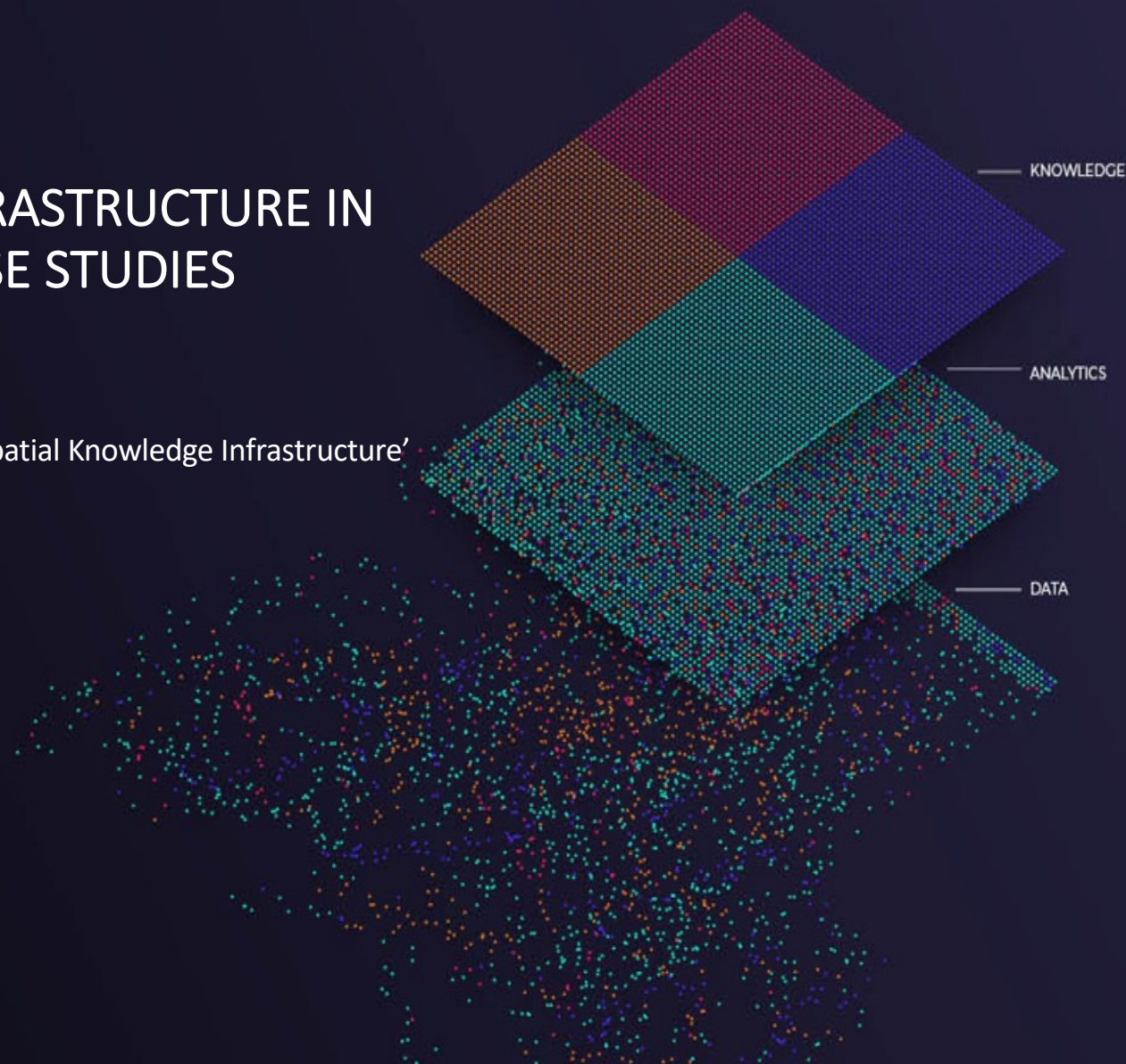# GEOSPATIAL KNOWLEDGE INFRASTRUCTURE IN ACTION – SECTORAL CASE STUDIES

19th JUNE 2023

UNGGIM Europe Webinar on 'The Way towards a Geospatial Knowledge Infrastructure'

Ruban Jacob
Associate Director – GKI
Geospatial World

KNOWLEDGE

ANALYTICS

DATA

User Industry Focus

Energy Transition

Construction & Infrastructure

Autonomous Driving

Land Administration

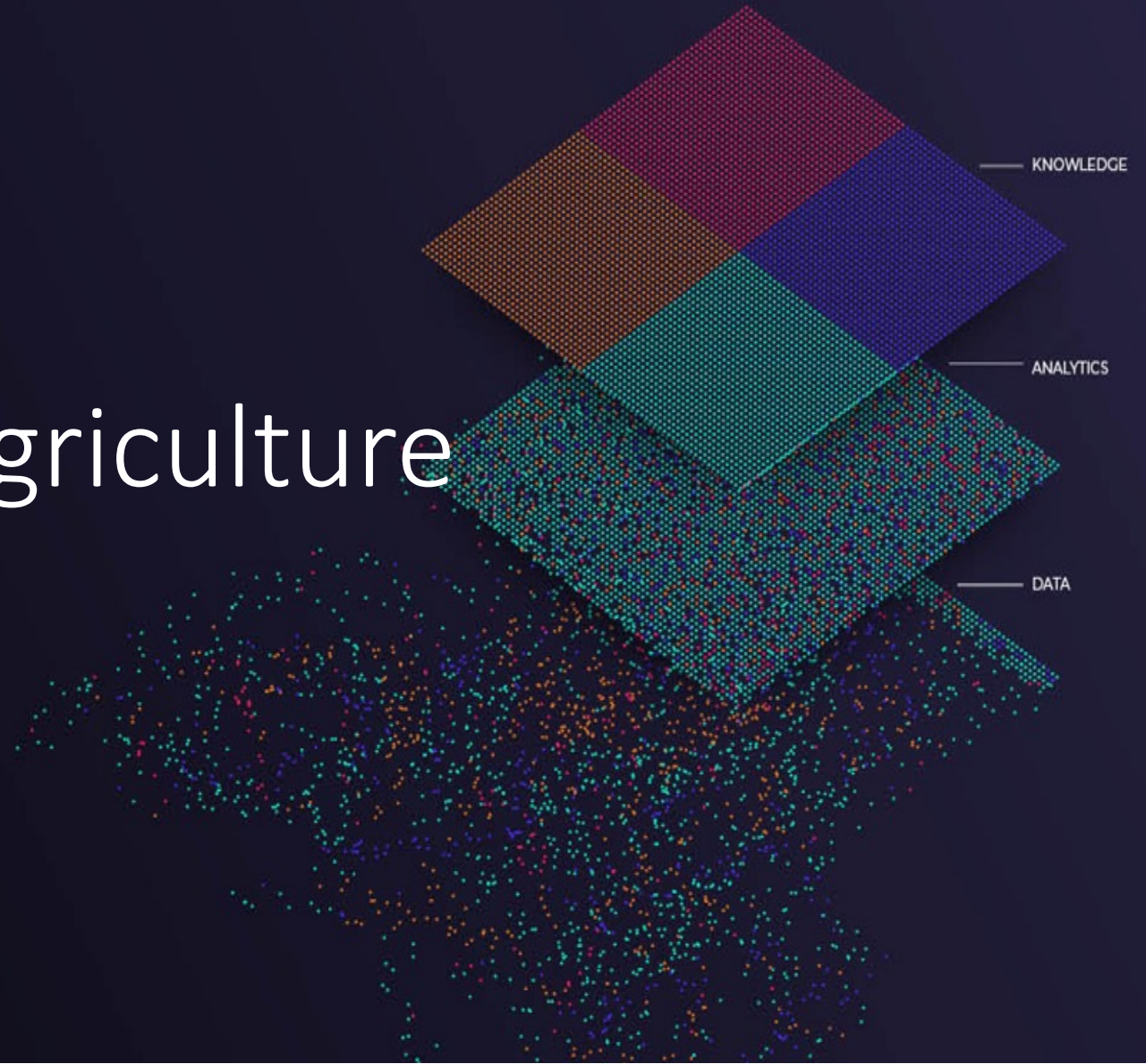**Logistics & Supply Chain**

Cities

Public Safety & Security

Agriculture

Agriculture

KNOWLEDGE

ANALYTICS
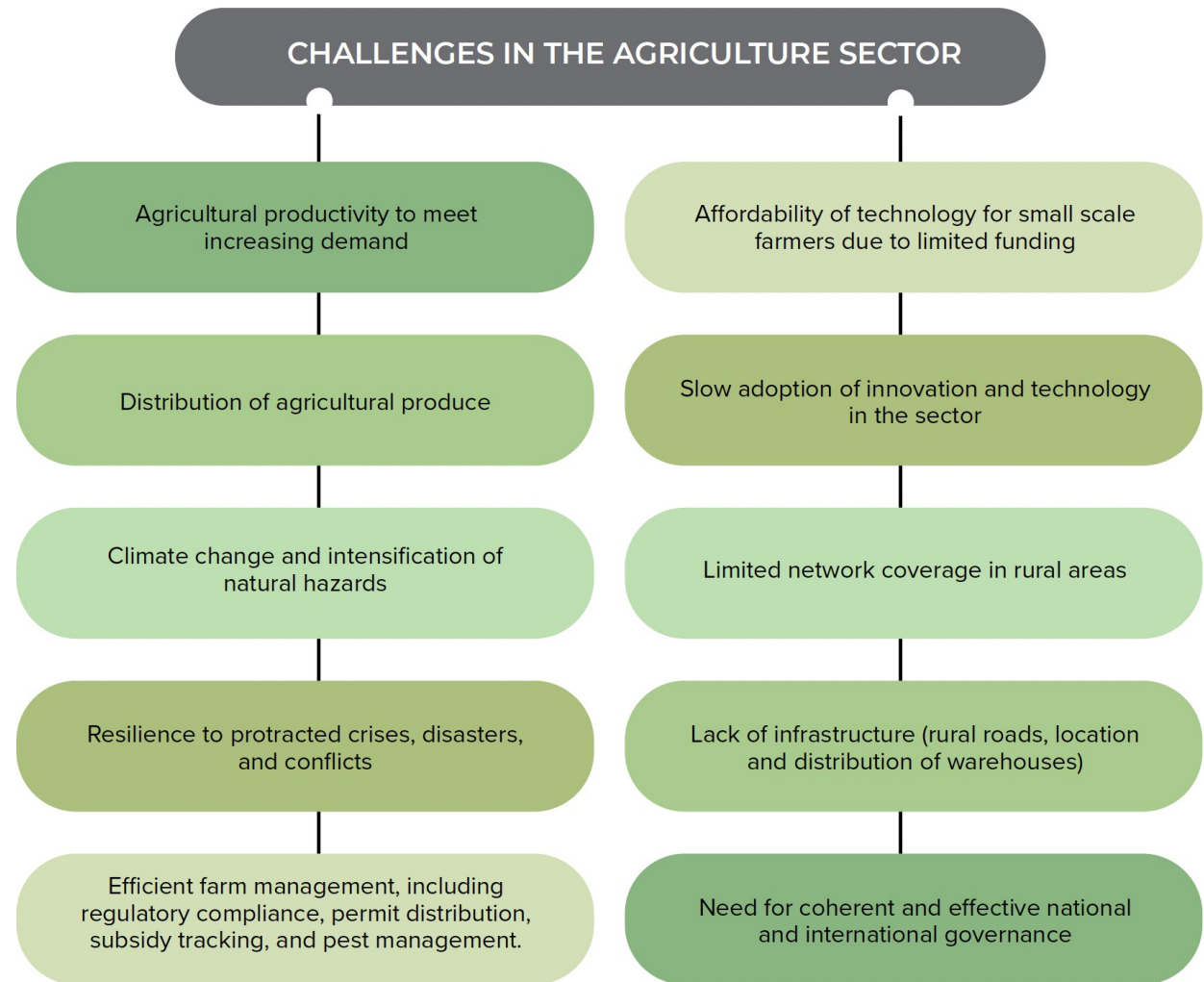
DATA

SDG Impact and Workflow

SDG Impact

Sustainable Development Goal 2, Zero Hunger, Target 2.3 by 2030, double the agricultural productivity and incomes of small scale food producers. Knowledge enables a holistic approach to improving the whole crop production system on a specific holding. Earth Observation (EO) supports crop monitoring and yield prediction. Governments open up high-resolution soil and hydro-meteorology data from EO to enable knowledge generation for small holders and industry; this knowledge is made accessible through smartphones, with integration and analysis hidden from the user.

Workflow

| Input | Production & Cultivation | Harvesting & Processing | Storage | Distribution |

Geospatial Knowledge Infrastructure

Sectoral Challenges

CHALLENGES IN THE AGRICULTURE SECTOR

- Agricultural productivity to meet increasing demand
- Distribution of agricultural produce
- Climate change and intensification of natural hazards
- Resilience to protracted crises, disasters, and conflicts
- Efficient farm management, including regulatory compliance, permit distribution, subsidy tracking, and pest management.

- Affordability of technology for small scale farmers due to limited funding
- Slow adoption of innovation and technology in the sector
- Limited network coverage in rural areas
- Lack of infrastructure (rural roads, location and distribution of warehouses)
- Need for coherent and effective national and international governance

Geo-AI for agri-food system digital transformation

Hand-in-Hand is an evidence-based, country-led and country-owned initiative of the Food and Agriculture Organization of the United Nations (FAO) to accelerate agricultural transformation and sustainable rural development to eradicate poverty (SDG1) and end hunger and all forms of malnutrition (SDG2).

Hand-in-Hand Geospatial Platform - FAO's geospatial infrastructure - enabling tool for the HiH Initiative unlocking over 2 million data layers for more targeted, evidence-based interventions

Cloud-based Infrastructure as a Service (IaaS) and Platform as a service (PaaS) - no software installation locally

Multi-disciplinary data federation and integration – all sub-disciplines in agriculture, from animal health to trade and markets

Standards-driven - complies with OGC and ISO standards; Strict data policy – Data privacy and ownership

Data visualization and dissemination (3D), multi-criteria data analysis, image processing & knowledge discovery enabled by GeoAI

Impact

Identify the largest opportunities to raise the incomes and reduce the inequities and vulnerabilities of the rural poor, and to guide concerted action among partners and in keeping with national sustainable development priorities

Present an evidence-based view of economic opportunities and to improve targeting and tailoring of policy interventions, innovation, finance and investment, and institutional reform

Geospatial Knowledge Infrastructure

Geospatial AI for sugar beet producers

Project Details: Rezatec's Geospatial Artificial Intelligence (AI) solution for sugar beet processors combines remote sensing and data science to assist with procurement and inputs optimisations for processors and their contract farmers.

Challenges:
- Faced with increasing global competitive pressures, regulatory requirements and logistics costs it is critical that sugar beet processors are able to optimise their factory planning and procurement processes.
- During the procurement planning phase, processors need visibility of historical crop rotations for every field in the catchment areas around their production facilities

Solutions:
- Satellite data coupled with crop modelling and AI tools enables processors to be more fully informed so that in-season planning, and mitigation actions are more effective

Benefits:
- By improving visibility over sugar crops, processors have better crop volume and harvest time estimates earlier in the planning process, which in turn allows for more accurate procurement for the factory processes
- Digitizing the sugar beet field by field crop data across all relevant catchment areas will facilitate improved pre-season crop rotation planning, pre-season farmer procurement, in-season crop identification, crop yield, farmer interaction, etc.

Geospatial Knowledge Infrastructure

Land Administration

KNOWLEDGE

ANALYTICS
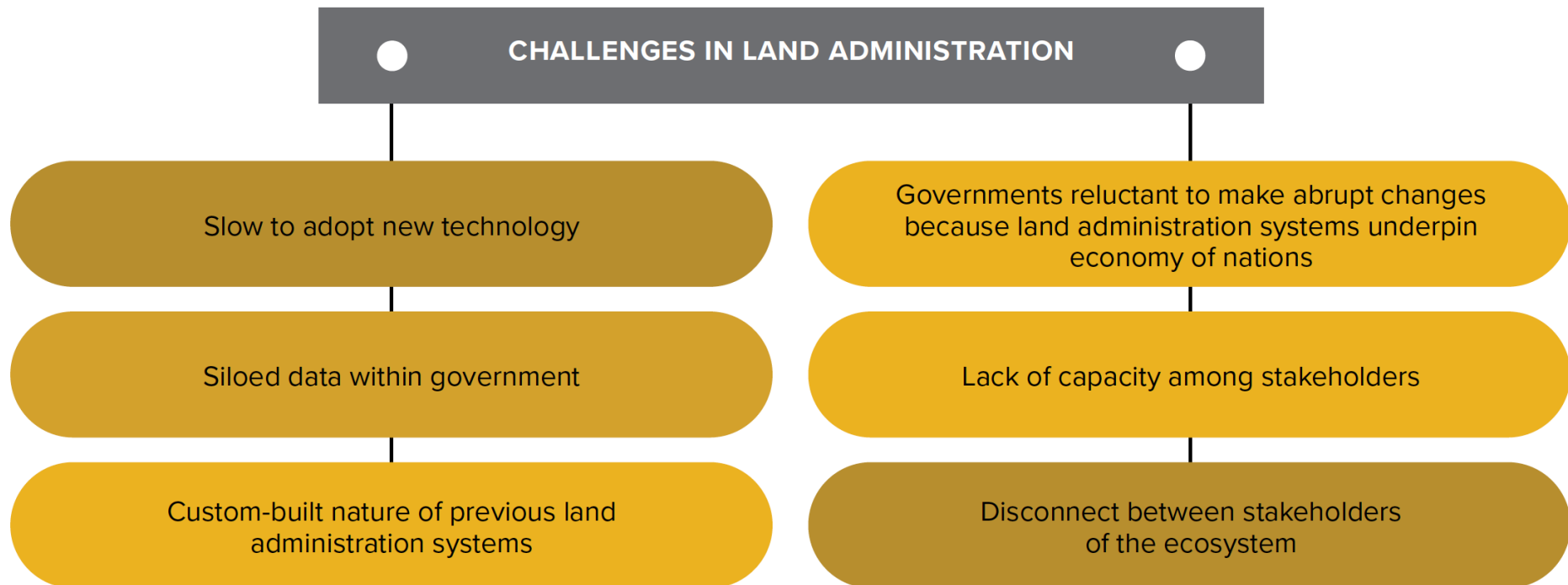
DATA
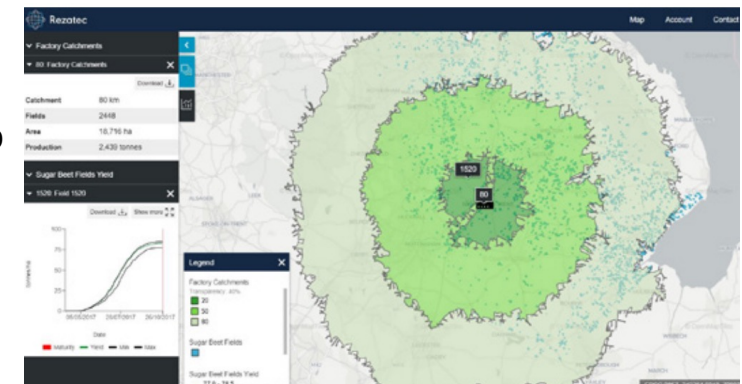
SDG Impact and Workflow

SDG Impact

Sustainable Development Goal 1, 'no poverty', Target 1.4, by 2030 ensure that all men and women, in particular the poor and the vulnerable, have equal rights to economic resources, access to basic services, ownership and control over land and other forms of property, inheritance, natural resources, and appropriate new technology and financial services, including microfinance. The adoption of geospatial technology like drones in land use mapping and other functions of the workflow, will enable the underprivileged to secure land rights and the necessary documentation, thereby enabling them to move towards financial security.

Workflow

Land Tenure → Land Value → Land Use → Land Development

Sectoral Challenges

CHALLENGES IN LAND ADMINISTRATION

Slow to adopt new technology

Siloed data within government

Custom-built nature of previous land administration systems

Governments reluctant to make abrupt changes because land administration systems underpin economy of nations

Lack of capacity among stakeholders

Disconnect between stakeholders of the ecosystem

**Geospatial Knowledge Infrastructure**

Automated Detection and Classification of Nationwide Residential Construction in the USA

Project Details: Machine Learning algorithms from Reveal analyse high-resolution imagery from Airbus' OneAtlas to count residential construction projects and assess their current stage across the US

Challenges: The U.S. Census Bureau tracks new home construction activity by manually monitoring building permits and conducting surveys. Information is often out of date, incomplete, or inconsistent

Solution: Reveal Global Consulting developed an automated process that uses machine learning to analyze optical imagery to identify when land has been cleared for residential construction, determine the type of structure being built, assess monthly progress, and verify completion.

Benefits: Residential construction progress reports are more accurate and reliable across the nation; consistent from month-to month and region-to-region.

Geospatial Knowledge Infrastructure
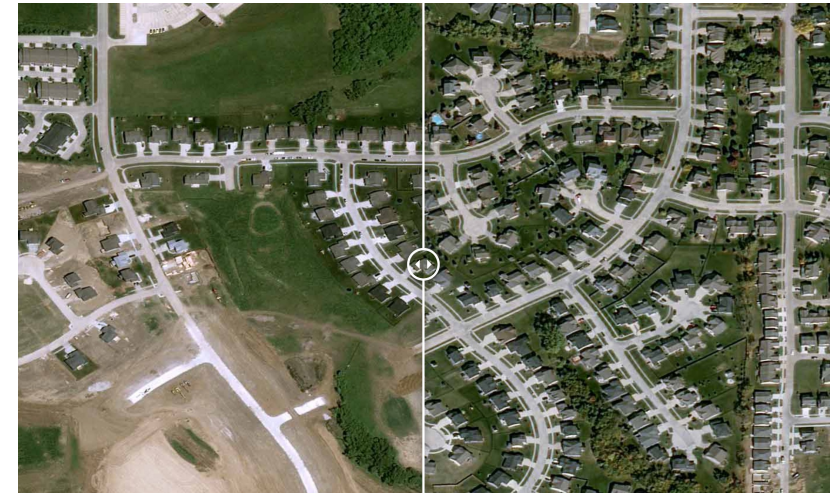
Evolving Role of Private Sector in Land Administration

The World Bank's Global Land and Geospatial Unit undertook an assessment of the viability of various models of PPP arrangements in land administration, by conducting global consultations with government and private sector representatives to discuss the evolving role of private sector in land administration[1]

Context: The World Bank has provided more than $1.5 billion in grants, credit and loans to more than 50 countries to support the implementation of programs to enhance land administration systems. Almost all these programs are being implemented by the public sector; The private sector engaged through service contracts or long-term contracts for providing technical services such as field surveys, mapping, aerial photography, establishment of geodetic networks, development of land information systems, etc., and paid against outputs/performance indicators

1. A private-sector role in managing land administration? (*Wael Zakout, Aanchal Anand*)
   (https://blogs.worldbank.org/ppps/private-sector-role-managing-land-administration-we-did-our-homework)

Evolving Role of Private Sector in Land Administration

KEY TAKEAWAYS

Governments interested in attracting private sector partnership; concerns raised about data ownership, the cost of services for citizens, the fate of government employees, and what happens after contracts end - *could easily be addressed by a clear, detailed, and transparent contract and competitive bidding processes*

Functions attracting the most interest from both governments and the private sector are *IT solutions*—governments might lack in-house skills to develop and maintain sophisticated solutions and adequate budget to maintain and upgrade them. The private sector has the know-how and ability to attract highly skilled IT professional

Private sector participation also envisaged in *first registration*; Many functions of first registration could be done by the private sector, such as management, surveying and mapping, collection of legal documents for citizens, and public announcements

Possible business model - *bundle first registration with IT solutions under one long-term contract*. Government subsidize first registration costs through their own financing or donor funding; private sector pay for the IT solutions and a small % of first registration costs, and recover the investment through a revenue-sharing arrangement on property transactions

Geospatial Knowledge Infrastructure

References

- A private-sector role in managing land administration?
  - *Wael Zakout, Aanchal Anand*
    (https://blogs.worldbank.org/ppps/private-sector-role-managing-land-administration-we-did-our-homework)
- FAO's Hand-in-Hand Initiative: a New Approach
  - (https://www.fao.org/3/nc347en/nc347en.pdf)
- Geospatial AI for sugar beet producers
  - (https://www.rezatec.com/wp-content/uploads/2020/06/Agriculture-Datasheet-Geospatial-AI-for-Sugar-Beet-Processors.pdf)

Geospatial Knowledge Infrastructure

THANK YOU

KNOWLEDGE

ANALYTICS

DATA