IGN FI

Global Trends of Integrated Land Information System

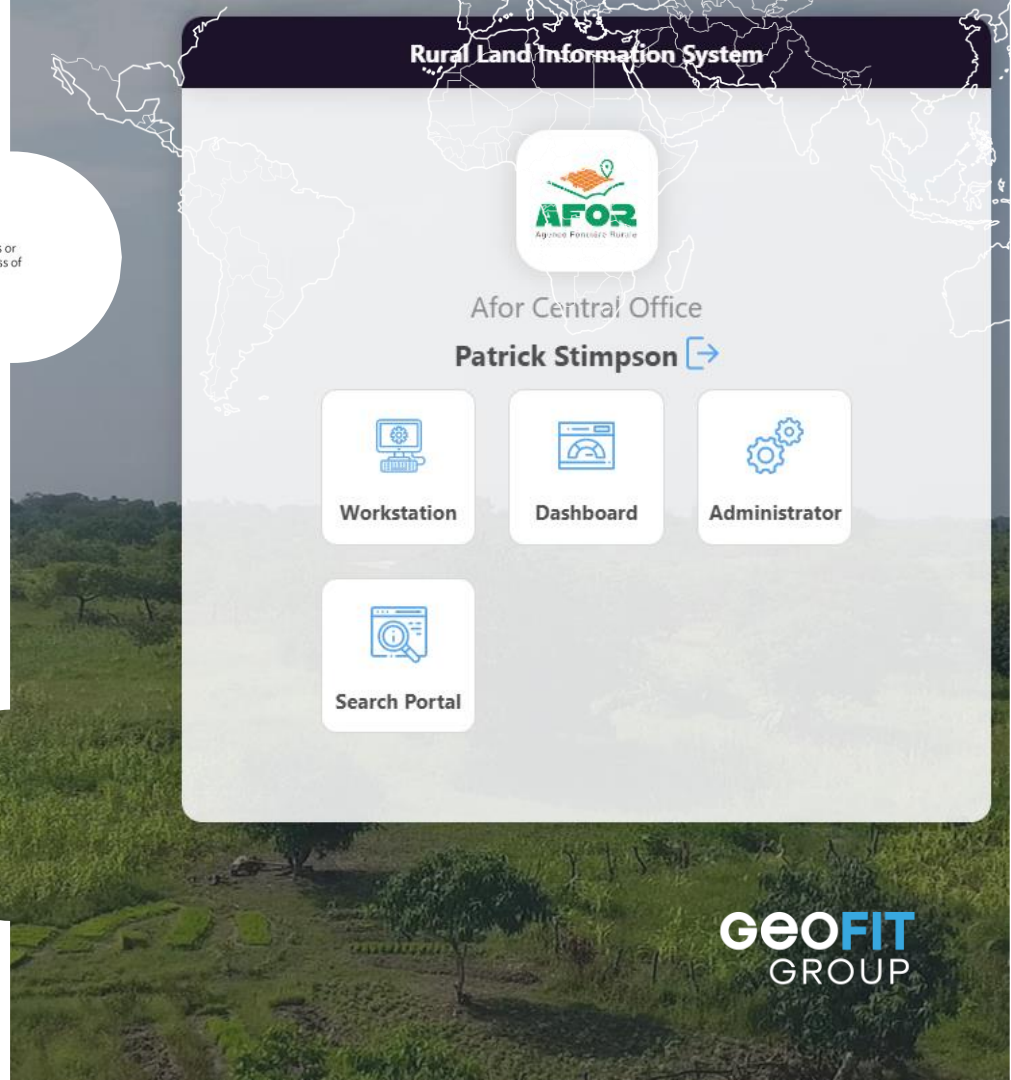
Patrick STIMPSON – IGN FI

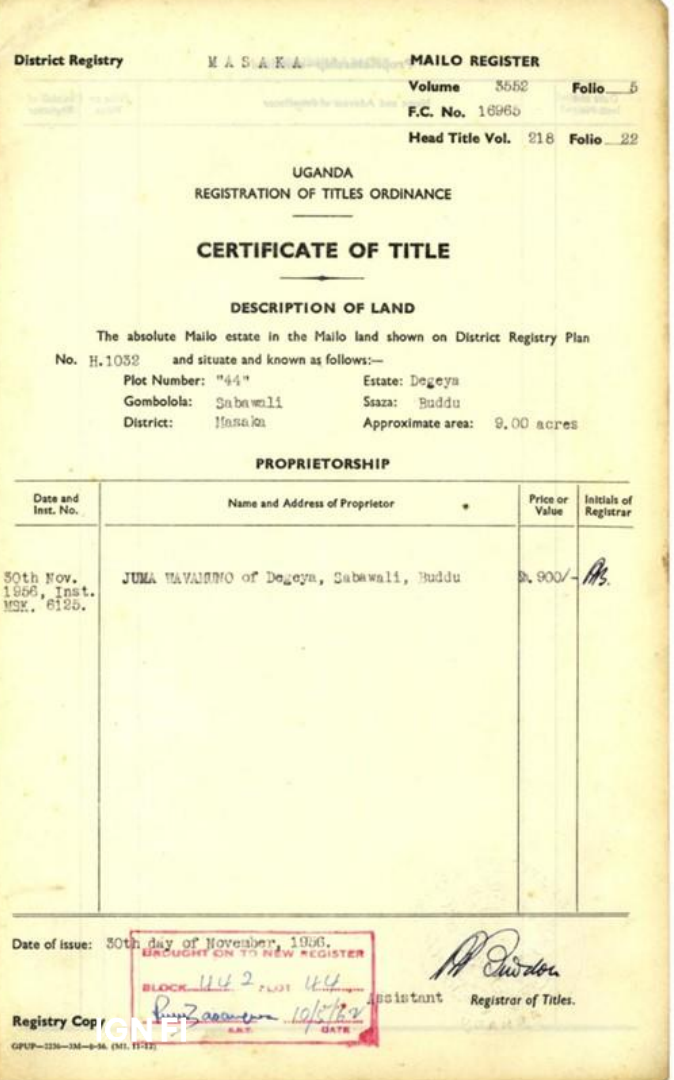
01/11/2022

ADB-LX Corp Joint Workshop

on Building National Spatial Data Infrastructure

Seoul, South Korea





District Registry MASAKA

MAILO REGISTER

Volume 3552 Folio 5

F.C. No. 16965

Head Title Vol. 218 Folio 22

UGANDA

REGISTRATION OF TITLES ORDINANCE

CERTIFICATE OF TITLE

DESCRIPTION OF LAND

The absolute Mailo estate in the Mailo land shown on District Registry Plan No. H.1032 and situate and known as follows:—

Plot Number: "44" Estate: Degeya

Gombolola: Sabawali Ssaza: Buddu

District: Masaka Approximate area: 9.00 acres

PROPRIETORSHIP

Date and Inst. No.	Name and Address of Proprietor	Price or Value	Initials of Registrar
30th Nov. 1956, Inst. MSK. 6125.	JUMA WAVAMUNO of Degeya, Sabawali, Buddu	Sh. 900/-	

Date of issue: 30th day of November, 1956.

BROUGHT ON TO NEW REGISTER BLOCK 144 PLOT 44 DATE 19/5/62

Assistant Registrar of Titles.

Registry Cop

A Land Information System (LIS) is the main tool and source of information for Land data management:

- Land Registration
- Cadastral survey and mapping
- Land adjudication and Titling
- Physical Planning
- Land Valuation
- …

LIS vs. LIS

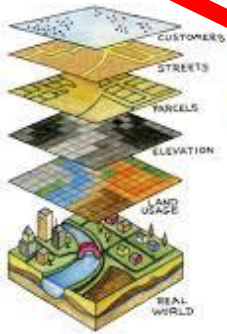
Land Information System

Or

Land Information Software

Common idea…

LIS ≠



GIS

geographic information system

+

DBMS

Geographic representation of the properties

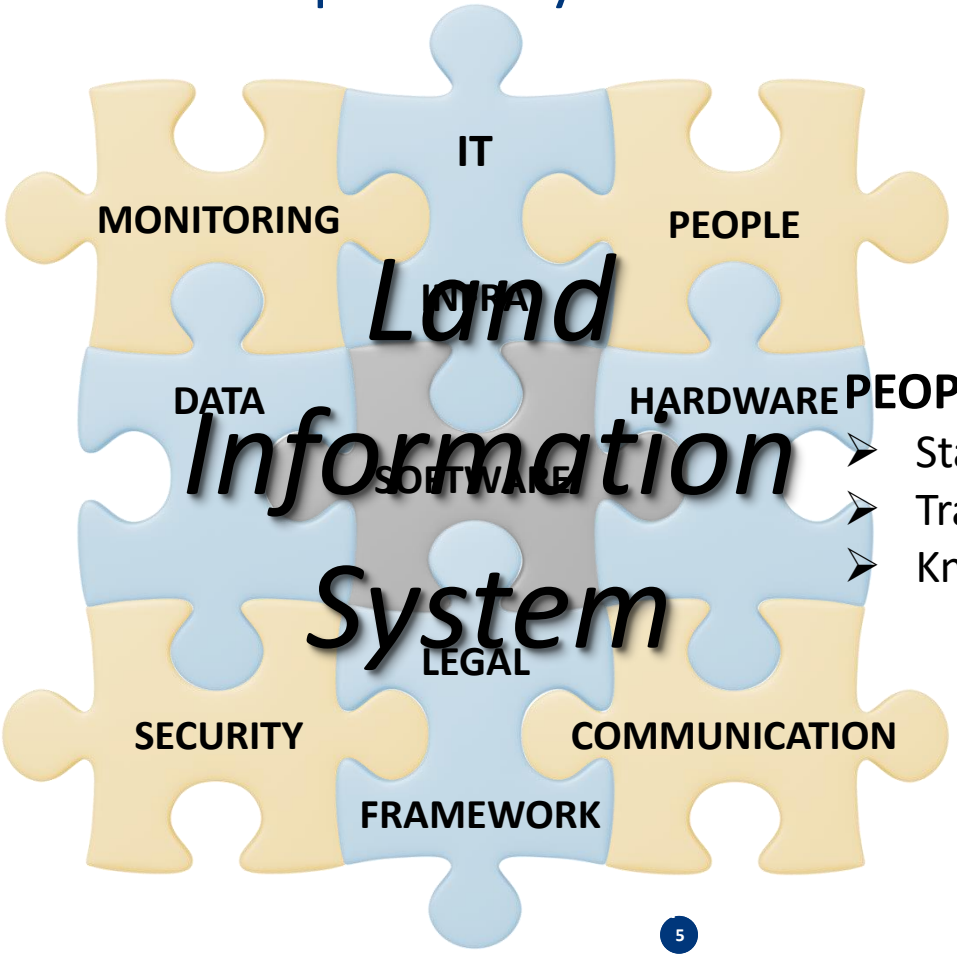
- **Lines, points, polygones**
- **Coordinates system**

Other layers (roads, water bodies,…)

- **Parties**
- **Rights**
- **Responsibilities**
- **Restrictions**

Related to the Property (LADM)

A LIS is a multi-component system



MONITORING

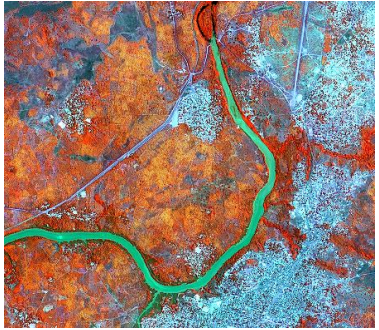
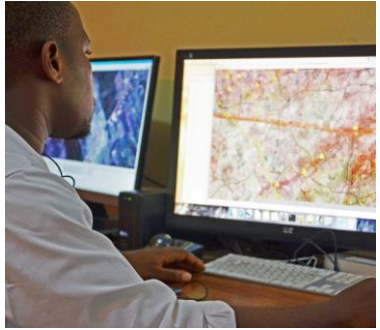
- Status of the system
- Dashboard
- [illegible]

PEOPLE

- Staff to operate the LIS
- Training
- Knowledge transfer

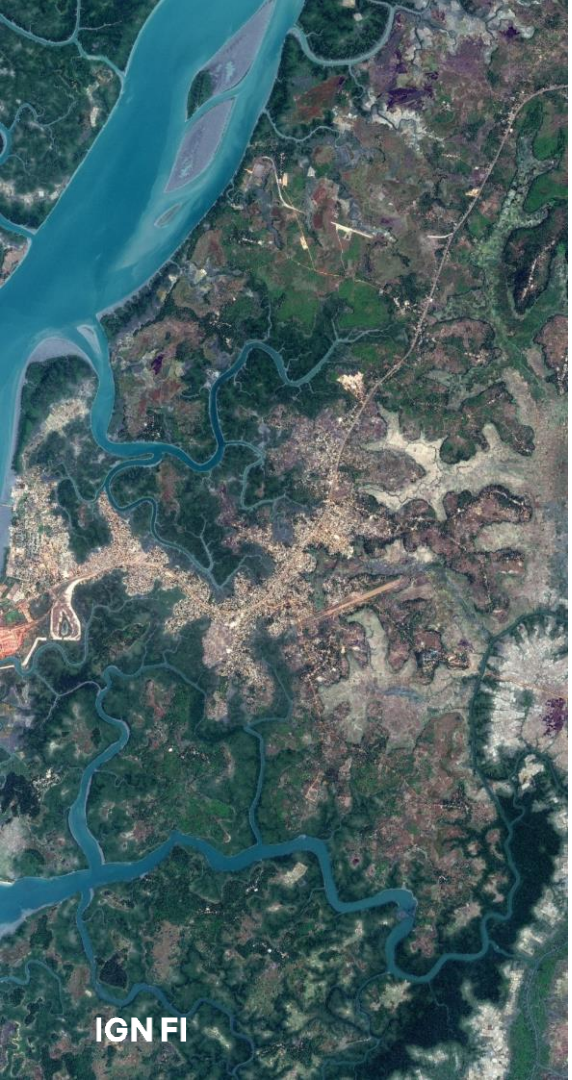
SECURITY

- Security policy
- Access to the system
- Tracability of transactions
- Backups
- Disaster recovery

Global Trends of integrated Land Information Systems

As multi-component systems, LIS have considerably evolved during the last decades



- **L**egal framework upgrade and Institutional reform
- **D**igital spatial data Capture/Conversion
- **T**echnological aspects

Legal framework upgrade and institutional reform (1)

Modern Land Administration can't be effective without **modern legislation** allowing **digital documents and digital processes**:

- Land registration,
- Land survey,
- Land valuation,
- Physical Planning

This includes, among others:

- Digital security policy,
- IT Infrastructure,
- Digital signature,
- Cloud hosting.

Legal framework upgrade and institutional reform (2)

Institutional structure of the Land sector:

- Different Land departments under one umbrella (ex: Land Ministry including Land registration, Survey and Mapping, Land Valuation, Physical Planning)

Transfer of responsibility with control at central level

Long term LIS strategy and Financial Plan (10 years) for development, implementation and maintenance

- Political will
- Vision, strategy and implementation plan
- Financial resources

One of the main issues for LIS is an outdated legal framework which doesn't recognize digital documents and doesn't support digital procedures and new technologies

Digital spatial data Capture/Conversion

A modern Land Information System requires the up-to-date spatial data as the spatial basis for all land records and information.

LIS without accurate and reliable data is like a car without fuel…

Digital spatial data Capture/Conversion

Main sources for Cadastral survey:

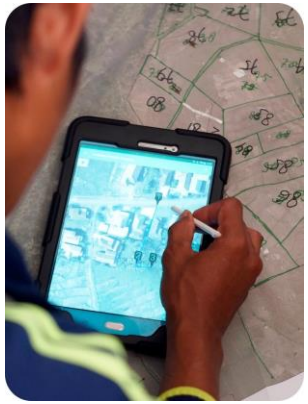
- CORS and RTK survey
  - National CORS network
  - RTK or online computing services

- Very high resolution images
  - Airborne or satellite Digital Orthorectified Imagery
  - Drone:
    - Standard grade (up to 50 min flight time, cheap, suitable for small areas)
    - Professional grade (up to 24 h flight time, 200 km range, medium cost, suitable for big areas);

Digital spatial data Capture/Conversion

Main sources for Cadastral survey:

- **Mobile solutions** (GNSS enabled tablets with orthorectified imagery);



- Crowd sourcing, (example OpenStreet Map, Wikimapia etc.)

Digital spatial data **Capture**/Conversion

Emerging technologies based on **Artificial Intelligence** (AI):

- **Automatic feature extraction, change detection,…**

  Ex: vector extraction from raster images

Ecopia

- Another AI capacity is analyzing the content of documents and automatic extraction of the meaningful information for legal review and analysis

Digital spatial data Capture/**Conversion**

Challenges:

Conversion of legacy data

Modern technologies don’t work with these documents due to their (very) poor condition…

Digital spatial data Capture/Conversion

Challenges:

Before their conversion to a digital format these documents need sometimes to go through a physical (and manual) process of rehabilitation

Digital spatial data Capture/**Conversion**

Rule n°1:

Do not convert legacy data without knowing the data model used in the LIS. Information captured during this digitization will feed the LIS.

Rule n°2:

If possible use dedicated transactions for data conversion which will directly populate LIS DBs.

This will facilitate the integration in the LIS

Technological trends

Technological trends (1)

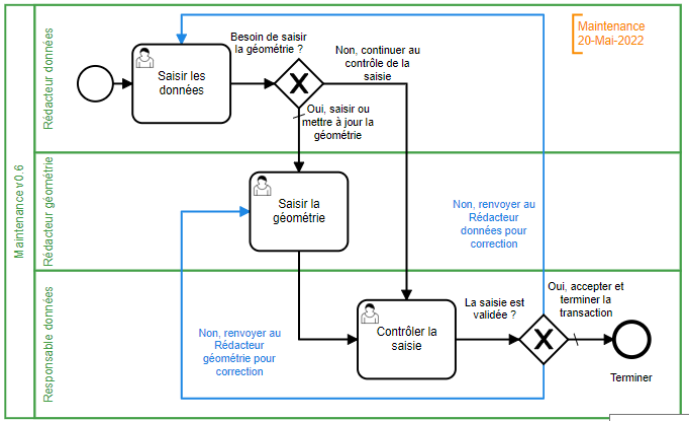
Web based and Workflow driven LIS is the new trend:

- Client/Server applications => Web Services, Web Applications
- Off-the-Shelf software (COTS) => Open Source Platforms
- Data Model => Web Map & Layers
- Custom Applications => Customizable Templates
- Stand-alone Desktop => Web client with browser
- Static Data => Real Time data

Technological trends (2)

Use of **Workflow engines** (ex: Camunda, Bizagi, Bonita BPM, etc.) and **Business rules engines** (ex: Drools) for standardization of procedures (services in different offices at the same standard level)

Land Administration Domain Model (LADM) – ISO 19152



Technological trends (3)

Decentralization:

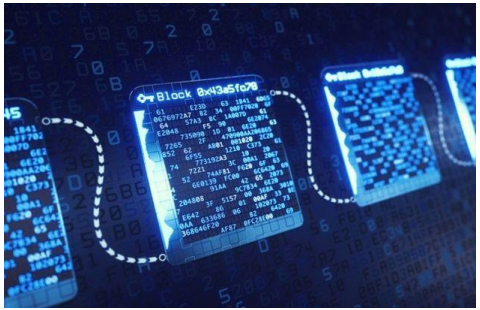
- Bring land services closer to the customers
- Transfer and sharing responsibilities to local level (establishment of regional offices)
- “One stop shop” for the land services as part of other administrative services
- Mobile systems and solutions to reach remote areas

Integration with external systems and variety of **online services**

Public and corporate portals and data availability to the third-party stakeholders

Technological trends (4)

Blockchain technology: future of LIS?



Blockchain technology is very often associated with **Smart Contract** technology that records state changes in an electronic contract.

Those initiatives have not yet reached the maturity level and face many challenges related to Land Administration (fully virtual transactions must be validated by the legislation in force, need to codify legal operations into standard digital contracts)

Technological trends (5)

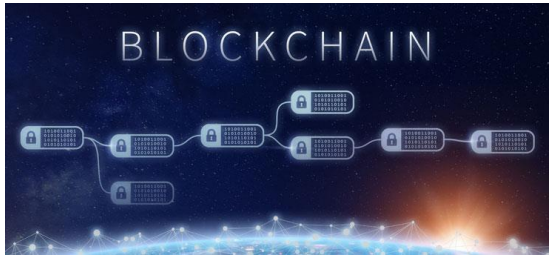
Blockchain technology

Main expected benefits:

- Greater transparency and reduction of fraud and forgery
- Easier auditability,
- Speed and efficiency of transactions

Technological trends (5)

Blockchain technology



Some pilots:

- Georgia (with Bitfury Group) – [1]
- Sweden (with ChromaWay) – [2]
- Ukraine – [3]
- Serbia, India, Kenya,…

Technological trends (6)

Blockchain technology: references

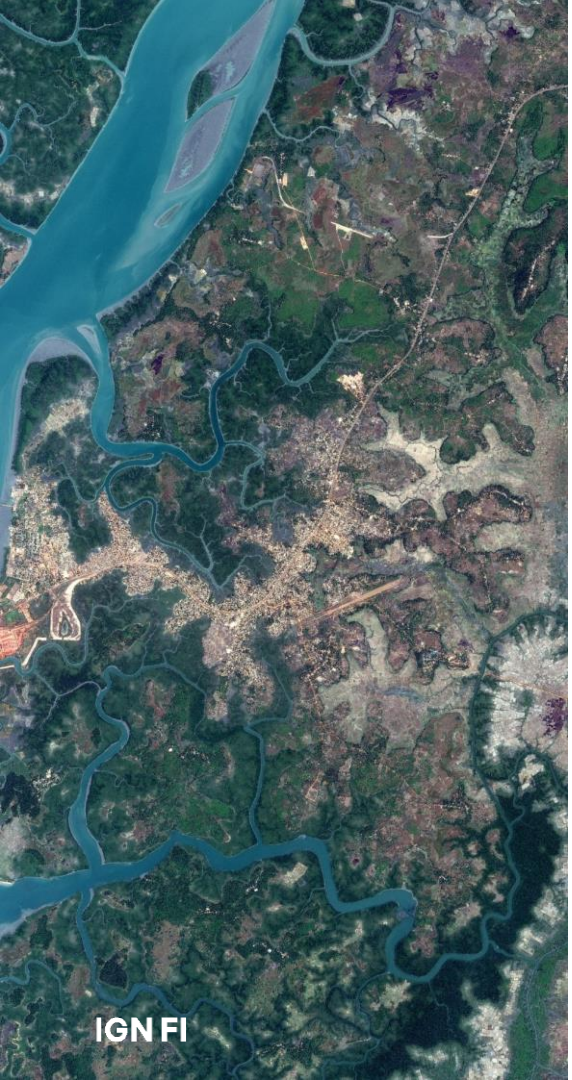
[1] Lazuashvili, N.; Norta, A.; Draheim, D. Integration of Blockchain Technology into a Land Registration System for Immutable Traceability: A Casestudy of Georgia. In *Business Process Management: Blockchain and Central and Eastern Europe Forum*; Lecture Notes in Business

[2] Information Processing; Di Ciccio, C., Ed.; Springer: Cham, Germany, 2019; p. 361. Lantmäteriet; Telia; ChromaWay; Kairos Future. The Land Registry in the Blockchain. 2016. Available online: http://ica-it.org/pdf/Blockchain_Landregistry_Report.pdf

[3] Graglia, M. Will Blockchain Work in Ukraine? New America Foundation 2017. Available online: https://www.newamerica.org/future-property-rights/blog/will-blockchain-work-ukraine

Benefits of LIS

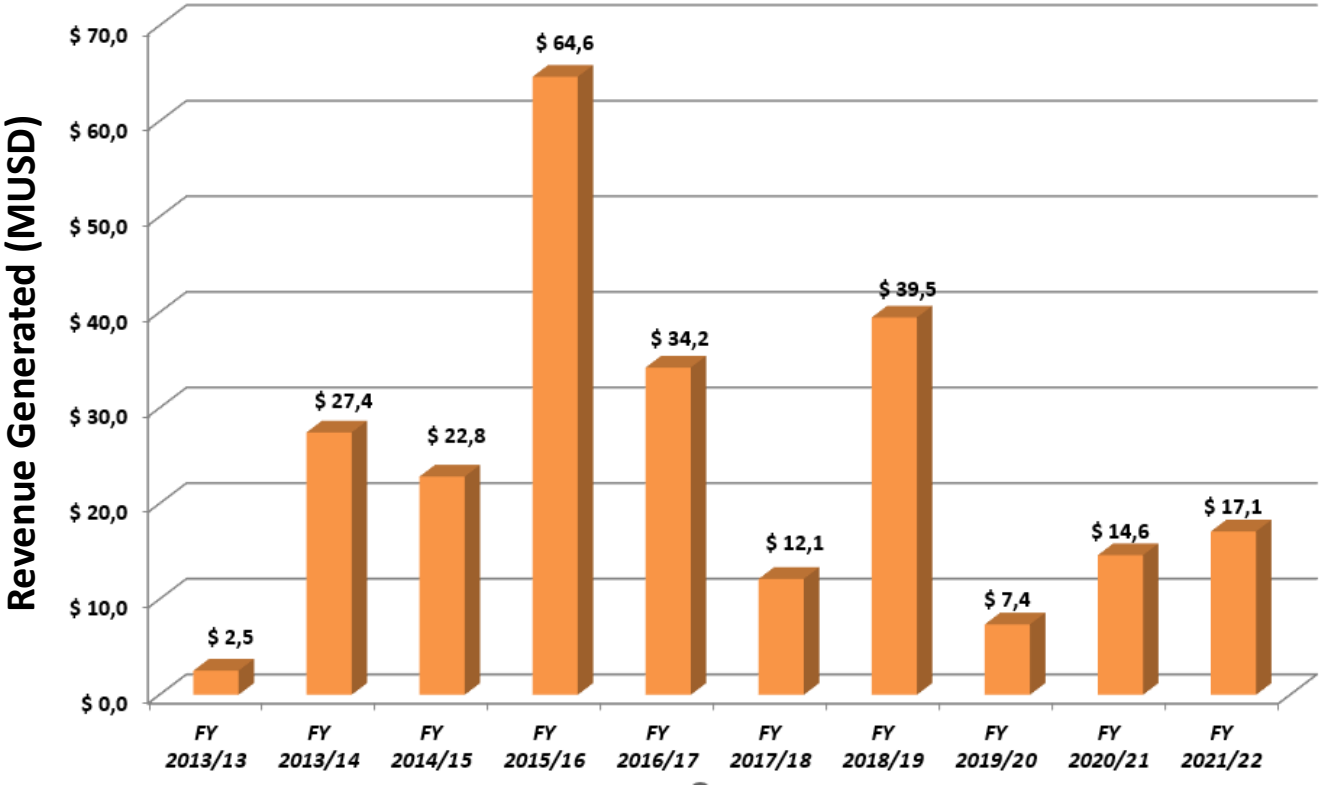
Why do we need a **LIS**?



LIS is a booster for the economy of a country:

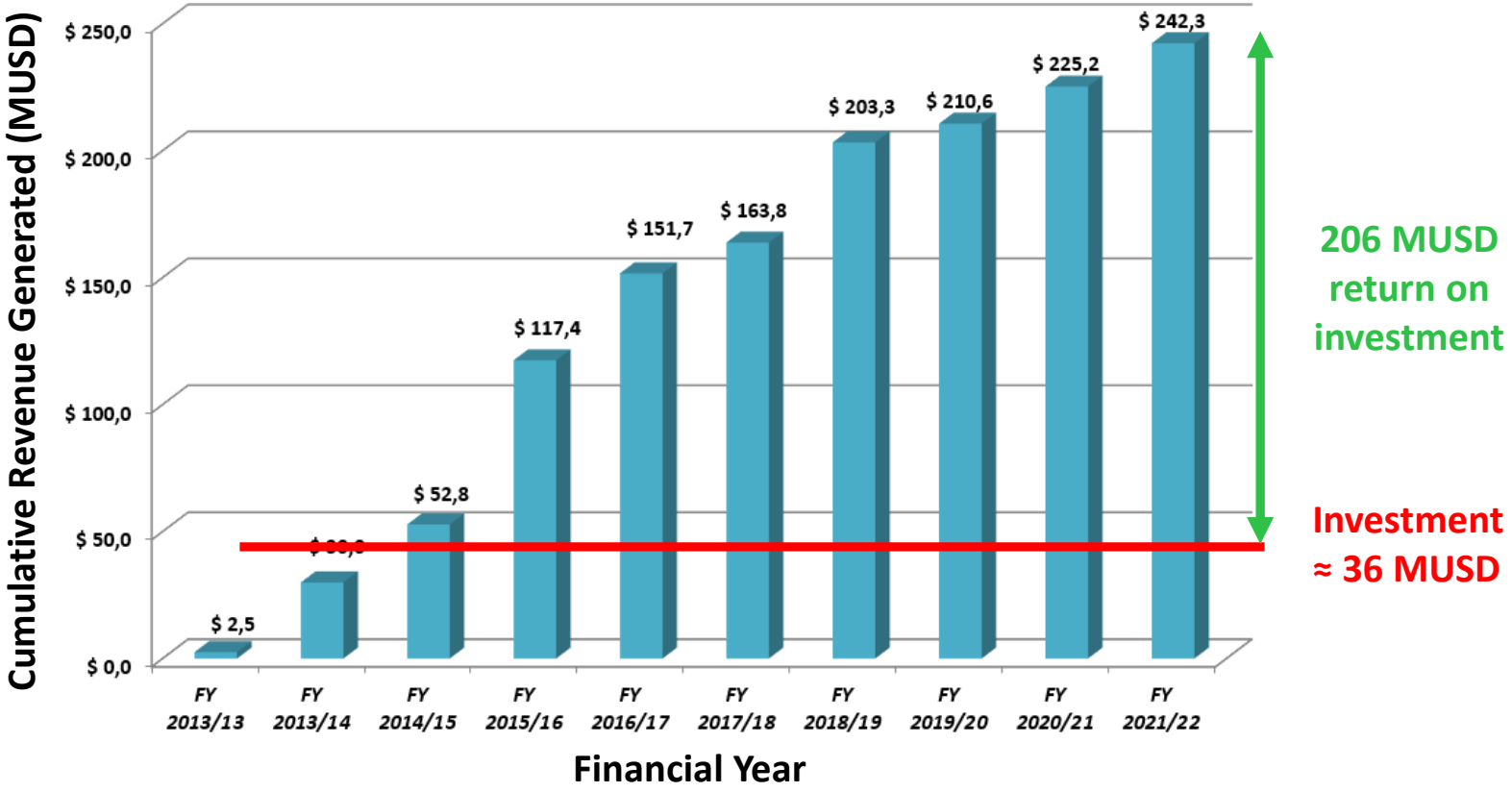
- *Increases land tenure security*
- *Promotes access to finances and investments,*
- *Efficiency in land market dynamic,*
- *Contributes to infrastructure development (knowledge of the territory),*
- *Increase in revenue*

Case study: UgNLIS (Uganda)



[Source: MLHUD LIS Data 2022]

Case study: UgNLIS (Uganda)



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