The Role of Land Information System in Instigating Development of a NSDI in Tanzania

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Outline

▸ Overview
▸ Status of LIS in Tanzania
▸ Relationship between SDI and LIS
▸ Spatial Standards
▸ LIS a motivation for SDI initiative
▸ Conclusion & Recommendations

Overview

▸ A Land Information System (LIS) has many common elements with a Spatial Data Infrastructure (SDI)

▸ Unfortunately, in most cases LIS and SDI are developed through different independent projects

▸ This poses potential problems of
  ◦ Misalignment of LIS and SDI
  ◦ Conflicts and duplication of efforts

Overview Cont.

▸ Tanzania has embarked project to develop an Integrated Land Management Information system (ILMIS)
  ◦ 3 years project, funded by the World Bank
  ◦ Currently at the design phase
  ◦ Will address all functions of ; town planning, cadastral surveying and Land delivery services.

▸ ILMIS has the potential of providing the basics on which a National SDI can be developed
  ◦ Due to strong similarities between the two concepts
  ◦ Several elements of SDI are available from existing manual and semi-digital LIS.

Existing LIS elements supportive of SDI

- Legal framework
  - Land Policy of 1995
  - Land Act No.4, Village Land act No 5 (1999)
  - Land Use Planning Act No.6 of 2007,
  - Urban Planning Act No.8 of 2007
  - Survey Ordinance (under revision)

- An active institutional framework for land management and administration

- Technology advancement especially in ICT
  - e.g. establishment of a fiber-optic network in the country

- Availability of fundamental spatial data e.g.
  - Topographic maps,
  - New geodetic control network (*WGS84, AFREF initiative*)
  - cadastral data

Lack of standards is one of the major challenges for development of ILMIS

- Standards
  - Provide a framework for development of a system
  - Represent code of best practice
  - Ensure interoperability between data elements of different systems
  - Ensure easy of transformation and portability in future development of the system

Implementation of standardized shared elements between LIS and SDI can provide a cost-effective way towards development of a NSDI

Status of LIS in Tanzania

- Agriculture is the major economic sector
  - Accounts for one third of GDP
  - Provides 85% of export
  - Employs 80% of the work force

- Proper management of land is critical for sustainable development.

- To achieve this, use of a modern Land Information System is inevitable

Status of LIS in Tanzania...

- Several land information applications are in operation since 2002, including
  - Land rent collection application
  - Cadastral Survey Registration System
    - work-flow management
  - Management of Land information System

- Major setbacks of these applications
  - Operate in isolation (not integrated)
  - Not linked with digital cadastral data

- To address the challenges, the government has initiated development of an Integrated Land Management Information System (ILMIS)

SDI and LIS

- Spatial data creation and use has became become very popular in recent years
  - In simple terms, data or an entity is spatial if it has shape and location
  - And thus can be represented by a symbol on a map
  - Most of the data held in information systems is spatial in nature

- Societies all over the world are developing SDIs
  - To manage and improve access to spatial data
  - To share spatial data and related resources (services).

Spatial Data Infrastructure

- Many SDI definitions exists, depending on the environment of the society (*social, cultural and political context*)

- Simply stated, SDI is a coordinated framework of agreements on technology, standards, institutional arrangements and policies that enable easy and timely sharing of and easy access to spatial information

- Core components of SDI;
  - Data (spatial data)
  - People (producers, value adders & users0
  - Standards (on data & technology)
  - Policies (institutions, regulations)
  - Access Networks (ICT technology)

SDI and LIS

▸ LIS elements that can be agreed, standardised and shared as part of a national SDI for Tanzania

  ◦ Spatial data and its metadata

  ◦ Tools and platforms for creating, editing publishing and sharing spatial data

  ◦ Technology standards – for data and data exchange models

  ◦ Institutional arrangements

  ◦ Land information policies

Relationship between SDI and LIS

▸ Relationship between LIS and SDI was highlighted by the Bogor declaration on cadastre reforms in 1996

  ◦ It stated that the spatial cadastral framework (cadastral map) should be a fundamental layer within a national SDI (FIG,1996)

▸ In Tanzania, the Ministry for Lands and Human Settlement Development is a key provider of fundamental spatial data

▸ Outcomes of ILMIS project can be utilised to build basis for spatial data delivery platform and national SDI

  ▸ The ILMIS will thus be a basic pillar of SDI

SDI and LIS

Thus, to be SDI compliant, ILMIS must implement the following basic SDI information system components;

- A spatial data repository
- Application software for creating and updating data
- Processing services – like datum and projection transformations
- A geo-portal for searching and querying metadata, services and resources
- Internet services for publishing and accessing data
- Applications software for accessing and analysing spatial data

Spatial Standards

Spatial data in ILMIS must conform to a number of standards in the form of either ISO standards and/or OGC standards.

- WMS (ISO 19128) **Web Map Service**
- WFS/ WFS-T (ISO 19142) **Web Feature service (Transactional)**
- WMTS **Web map tile Service**
- SFA (ISO 19125) **Simple feature access**
- CS-W **Catalog service for the Web**
- OGC-KML **OGC Keyhole Markup Language**
- WCS (ISO 19128) **Web Coverage Service**
- GML (ISO 19136) **Geographical Markup Language**
- Metadata (ISO 19115 & 19139) **Metadata**

Spatial Standards..

Important spatial data standards innclude

▶ Land Administration Model
  ◦ ISO 19152 LADM (Van Oosterom et al, 2011)
▶ Geodetic reference frame
  ◦ Based on the international WGS 84 reference datum
▶ Unique Parcel identification
  ◦ To be developed locally and agreed by stakeholders

LIS a motivation for SDI initiative

▶ Lack of awareness and motivation is a major setback for development of a national SDI

▶ SDI is yet to be recognized as an enabling platform for land administration (Steudler, 2004)

▶ less than 5% of SDI nodes world wide support land administration (FGDC, 2007).

LIS a motivation for SDI initiative

A Land Information System can;

▸ Increase awareness and motivation for development of a NSDI
  ◦ SDI show case (e.g. Web portal)
  ◦ Ease to comprehend than SDI
  ◦ Can attract suport and funding

▸ Provide core SDI elements needed for NSDI initiative
  ◦ Spatial datasets,
  ◦ Standards
  ◦ Legal frameworks (*SDI policy formulation*)

Conclusion

▸ Aspects that a NSDI initiative can take full advantage of the ILMIS project in Tanzania.
  ◦ Existing LIS elements also useful with NSDI
  ◦ Standards adopted by LIS also applies to NSDI
  ◦ ILMIS showcase benefits of NSDI, thus raising awarenes and motivation among decision makers

SDI and LIS are interdependent; ILMIS will be an SDI node, part and parcel of the NSDI for Tanzania.

Recommendation

We recommend that;

A cost effective approach for developing a NSDI can start by development of SDI compliant sector-wise geo-spatial information systems (such as ILMIS) which could later on be linked together into the National Spatial Data Infrastructure

▸ Examples the sectors include;
◦ Environment and biodiversity
◦ Mining (e.g mining cadastre)
◦ National socio-economic statistics (bureau)
◦ Physical infrastructues (roads)
◦ Utilities (electricity, water networks e.t.c)

Thanks

for

Listening