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PRACTICE GUIDE ON COMPUTERISATION OF RECORDS AND SYSTEM AS WELL AS ARCHIVAL MAINSTREAMED BY GENDER

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ACRONYMS AND ABBREVIATIONS

BAA	Business Area Analysis
BPR	Business Process Re-engineering
DVD	Digital Versatile Disc
ICT	Information Communication Technology
IGAD	Intergovernmental Authority for Development
JPEG	Joint Photographic Experts Group
LIS	Land Information System
MassReg	Mass Registration
MDA	Ministry, Departments and Agencies
NDP	National Development Plan
NGO	Non-Governmental Organization
NLIC	National Land Information Centre
NLIS	National Land Information System
NLP	National Land Policy
NOC	Network Operations Centre
NRLAIS	National Rural Land Administration Information System
PDF	Portable Document Format
PIAC	Public Information Awareness Campaign
RAID	Redundant array of independent disks
SLLC	Second Level Land Certification
TIFF	Tag Image File Format
UgNLIS	Uganda National Land Information System

FOREWORD

In the IGAD Region, a need for increased cooperation among Member States has been acknowledged as the region finds itself at a time where economic, social, and political developments in one country are increasingly affected by developments in others. In dealing with cross border contexts in land governance, it is important to understand how transnational rules are implemented on the ground, how they are monitored by civil and public actors, and whether there is any learning from local experiences going on.

One of the interventions that IGAD has identified is the need to develop a Practice Guide on Computerization of Records and System as well as Archival Mainstreamed by Gender based on sharing best experiences within the IGAD region. It is envisaged that computerization of land administration systems in the region will enable to unlock the much-needed potential in the land resource.

IGAD therefore has undertaken to produce this Practice Guide using a hackathon approach. Technical staff were drawn from within the IGAD Member States, who have intensively shared experience and have put up these technical guidelines on the computerization of records and systems, as well as archival mainstreamed by gender.

It is hoped that the respective Member States can replicate or scale up the prototypes provided in the guide to develop their own capacities at country level to computerize their own systems. The guidelines provide practical insights to the processes involved, and also opens room for incremental improvements by Member States. It is indeed worth consideration by Member States desiring to computerize their own systems.

EXECUTIVE SUMMARY

This Practice Guide on Computerization of Records and System, as well as Archival Mainstreamed by Gender, is a collaborative effort between IGAD and the Swedish Embassy in Addis Ababa aimed at improving the performance of the land administration functions in the IGAD region, moving closer to convergence and enabling the implementation of cross border initiatives that have a bearing on land.

The guide outlines the mandate of IGAD, and explains that the Guide is a prototype that the member states can upscale and hopefully develop their own capacity to computerize their land administration systems. It narrates the background of land administration systems, but also justifies the need to computerize those systems but mainstreamed by gender.

It provides detailed procedures for computerizing land administration systems, such as conducting legislative reviews, reviewing land administration processes, identifying gender deficiencies in current processes, conducting baseline studies on land administration systems, developing a long-term strategy for Land Information Systems, and strengthening support functions to a computerized Land Information System.

The guidelines discuss the Design, Development, and Implementation of a computerized Land Information System. It discusses the several steps of Business Area Analysis, Gender Mainstreaming, Business Process Re-Engineering, Phased out Implementation and steps for Conversion of Records.

Additionally, it shares the challenges of Computerization of Records and Systems mainstreamed by gender in the IGAD region with some of the key challenges including the lack of political and technical support at various levels, and the difficulties in sustainability of the systems.

It lastly shares the achievements and best practices drawn from the IGAD region that include improved delivery of services to the public, integration with complementary MDAs, and increased revenue collection. This is a living document that will continue to incorporate additional findings from upcoming expertise from Member States as implementation continues

1.0 INTRODUCTION

1.1 Background

The IGAD region, which comprises the countries of Djibouti, Eritrea, Ethiopia, Kenya, Somalia, South Sudan, Sudan and Uganda, was established in 1986 as the Intergovernmental Authority on Drought and Development (IGADD). While originally established to co-ordinate the efforts of Member States in combating desertification and promoting efforts to mitigate the effects of drought, an extra-ordinary Summit of Heads of State and Government on 18th April, 1995 resolved to re-vitalize the Authority and to expand its mandate to cover political as well as economic issues. Consequently, the Authority was re-named the Intergovernmental Authority on Development (IGAD) and the Agreement Establishing IGAD was amended accordingly.

The newly amended Agreement gave IGAD an expanded mandate amongst Member States on several areas of cooperation, some of which include the following;

- i) Ensuring of the prudent and rational utilization of natural resources, and
- ii) Cooperation in the gradual harmonization of national policies in scientific and technological research and development, transfer of technology and policies on capacity building in science and technology in the sub-region.

In light of the expanded mandate, IGAD in collaboration with the Swedish Embassy in Addis Ababa is running a project that seeks to improve the performance of the land administration functions in the IGAD region moving closer to convergence and enabling the implementation of cross border initiatives that have a bearing on land.

This project intends to deliver the following four results:

- 1) Enhanced Capacity Development of IGAD Region on Gender Responsive Land Administration.
- 2) Strengthened Gender Mainstreaming in Land Administration for the IGAD Region.
- 3) Strengthened Capacity of the IGAD Region to Implement Land Monitoring.
- 4) Strengthened IGAD Land Governance Project Coordination and Implementation

To improve efficiency and effectiveness of land administration systems, one of the key areas identified by IGAD in this project is the computerization of land administration records and system, which should be accompanied by simplification of the registration procedures, involvement of Civil

Society Organizations (CSOs) and the private sector, capacity building for sustainability of land administration, and acceptance of various degrees of accuracy for land surveying to make affordable and economically viable the use of the opportunities of satellite imagery for land and natural resources management.

Since many IGAD Member States have not undertaken computerization of their Land Administration systems, IGAD undertook to develop a Practice Guide on Computerization of Records and System as well as Archival Mainstreamed by Gender, which can be replicated or scaled up by Member States in the process of computerization of their own systems.

IGAD envisages that with the Practice Guide, respective Member States can be guided to develop reliable, effective and appropriate approaches for computerization of records and system and access to land information and records. It is hoped that the capacities of local stakeholders within the respective Member States will be built sustainably to support the computerization of records and system, as well as access to land information and records.

1.2 History of Manual Land Administration Systems

Most of the Manual Land Administration systems in Africa that are variably based on the Torrens and Deed systems were established by the colonial masters, with some of them surviving to this day. These systems have provided services through the various complementary Departments of Land Inspectorate, Surveys and Mapping, Land Administration, Land Valuation, Physical Planning, Land Registration and others as their nomenclature might vary in different jurisdictions.

The manual systems in several IGAD Member States, are encumbered by poor document handling and storage, and have thus led to the tremendous deterioration of vital documents in all the relevant departments in the entire land administration chain.

The condition of physical records in Land Administration, especially in cadastral and land registry sections is appalling, with documents continuously deteriorating and/or missing.

The destruction of cadastral maps and deterioration of registry documents has in the long run affected the process of subsequent surveys, and equally hindered the effective resolution of land disputes.

The manual land administration systems in most Member States have given way to fraudulent actions that are heavily riddled with corrupt tendencies. This has resulted in inefficient procedures, long delays during registration, inefficient storage and retrieval of data, lack of accurate ownership information, and, most significantly, insecure property rights, with the cost of doing business spiraling to unacceptable levels.

It suffices to acknowledge that the land administration systems in the Member States that rely on manual and paper-based business workflows are woefully inadequate to meet the needs of a rapidly expanding real estate market, the financial markets, the increasing public demand for efficient land administration services and good governance.

1.3 Justification for the Computerization of Records and Systems

In the manual land administration systems in various Member States, the volumes of manual records have been expanding rapidly. With such an accumulation of manual records, the keeping of records has become inefficient, time consuming and prone to abuse.

It cannot be underscored enough that today land occupies a central part in many societies. Inappropriate land administration systems therefore are likely to pose serious constraints on social and economic development, gender inequality in land rights and poor governance, which results in unsustainable development. Appropriate land policies offer the advantage of regulating access and management of land to the advantage of the realization of various governments' objectives that include but are not limited to economic growth, infrastructure, food security, poverty reduction and provision of decent housing.

Therefore, in a bid to establish efficient and effective land administration, there is an urgent need for Member States to convert the available voluminous analogue data to digital format to be compatible with modern land administration systems that espouse modern information technologies. This will ensure efficient service delivery, accuracy of records and lower cost of doing business.

1.4 Benefits of Computerization of Records and Systems

One of the key benefits of computerization of land administration records and system, is that the ultimate system will be more responsive to the needs and demands of the citizens and business clients.

The establishment of a computerized Land Information System (LIS) will result in improved service delivery across the land sector. This comes along with a substantial reduction in the time required for land transactions, minimization of opportunities for corruption, increase in accountability and strengthening of tenure security.

There are several advantages that accrue from a modern computerized LIS, with some specific ones including the following;

Increased Number of Land Transactions

A computerized LIS is enhanced with operational speed, and can handle several transactions within a short time. It is also possible to host several users on the system, making it possible to handle a considerable number of transactions within a limited time.

Decentralization of Cadastral and Registration Services

The operations of the LIS can be extended to regional levels, where branch offices (linked to a replication center in one location) can be established at selected regional locations in a country for purposes of extending services nearer to the people. This reduces the cost of transaction by the applicants, who otherwise in a centralized system would have to travel to the only transaction center wherever it would be established. The decentralization also helps in scaling up the number of transactions since applications can be handled at different regional offices across the country.

Securing of Land Records.

One of the prerequisite functions for the establishment of a computerized LIS is the conversion of manual records/datasets into digital format. The computerized LIS provides an opportunity of rehabilitating, digitizing and storing records. The digital records are more secure in the LIS database where there is no possibility of further deterioration. However, upon conversion, the physical records should be securely archived for possible future reference as the need might arise.

Establishment of Audit Trail of Land Transactions

The computerized LIS has the ability of maintaining an audit trail for all transactions carried out in the System. The audit trail ability enables the retrieval of transactions for any desired purpose, which includes investigations of any suspicious transactions that may have been carried out in the System.

Improvement of Quality of Records and their Management

A computerized system allows for various quality checks such as detection and correction of errors, updating of records, completeness of information, its reliability, relevance and timelines of undertaking transactions.

Instant Retrieval of Land Related Information

The operations of a computerized LIS make it possible to have instant retrieval of required data from the system for any desired purpose. The portals offer a possibility to the authorized users to access the information whenever required.

Improved Service Delivery to Stakeholders

A computerized LIS improves service delivery to all relevant stakeholders by shortening the timelines of completion of transactions and notifying the applicants on the status of transactions, and any additional information required.

Improved Land Governance

An efficient LIS improves the function of land governance by enhancing tenure security, increasing accountability and access to engendered land information. The system mitigates duplication of records, and thus minimizes incidences of land disputes and enables management decisions on land to be promptly taken and implemented.

Facilitation of Transactions in the Land Market

The system facilitates land market transactions such as mortgages, loans and other land conveyancing processes by providing real time information to credit institutions and real estate agents for prompt decision making.

Increased Revenue for Governments

The LIS provides possibilities of integration with Tax or Revenue collection institutions in any one country, thus facilitating the payment of government taxes directly to the central treasury. The system eliminates hemorrhages of finances and ensures that transactions cannot be accomplished without the requisite fees having been paid.

Other overall advantages expected from computerization of records and system include the following;

- Reduced back door transactions
- Elimination of forgeries, malpractices and corrupt tendencies.
- Reduced physical space and cost of storing manual land records
- Preparation of data backups and disaster recovery.

1.5 The Importance of Reliable Archival Systems

Land Administration processes generate volumes of data and documents, which if not properly stored can go missing and most likely get into unauthorized hands. This potentially can cause immeasurable damage to the land applicants and the respective Institutions.

It is important to note that the documents generated during land transactions should be stored with a commensurate degree of confidentiality, integrity and availability. Thus, an archival system that meets these parameters should be established to cater for volumes of documents generated during land transactions. This will greatly cut down on clutter of documents, save time on retrieval processes and reduce the cost of acquiring bigger storage space.

In addition, an efficient archival system can support legal or litigation processes regarding land matters.

1.6 The Need for Gender Mainstreaming in Computerization of Records, System and Archival Processes.

Computerization of land records should enable the capture and retrieval of gender-based data for purposes of achieving various objectives on land that include ownership, access to land, productivity, provision of housing and sustainable resource management. It is important to acknowledge that there are gender related concerns in land ownership and user rights. Without due consideration on gender differences as far as land is concerned, there is a great danger of locking out sections of society from the benefits of land administration, land management and development projects there on.

1.7 Objective and Scope of the Practice Guide on Computerization of Records and System

1.7.1 Objective the Practice Guide

The main goal of the Practice Guide on Computerization of Records and System is to provide practical steps and approaches for computerization of records and systems. The guide will contribute to the development of efficient and effective land administration systems within the IGAD Member States.

It is envisaged that the guide will build the capacity of the local stakeholders to support computerization of records and system and access to land information and records that can be sustained over a long period of time at country level.

It is further sought that the performance of land administration functions in Member States will improve, and move Member States closer to convergence, with the possibility of implementing cross border initiatives.

1.7.2 Scope of the Practice Guide

The Practice Guide on Computerization of Records and System as well as Archival Mainstreamed by Gender documents best practices within the Member States and borrows related experiences outside the IGAD region, and subsequently generates gender sensitive prototypes on land administration and management that can be replicated or scaled up by the respective Member States. The model/prototype generated are mainstreamed by gender and will be used as learning ground and adaptation for use by the IGAD Member States with the expectation that there will be increased systemic change on how land governance functions at Member States level.

The guide seeks to facilitate a more informed approach to computerization of land administration records and system and access to land information that can be used by Governments at various levels, the Private Sector, and Non-Governmental Organizations (NGOs).

2.0 COMPUTERIZATION OF RECORDS

2.1 Understanding Current Policies and Legislative Frameworks

Apart from achieving the rehabilitation and conversion of manual records into digital format to preserve them, it should be borne in mind that the digital records will ultimately serve as datasets in the computerized Land Information System in all land administration functions and processes. However, the experience from Uganda and Kenya has shown that some of the required digital approaches may not be supported by the existing legal frameworks, some of which have grown moribund with time. It is therefore imperative to understand the legal frameworks that guide the entire land administration processes in any one Member State.

Examining the obtaining laws and legal framework on which land administration processes are anchored will reveal the gaps in the current legal provisions that may not be supportive of digital operations or may not be gender responsive as to accommodate all members of a given society.

2.1.1 The Constitution

In most Member States, the Constitution is the supreme law. It is therefore of importance to understand the provisions of the Constitution, to ensure that the intended computerization interventions are anchored within the ambit of the Supreme law so as to capture the national aspirations of the country.

2.1.2 Policy Frameworks

Some Member States have National Development Plans (NDP), National Land Use Policies, and National Land Policies alongside the country's Vision. Such policies are expected to be comprehensive with specific provisions on computerization of land records, systems, and candid in gender sensitivity to speak directly to the national aspirations of the country. An understanding of such policies will guide the intended computerization and also reveal the gaps that could be remedied in order to support the computerization process.

2.1.3 Land Legislations

Various Member States have specific land laws with varying nomenclature such as the Land Act, Registration of Titles Act, Survey Act, Physical Planning Act, Rural Land Administration and Use Proclamation, Land Regulations etc. Examining such laws reveals their sufficiency or gaps in supporting the envisaged operations of a digital land administration system.

It should be noted that the processes of amending legislation or putting in place new provisions can be lengthy within the Member States. It is therefore of essence that the existing legal frameworks are examined early enough such that amendments or creation of new laws that will be deemed necessary can be initiated reasonably early. However, it is also prudent for Member States to be creative enough as to work within the existing frameworks to avoid being bogged down by the usually lengthy legal amendments. This enables the efficient implementation of the desired LIS.

In the event that the policy and legal reforms take longer to finalize, the member state should put in place a strategy to allow the computerization process to work hand in hand with the manual system. This might mean digitizing processes that are not blocked by the laws.

While examining the obtaining legal provisions in any one-member state, it is also vital to understand specific enabling legislation that will support the establishment and operations of the computerized land administration procedures.

Any one-member state usually has an array of legal provisions that legislate for practically all functions in the country. It may not be possible to find a single piece of legislation that can provide for the operations of the LIS, but rather take advantage of the several pieces of legislations, statutes, and regulations that may be used together to enable the operationalization of a computerized Land Information System.

Whereas the wording of the legislation may vary in the respective Member States, most of the desired land administration and functions are quite similar. Examples of legislation that support the running of a computerized LIS drawn from Uganda and Kenya include the following;

Data Protection and Privacy Act, 2011: It regulates the use or disclosure of personal information, consequently protecting the clients or customers of the system

Electronic Signature Act, 2011: It makes provision for and to regulate the use of electronic signatures and to provide for other related matters

Electronic Transactions Act, 2011: It provides for the use, security, facilitation and regulation of electronic communications and transactions.

Computer Misuse Act, 2011: It provides for the enhancement of safety and security in increasing the digitized environment including prevention of unlawful access, abuse or misuse of information systems

The Business Laws (Amendment) Act, 2020 (Kenya): It provides for amendment of various statutes to facilitate the ease of doing business in Kenya.

Develop regulations, policies and procedures that enable computerization process

2.2 [Review of Current Land Administration Processes and Procedures](#)

There is a spectrum of activities that complement one another in any one land administration system, which may be spread amongst relevant Ministries, Departments and Agencies (MDAs). Some of these activities include the formulation of policies and legislative frameworks, Surveying and Mapping, Land Valuation, Physical Planning, Land Administration, Land Registration, Land Inspectorate, and Land Adjudication etc. It becomes of essence therefore to review the entire land administration functions

in any one system or Member State, as this will inform the decisions to be taken in the processes of the intended computerization.

There may be different kinds of documents and records accruing from different land administration processes that may have to be reviewed at this stage. This documentation will vary from State to State, as some of the land administration processes might be unique to particular Member States.

What kind of documents or land records emanate from the land administration processes in the respective Member States?

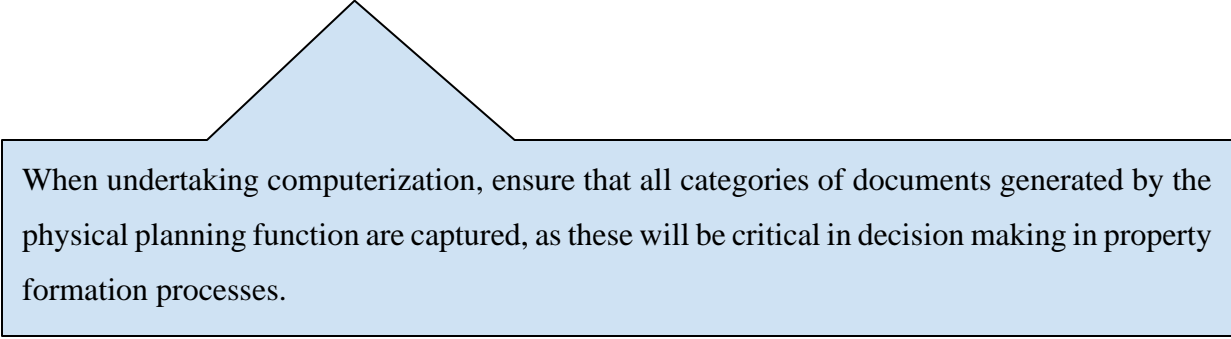
2.2.1 Land Inspectorate

Land inspectorate is closely associated with compliance to the relevant legal frameworks or regulations within the land administration functions. The documentation associated is vital in understanding adherence to the land regulations and processes that have culminated to the registration of title. Understanding such documentation helps in the ultimate conversion of such records, and determining which ones are vital for subsequent processes.

2.2.2 Physical Planning.

Physical Planning functions aim at improving the physical, social and economic welfare of a place and its dwellers therein.

The functions of physical planning ultimately help in ordering the development of a particular place, taking into account suitability of usage of space, and the sustainable use of the land. Physical planning generates a lot of textual and spatial datasets alike. It is important to study how the physical planning function evolved and how it has been handled in respective Member States in order to integrate its functions within a computerized land administration system. Some of the documentation that could have been produced during Physical Planning Processes includes Physical Development Plans (National, Regional or Local), Detailed Layouts, and Physical Development Frameworks etc. All this documentation becomes relevant in the process of property formation and the control of usage of land parcels.



When undertaking computerization, ensure that all categories of documents generated by the physical planning function are captured, as these will be critical in decision making in property formation processes.

2.2.3 Surveys and Mapping

The Surveys and Mapping processes can be complex even in a single member state, depending on prevalent land tenure systems, the technologies used, the mapping projections employed, and other requirements. Depending on the Datums and mapping projections used, one member state might have different categories of cadastral maps. The use of fixed boundary surveys as opposed to general boundary surveys has a bearing on the type of cadastral maps generated. It becomes therefore necessary to examine the cadastral processes that the Member State has been undertaking.

It is also important to understand the technology and methods of spatial data collection used, as these influence the quality and integrity of data collected as well as the resulting cadastral maps, which form a vital component of subsequent land registration processes.

The status and quality of the Geodetic Networks also determines the data collected and the integrity of the subsequent cadastral plans that are to be computerized for future operations. The integrity of data and status of cadastral maps inform the data conversion processes that will have to be employed.

The topographical maps and Ortho-photos play a vital component in various land administration functions. It is important to understand the chain of production of Ortho-photos and topographical maps, and how consistently and periodically they have been produced. Some of the Member States today may still be using topographical maps that were produced as far back as the 1960s.

The storage facilities and conditions of the manual records and retrieval processes directly affect the cadastral maps and associated documents that are candidates for computerization. Some storage facilities could have led to shrinkage or stretching or even physical deterioration of maps. This might call for the rehabilitation or abandonment of such maps. A careful examination of these documents therefore is vital as it gives an understanding of not only the processes that might be required in the

data conversion, but also points to the kind of resources that might be required for the exercise of data conversion.

While reviewing the Surveys and Mapping functions some of these questions might arise;

1. What Geodetic Datum has the country been using?
2. What land tenure systems does the country have?
3. What mapping projections does the country use?
4. Does the survey system use fixed or general boundaries?
5. What technology has the survey section been using for spatial data collection?



Figure 1: Depreciated cadastral maps.

2.2.4 Land Valuation

Land valuation plays a vital role in land conveyancing processes. It is undertaken for various purposes including mortgage, sale of property, court fees, compensation and revenue collection.

The valuation function generates supportive documents in the process of assessment of government fees. In jurisdictions of manual land administration systems, a considerable volume of records is

generated by this function, which documents support the land registration processes. It is vital to understand how the valuation integrates with other land administration processes and how it has been carried on in order to identify the gaps that have existed, and the best way to handle future operations especially under the envisaged digital processes. Prior knowledge of the valuation function will inform the computerization process of the pertaining documents.

What are the valuation approaches that the Valuation Department has been using?

2.2.5 Land Registration

The land registration unit records land rights, keeps the land register and issues certificates of titles. It is vital to trace land registration processes right from commencement in various Member States. This offers the advantage of understanding the records that may be considered as root titles. Uganda offers a good example, as its registration media migrated from cartridge sheets to micro photographic films, to title jackets and finally to the computerized media currently used. This forms an important aspect in the evolution of the land register in the Member State, and traces the transfer of title from one proprietor to another. It is important to understand how the land registration has been handled at different times, so that one can best understand the documentation systems that may have changed over time, as such might be important to have converted to digital format.

Some of the old records or documentation in land registration that is not being used today for the registration processes still remains part of the root title, and in some cases is referred to in litigation processes. Some Member States might have had different registration systems for different types of land such as rural land, agricultural land, pastoralist land, communal land, urban land etc. The registration systems may have also varied in any one Member State depending on the multiplicity of land tenure systems prevalent. It then becomes vital to understand such systems for effective conversion of such datasets to digital format for compatible use in the modern land administration systems.

1. Have the registration processes been changed at any one time?
2. What kind of documents are generated during the registration processes?
3. Are there in-active documents or instruments that might still be referred to at any one time?

2.2 Isolating the Gender Sensitive Deficiencies in the Current Processes.

Most of the land documentation of the Member States are gender blind and may need to be improved for gender inclusivity. It is vital to have a system that offers each and every member of the society recognition and benefit in the Land Administration processes. In the exercise of understanding current land administration processes therefore, it is important to take note of the deficiencies that exist in terms of gender inclusiveness in the entire chain of land administration.

In the computerization process the gender deficiencies in the current system should be noted and plans put in place to capture gender inclusive information by disaggregating data by gender in the future land administrative processes.

2.3 Baseline Study on Land Administration Systems.

Whereas the review of land administration processes and procedures concentrates on the property transformation functions, the baseline studies should involve a deeper review of all the studies that have been undertaken in the sector. The previous studies carried out in the sector offer an in-depth analysis of the sector problems. It should also include the review of available literature and relevant publications, which offers the advantage of revealing possible gaps.

In addition, the baseline studies should entail carrying out field appraisals or surveys with relevant stakeholders. The field appraisals reveal the challenges involved in the entire sector that might include but not limited to the following;

- Land registration
- Surveys and mapping
- Gaps in legal frameworks
- Status of land records
- Nature of fraudulent actions

- Gaps in gender consideration on land processes.

The report emanating from the baseline study of land administration systems will inform the design of the computerization process.

To achieve the established goals, the approach used in the baseline studies takes into consideration the complexity of the land administration in the Member State, the general political sensitivity of land tenure issues and the time frame of the envisaged consultancy service.

The methodological approach consists of three principal methods for data collection, analysis and assessment of situation:

- Review of the previous studies;
- Related literature desk review;
- Rapid field appraisals- meeting with the official, registrars, experts in land registration and cadaster; and Participatory approach in all activities

1. What are the activities involved in a baseline study?
2. What kind of documents are involved in a Baseline study?

2.4 Developing a Long-Term Strategy for LIS

The development of a long-term strategy for the LIS is informed by the findings of the baseline studies.

The establishment of a National Land Information System (NLIS) is fundamental in running the land administration functions. However, considering the fact that the establishment of an LIS consumes time and resources, an appropriate strategy needs to be established for its implementation.

The strategy should provide a framework on how to mobilize for basic infrastructure, human resource and financial resources required for computerization.

It is proposed that Member States should combine internal capacity with external Consultancy such that when Consultants are used, capacity building interventions for internal or local human resource should be integrated right from the beginning of the computerization process, to run across the stages of Design, Supply, Installation and Implementations of the National Land Information Systems. This

will ensure sustainability by having internal or local capacity to deal with any stage of computerization thus reducing on the over reliance on external Consultancy and support during the course of computerization

Drawing from Uganda's experience, it is preferable to divide the whole computerization process into two stages;

Phase I

The phase I component entails the development of the basic land information system infrastructure, as well as the maintenance and improvement of the LIS. The main objective of phase I is to establish the basic land information systems infrastructure, and facilitate the transition from the manual land administration process into digital/ electronic operations.

Depending on the status in each Member State, the basic infrastructure might include the following;

- Buildings
- Network infrastructure and Connectivity
- ICT equipment and Software

1. What are the components of basic infrastructure for the LIS in your State?

It is important to take note that while the basic infrastructure for the operations of the LIS is being developed, adequate steps should be put in place to develop the human resource required to roll out the entire process.

Each member state should break down activities envisaged at each stage into budgetary items to help in cost estimation and planning for the same across the departments. Some of the budgetary items might include the following;

- Procurement of consultants
- Baseline studies
- Stakeholder engagement
- Review of the existing laws and regulations

1. What are the budgetary items for establishing a basic LIS infrastructure in your country?
2. What is the internal capacity for establishing the LIS in your country?

In phase I, all the cadastral and land registration records are converted from manual to digital format to secure them from further deterioration and also prepare them for use in digital operations.

The end results of Phase I should be a developed LIS ready for pilot roll out in the Member State. The LIS roll out should be in a phased manner to take advantage of lessons and unique experiences that will be learnt as the roll out is implemented.

Phase II

This phase seeks to consolidate the achievements of phase I, aiming at a full transition from manual operations into digital or electronic operations. It includes the activities implemented in phase I and some of the actions as identified below;

- Analyzing lessons from phase I implementation
- Revision of the implementation of the roll-out plan
- Enhancement of LIS functionality with additional features based on lessons learnt from Phase I, in order to improve system performance, security, reliability and effectiveness of land administration services of the Member States
- Actual full-scale roll-out

For each phase, Monitoring and Evaluation (M&E) is an integral part of the process. It is therefore important to develop an M&E plan for each of the two phases.

1. What are the lessons learnt from Phase I implementation?
2. How can system performance be improved in terms of security, reliability and effectiveness of service delivery?

2.5 Implementation of Support Activities

The support activities enable the implementation and operation of a Land Information System. They allow for the establishment, operation, and eventual deployment of the computerized Land Information System.

2.5.1 Undertaking Basic Computerization.

The basic computerization process involves the capturing of existing manual records into digital format and storing them in a database. The data will have been indexed to enable easy searching and retrieval from the database. Basic computerization will also include activities like training of staff in basic computing, customer care and database management activities.

It will inevitably require issuance of new land administration procedures to match with the basic computerization procedures that have been undertaken in order to ensure that the applicants being dealt with are indeed the genuine proprietors (this might call for the need of addresses, e-mails, telephone contacts, One Time Password (OTP) etc.)

It is imperative to develop a client's charter to guide the applicants on transaction processes, the duration of transactions, and the associated fees. Additionally, developing a website for the implementing institution will be very helpful, as most of the processes and all associated information will be found on the website.

It is important to note that this stage of basic computerization only supports internal systems for update of information, referencing and verification of authenticity of information. It does not eliminate the need for a National Land Information System but sets a prior stage for its establishment. The basic computerization deals with already existing data which might not be gender responsive. However, it is essential to engage a gender lens to ensure inclusivity of all the vulnerable in the society.

2.5.2 Establishment of the Geodetic Network.

The geodetic network plays a key role in achieving a functional land administration system. This supports the data capture for cadastral surveys, and also provides control for mapping activities in the Member States. However, the geodetic network in most of the African countries that was established in the colonial times has since been destroyed. It is therefore of essence to establish a modern geodetic network that is compatible with the current GNSS technological requirements. In

consonance with current technologies, most of the modern world is establishing GNSS geodetic network that are realized through the Continuous Observing Reference Stations (CORS).

2.5.3 Carrying out of Base Mapping

Base Mapping entails aerial surveys or use of satellite imagery to provide Ortho-photos that are used for various mapping purposes.

There is an increasing shift in the provision of cadastral needs using mapping approaches as opposed to the traditional surveying methods. The systematic certification of land applies the use of Ortho-rectified images with reasonable resolution. The Ortho-photo also plays a key role in carrying out technical compliance in the cadastral survey functions.

The Ortho-photos play a vital role as data sets in the revision of topographical maps which also find use in different areas in the land administration functions that includes physical planning.

Therefore, it is important to carry out the base mapping activities, because this will support various computerized land administration functions.

2.5.4 Strengthening Physical Planning Functions

The absence of physical planning or its inadequacy has a big impact on land development processes, including leading to encroachment onto eco sensitive areas. The physical planning section needs to develop physical development plans that will guide the development in the country. These processes need to be computerized and integrated into the LIS. This is a crucial step in the creation of new records to be fed into the LIS.

2.5.5 Strengthening and Establishment of Institutional Setup of Land Information System.

The land administration system varies across Member States where some have a centralized system while others have decentralized or federal systems. However, for the efficient running of the LIS, it is a good practice to decentralize the services nearer to the people, as opposed to centralizing the services. A decentralized system will call for the construction or setting up of regional offices evenly distributed throughout the country.

It is also necessary and advisable to build one central National Land information Centre (NLIC) to host the National Replication Centre, the Disaster Recovery Site and the Network Operation Centre (NOC) in order to enhance the security of data.

For purposes of archival needs, it is vital to construct a modern archival center where all the physical files will be archived upon digitization. Whereas different Member States may have decentralized archival centers, it is a good practice to have a centralized archival center to enhance the security and safety of records. The importance of efficient archival procedures has already been underscored in the foregone sections.

The intervention of strengthening Institutions may also call for the support to existing academic training institutions in a way of enhancing or setting up some structures to facilitate the training of potential staff to participate in the land administration functions. Borrowing from Uganda's experience, institutional strengthening included support to the Institute of Survey and Land Management through the construction of lecture theaters and hostels, as well as the purchase of survey equipment. The same project in Uganda also provided survey equipment to Makerere University.

1. Are there established structures that can be used for purposes of Regional Offices, National Land Information Centre and Archival centers?
2. Are there learning Institutions that need to be supported to build capacity in Land Administration?

2.5.6 Capacity Building/Training

The capacity building and training should be cognizant of the need for pre, during and post operations of the LIS. Its objective is to ensure that Users are capable of independently managing the system at the system delivery time.

A plan has to be put in place for Capacity building that will run and sustain the LIS. Different training categories will have to be arranged, that might include the following;

- Basic computing training for the existing staff
- Benchmarking tours or learning routes across Member States on establishment of LIS.
- Tailor made courses for the staff to be able to operate the LIS software
- Specialized training for ICT staff;
 - To manage constant modifications to the system.
 - GIS & Image processing

- System Security
- Database Management
- Networking
- Software Development & Testing
- In the process of recruitment of staff, some of the key staff to be absorbed should have basic Bachelors training or competencies that include the following;
 - Graduate Surveyors (Geo-Spatial Experts)
 - Cartographers
 - Physical planners
 - Valuation Experts
 - ICT Officers
 - Land Administration Experts
 - Social Works and Social Administration

1. What are the basic training skills required by the system users?
2. What are the specialized ICT training needs required for the establishment and maintenance of LIS?
3. What are the best practices within the region?

2.5.7 Public Information and Awareness Campaigns (PIAC)

The development and carrying out of Public Information and Awareness Campaigns should be planned and implemented in accordance with the PIAC plan to provide information support to the implementation of the systems. Some of the PIAC activities include the following:

- Stakeholder sensitization (Internal and external) - open days, clinics, boot camps
- Managing stakeholder expectations
- Provision of relevant and appropriate information - (different stakeholders require particular information in different formats.).
- Addressing gender concerns and engagements with vulnerable groups (In terms of providing information)

1. What are the key issues that need to be disseminated in sensitization programs?

2.5.8 Engagement with Relevant MDAs for Integration

There are several Ministries, Departments and Agencies whose operations complement the day to day running of a Land Information System. For the efficient running of business, it is necessary to integrate with such MDAs. Some of the relevant MDAs include the following;

- The Tax Authority for revenue collection
- National Identification Authority for purposes of verification of applicants.
- The Roads Authority for purposes of securing road reserves
- The Tourism Authorities for purposes minimizing encroachments to areas such game parks
- Wetland Institutions for purposes of securing eco sensitive corridors.
- Other Mapping Agencies
- Statistics Agencies
- Natural Resource Management Authorities
- Financial Institutions
- The Judiciary

The Institutions that relate with the NLIS may vary in different Member State. It is important to undertake mapping of the related institutions.

What are the relevant MDAs that complement the land administration processes and the operations of the LIS in your country?

2.5.9 Mapping of Stakeholders Involved in Computerization of Records and Systems

It is important for each Member State to extensively map stakeholders (Internal and External) to engage in the computerization of records and systems. This may include;

- Political leadership
- Technical Leadership
- Public
- Judiciary

- Professional bodies (Law Society, Institutional Surveyors, Physical Planning Boards etc.,)
- Corporate Institutions (Banks, Real estate, Probate)

Some of these stakeholders can be constituted into an LIS working group, and will have a forum through which they will contribute ideas for the development and enhancement of the system

2.5.10 Establishment of a Standards Committee

During the implementation of the LIS, it is necessary to have a committee that ensures the following;

- To provide for approval of various decisions during the development process
- To promote efficiency and effectiveness amongst the working and end user teams
- To provide an oversight role on the implementation
- To provide for approval for technical specifications in the LIS.

It will be vital to establish a standards committee that will achieve this requirement, and will facilitate the implementation of various decisions and activities during the development of the LIS. Such a committee will draw its membership from the relevant departments that are hosted in the LIS. The standards committee will ensure that the LIS meets its standard objectives

2.5.11 Establishment of a Dedicated Sustainability Plan for the Future LIS and Monitoring System

The development of a computerized Land Information System is a massive investment that normally requires a lot of financial resources. A computerized system will not require finances for only its development and implementation.

Beyond the implementation of the system, finances will be required to sustain the system. Most of the equipment in the LIS has a life span, and hence will require replacing at some point in time. Some of the items that require financing include;

- Operational budget
- Equipment such as computers, servers, security appliances.
- Consumables such as printing toners and stationery
- Continual upgrade of the system.
- Monitoring of the decentralized offices

There is a danger of investing a lot of funds (usually in the form of a loan) in the development of the LIS and then failing to plan for the system's required sustainment. Routine supply of things such as

consumables that might include printing tonner, paper and associated service of equipment should be factored in. The experience from Uganda has demonstrated that it is not normally easy to have the money from central treasury ploughed back into LIS maintenance. It is therefore important to put up a sustainability plan for the system, with some of the possible options listed below;

- A possibility of making sustainability budgets requirements being part of the original budget plan of the project for a few years, in case of consultancy approach
- In case of internal implementation, sustainability should be catered for in the initial budgeting of the project

2.6 Governance Issues Regarding Computerization of Records and Systems

Governance is a process of establishing policies or laws and continuously monitoring their implementation in the public. Citizens are the main stakeholders in this process. To make the land governance process cost effective, easy and convenient to the public, Computerization of Land Records and Systems (CLRS) plays a vital role in helping the public to participate not only in policy making but also in service quality improvements and getting government services over network or internet. CLRS enables citizens to post or send the opinions/comments over MDA's web sites or portals unlike the traditional guide process of writing opinions/complaints/suggestions and sending them to concerned Institutions/Parties via post mail or local suggestion box for improvements of services. Furthermore, CLRS promotes enforcement of better control mechanisms and supports faster access and retrieval of information by the public which in turn increases accountability and transparency for better decisions making processes and policy formulation.

The following governance issues exist across Member States;

1. Inadequate policies and Regulations; In Uganda, the policies and regulations that govern CLR include;
 - a. **The National ICT Policy, 2014:** was established to support the realization of the national vision. The broad policy objectives of the national ICT policy are to; Build a knowledge based human capital; Promote innovation in economic and social systems; Expand ICT infrastructure and its integration throughout the country; Deepen utilization of ICT services by government, private sector, Non-Government Organizations and Citizenry; Enhance research and innovation in ICT products, applications, and services; and Improve ICT governance and environment in Uganda.

- b. National Information Technology Authority – Uganda (NITA-U) E- Government Regulations, 2015:** The objectives of these Regulations are:- To promote e-government services and electronic communications and transactions with public and private bodies, institutions and citizens; To promote the use of internet to provide increased opportunities for citizens participation in government; To promote interagency collaboration in providing public services by consolidating, rationalising and integrating related functions and using internal e-government processes to improve the service to citizens, efficiency and effectiveness of the processes; To promote the use of the internet and other appropriate technologies within and across government agencies in providing Government information and services; To reduce the cost and burden for Government and business entities in the provision of public services; To improve access and sharing of Government information and services.
 - c. Electronics Transaction Regulations, 2013:** The regulation provides for how to authenticate data messages, determine the integrity of a data message, and specific requirements applicable to an electronic communication for a public body and general information to be provided by a service provider.
 - d. Electronic Signatures Regulations, 2013:** The purpose of this Regulation is to operationalize the Electronic Signatures Act (ESA). The Regulations provide further detail to the Electronic Signatures Act (ESA) with regard to licensing and recognition of Certification Service Providers (CSPs); providers of Repository Services and Date and Time Stamp Services.
 - e. Data Protection and Privacy Regulation, 2020:** The regulation provides some checks and balances during data collection and processing and also seeks to ensure that data in relation to children is collected in a manner that does not violate their right to privacy
- 2. Inadequate Human and Financial Resources:** Experienced and capable IT people are necessary to manage and run the system and resources are very necessary to maintain the sustainability of the system.
 - 3. Inadequate Technology and IT Infrastructure:** Technology and IT Infrastructure used for setting up the computerized system play a vital role in the adoption of the system. Unfriendly user interfaces, slow internet, and low telecommunication coverage discourage users from using the system.

4. **Lack of Data interoperability:** Information sharing between departments and among MDAs help in improving efficiency, managing resources, communicating essential information thus reducing redundancy.
5. **Security:** System security is key in the computerization of records and systems. Technologies such as firewall, cryptography, digital signature and Public Key Infrastructure (PKI) can be used for security purposes
 - **Lack of capacity building**
 - **Socio-economic barriers**
 - **Cultural barriers**

3.0 DESIGN, DEVELOPMENT AND IMPLEMENTATION OF A COMPUTERIZED LIS

3.1 Business Area Analysis

Business Area Analysis (BAA) provides a report of an assessment of the status of all business processes involved in land administration especially in the core cadastral and registration functions. This will help in the customization of the required software for running business.

The report details all support functions in the land administration processes and also gives insight into organizational structure of the implementing agencies, existing workflows, client's charter and the associated transaction fees, and organization and staffing arrangements. The BAA will also analyze the adequacy/inadequacy of staffing needs, existing IT interventions and sample documents that the system is required to generate. The BAA report is vital in informing the Business Re-engineering Processes.

In addition, the BAA entails the gathering of requirements and specifications that involves meeting stakeholders to understand their needs. The process includes an analysis of clients' needs and the relationships of such needs. This helps in achieving the required results in the ultimate design of the system.

Table 1: Sample questions of a Business Area Analysis

Sample of some of the Pertinent Questions during an Area Business Analysis-Registry Sections
What is the Address of the Main Registry Office?
What is the office working hours?
Which Agency does the Registry report to (e.g., Judiciary, independent statutory agency)?
How many levels does the Registration Authority/Agency have?
What is the total number of Registration Office Branches in the country?
What is the total number of staff in the Registration Authority/Agency?
Does the Registry operate at the local or sub-national level?
Is the Registry unified across geographical regions (e.g., centralized or linked among regions)?

Sample of some of the Pertinent Questions during an Area Business Analysis-Registry Sections
Is the Registry Database centralized or decentralized?
Can there be more than one Registry office for the same region?
Is the registry unified across types of property (e.g., rural vs. urban, industrial vs. agricultural). In other words, is information stored in one registry/book/system or in separate registries?
Is information technology used or applied in the foregoing aspects of the registration system?
<ul style="list-style-type: none"> • Is the register of property rights itself computerized in any of the following areas: <ul style="list-style-type: none"> ○ Business systems (transaction management, revenue collection, management information, etc.)? ○ Maintenance of indices (owner, parcel, etc.) and cross-indices for the various types of land records? ○ Imaging/Document Scanning?
Does the registry use unique reference numbers for each property recorded?
Is the Registry privately/ publicly owned?
Is Registry part of the same institution as the Cadaster (Surveys and Mapping)?
Is the Registry part of the same institution as the fiscal cadaster (tax authority)?

3.2 Gender Mainstreaming Considerations.

While a BAA is being carried out, it is key to assess how gender sensitivity is catered for within the existing process arrangements. It is worth noting that existing processes may not have adequately provided for gender responsiveness. However, understanding the gender blindness in the existing processes helps in making recommendations for establishing gender responsive systems.

The gender responsiveness of land administration systems should normally have resulted from land governance processes. However, faced with existing gender-blind procedures, the incoming design of the system can at least provide a mechanism of appropriate segregation of data in order to provide gender bearing statistics when required.

3.3 Business Process Re-engineering

The Business Process Re-Engineering (BPR) involves an analysis of current business processes in order to identify process gaps and possible redundancies to inform the design of the future business processes, the technology and organizational changes that might be required to support the optimal operations of the intended LIS. It seeks to improve opportunities for validation and implementation of the design of the system.

The BPR assessment report provides an implementing Institution an insight into the impacts of introducing a computerized land information system

BPR is normally informed by the BAA. It entails a radical design process to achieve quality, good output, reduce operational costs, enhance speed of doing business and cut associated redundancies in the business.

The BPR gives recommendations on possible ways of changing business processes within an implementing institution. Among many other recommendations, the BPR might advise on changes and modifications in some of the areas as listed below;

- Minor or major institutional changes
- The need for staffing or training existing staff
- The need for spatial related professionals (whether government or private)
- Possible web access to the system by citizens via public Portals
- A decentralized approach in way of Regional Offices in order to carry services nearer to the citizens
- A revision or modification of existing business processes.
- Detail of what the system will deliver

3.4 Implementation of the LIS in Phases

Deriving from the Long-Term Strategy put in place, it is preferable to develop and implement the LIS based on a phased-out approach. A phase I implementation entails the development of the basic infrastructure of the LIS, while Phase II consolidates whatever achievements have been scored in Phase I.

3.4.1 Phase I operations

It is advisable to have the implementation of Phase I divided into component parts that will guide the processes.

Component 1: Detailed Design of the LIS

This covers the design of the System with keen attention to capture the national strategies and aspirations of any one country. A specific consideration will be made to ensure that the design fits within the obtaining legal frameworks within the Member State.

Component 2: Data Conversion

Data Conversion will encompass the transforming of the existing manual records into digital format to support the operations in the envisaged digital land information system. An entire process of data conversion is adequately provided in later sections of this guide.

Component 3: Data Integration

This will include the processes of linking cadastral data with the land registration data. The cadastral datasets are normally in spatial format while the registry data is textual. The process achieves the linkage between parcels and ownership attributes.

Component 4: LIS implementation

This entails the development of the system while incorporating the different functionalities. It will see the actual installation of the LIS and its associated IT equipment.

The implementation process will include the carrying out of Public Information Awareness Campaigns (PIAC). The PIAC enables you to engage with external users of the system by way of integration and also achieves the requirement of the public owning and embracing the system. This helps in managing the expectations of clients and also stem possible sabotage intentions.

Within this component, Training and Capacity building is carried out. It is important to note that the capacity building should be well structured to meet the required continuous operations of the system. The training therefore may have to be structured to cover pre-implementation, during implementation and post implementation requirements.

Component 5: Review of the Design and Preparation for the Roll-Out

Whereas the roll-out of the system in Phase I is done on a pilot basis, it is of importance that a review of the design is carefully undertaken just before the intended piloting deployment. This will eliminate the possible immediate obstacles that can arise at the onset of operations.

3.4.2 Phase II operations

The operations in Phase II are ideally a replication of the Phase I operations. However, the activities and processes in Phase II will be informed by the Monitoring and Evaluation carried out on the Phase I interventions.

Phase II aims at consolidating the achievements that have been scored in phase I. It will entail a further detailed design and national roll out of the system, and also establish and strengthen a national land information infrastructure. Some of the activities will entail the following

- Analyzing lessons learnt from phase I implementation
- Revision of the implementation of the roll out plan
- Enhancement of LIS functionality with additional features based on lessons learnt from Phase I in order to improve system performance, security, reliability and effectiveness of land administration services of the Member States
- Undertaking a full scale roll out of the system

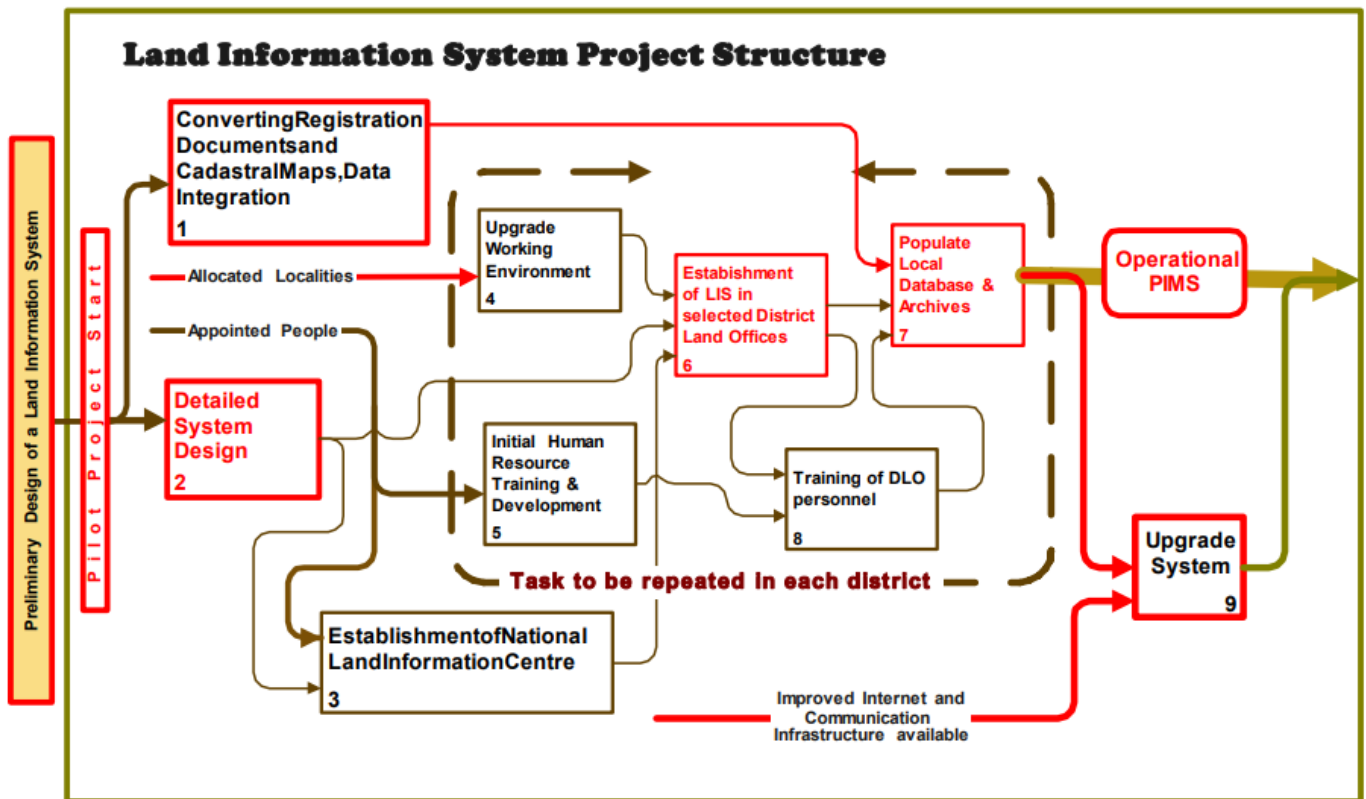


Figure 2: Land Information System project overall implementation procedure and approach

3.5 Computerization of Records/Data Conversion.

3.5.1 Objectives of Data Conversion

The initial objective of data conversion is to preserve cadastral and registry information and keep it related to the original hard copies as closely as possible. The process involves the digitization of the original map formats with professional scanners. Value-added conversion arises by means of geo-referencing and vectorizing of cadastral maps. The scanned maps are indexed for purposes of eventual construction of databases.

The second objective of data conversion is to provide all required and available information to be integrated into an LIS to support future cadastral and registration processes.

The data conversion normally outputs the following results;

1. Secured titles and registration documents converted into digital form, ready for integration into the National Land Information System (NLIS).

2. Complete datasets of digital documents to be included in the document management system of the NLIS, to be usable in the land cadastral and registration processes including available information from physical planning and land valuation historical records.
3. A spatial land information layer with topologically structured parcel polygons, to be included as the spatial description of properties to be linked with title information in the NLIS.
4. A base map for cadastral information management purposes and basis for land and registration information management, land allocation, land development and planning.
5. A set of all geo-referenced information available concerning cadasters' historical maps; topographic, geological and soils maps; and physical planning maps available to be accessed via the NLIS

1. What data are required to be converted for use in the LIS?
2. What are the expected outputs of data conversion process?

3.5.2 General Steps of Data Conversion

Below are general steps of data conversion and applicable tasks to all documents, regardless of the type, size, medium or content of documents.

i) Assessment of rehabilitation needs

A general assessment of the needs for the rehabilitation of specific documents will be carried out. This will take into account the legal and historical value of the documents as well as their general state and age.

ii) Inventory

Prior to the initiation of conversion, all documents are counted and bar-coded. This is necessary because the conversion is not immediate, and hence the numbers of documents should be known or estimated as documents will have to be stored and turns taken for the necessary conversion.

iii) Vetting

Not all documents will have to be converted. A vetting or validation process will be required and proof of the validated documents will be attached to only the documents that will be converted.

iv) Pre-scanning quality checks

Pre-scanning tests are carried out prior to the actual scanning production environment. The results are compared with the originals for legibility, colour resolution and alignment. The test sheets are stored and will be referred to during the actual production process.

v) Job Preparation

Preparation of hard copy materials is undertaken for scanning. This will follow the procedures as below;

- Check physical state of originals and separate documents in need of rehabilitation,
- Remove damaged paper clips, elastic bands, and staples and make the hardcopy material as ready for batch scanning as possible.
- All folded, booklet-type, documents should be split into individual pages.
- Record any material which is unsuitable for scanning due to physical state (damage, size) and sort it out for special treatment.
- Bind with adequate material (rubber coated clips.) to ensure that all pages of a multi-page document are kept together and in appropriate order before, during and after scanning.
- Separate into different documents to be maintained in their digital form if this applies (e.g., a survey report, or instruments in a Title folder)
- Complete index/metadata/Job Sheet which records batch number and details of the documents prepared, special notes, etc. Numbers of pages in each document will be recorded for the process.

vi) Intake and initial capture of digital information.

In most cases an initial capture of information on a document will be performed before its conversion. This will involve the attachment of a label giving a unique ID to the complete document conversion transaction or process.

In the case of Maps, this information allows access to the maps based on their type, scale, position on national index map, and probable regional office, and where applicable information of unique parcels identification will be included (such as block and plot numbers). In the case of other records, it could

involve the capture of the information related to the property that the document refers for example Regional office or registration unit, District, county, block, plot, historical route

vii) Scanning.

Scanning will be performed for all documents that are to be converted. In case of complex documents such as the survey files/reports and title folders, individual documents have to be scanned into one logical set.

viii) Storage in digital format: media and file formats.

After the scanning, all converted electronic data will be registered and held on stable media such as RAID, DVD in specific formats e.g., PDF, TIFF, JPEG.

ix) Quality check of digital images

The quality check for all scanned documents is carried out, and will include the following;

- a) Check if all documents required to be scanned were scanned by comparing what is in the physical file and what was scanned.
 - b) Verifying alignment, color, resolution, and legibility.
 - c) Cross checking all files to ensure that the original order of pages and folios is maintained.
- x) Original Document storage after scanning

Original documents which have been scanned and the digital images that have been quality controlled will be organized depending on the type of document and prepared for delivery and later archiving by the undertaking institution or relevant Government Ministry.

xi) Production of digital information from documents.

Additional to the basic index information captured at the intake of the documents, specific information related to the type of document will be captured. This information is needed for the registration or cadastral process implemented in the NLIS. The capturing of information is made by examination of the images already scanned and where quality control of the images has already been performed.

The quality control can be performed by either comparing information captured through double entries or by reviewing information entered through single entry.

During the quality check, if it is realized that some of the information for instance Regional Office or Registration Unit, District, County, Block, Plot Number etc. was not captured, then the missing information can be captured based on the scanned documents.

The geo-referencing of maps is the first step of data extraction from a map. However, this requires the map to be geo-referenceable by having correct coordinates or a usable latitude-longitude grid indicated on the map. This step generates the meta-information on the map that allows it to be placed precisely as a background to spatial work or analysis.

Vectorization is the other part of this step that can be performed on geo-referenced maps to extract geometric forms from the maps. These vectors can represent block maps, cadastral boundaries, parcels and roads. Administrative boundaries can be obtained from the authority responsible for such boundaries such as the Bureau of Statistics in some jurisdictions. This process helps to create the layers of the Cadastral Data Base.

xii) Quality check of captured information

Compare and crosscheck the document fields and the indexed fields, against the images of the document. This step is the final quality check performed on the data conversion.

In some cases where there are multiple captures, then a comparison of the values is presented to a user who chooses one of different values or corrects the captured resulting value.

In the case of key registration documents such as title certificates or instruments, this last step is performed by Senior Registrars of the respective MDAs.

In the case of maps, the quality check will differ from that performed on titles.

xiii) Movement of documents during conversion

If a document in the hands of a consultant is required during the conversion process, it will be registered as it moves out. However, on its return it has to be compared with converted images where a reversion is necessary if changes have occurred to it.

3.5.3 Roles and Responsibilities

Institutional arrangements may vary in respective Member States, where a number of Ministries, Departments or Agencies may be involved in the entire chain of land administration. The hosting Ministries, Department or Agencies for land administration processes may have also changed, where responsibilities have been migrating. It is important in such cases to have a prior discussion to point out what the responsibilities and roles of each player will be. This will eliminate unnecessary disagreements in the process of computerization. It is vital to ensure that as responsibilities have been migrating, even the associated documents have to be securely handed over. This will ensure that the computerization process will be comprehensive as to capture all the required documentation.

3.5.4 Overall Guiding Principles for Computerization of Records and Systems

The computerization of records and systems should be guided by the following principles

1. Confidentiality of records

Land records are very sensitive and must be handled with utmost confidentiality so as to protect the privacy of respective land owners. However, a guided approach of accessing any records by the public or interested party can be put in place.

2. Integrity of records

The digital records should as much as possible reflect the true picture of the original guide records. There should also be no unauthorized alteration of the records.

3. Availability of records

It is important that all records to be converted are readily available and accessible for capturing when required. Experience has shown that there is a tendency of some personnel within the implementing institutions to hide records that are required for conversion. This will ultimately affect the process of computerization as such documents will not have been captured and uploaded into the system.

4. Gender responsiveness

In jurisdictions where land governance process did not adequately provide for gender requirements, the records equally will not have gender sensitivity in them. However, in the process of computerization, the gender-blind records should be coded in such a way that at least inquiries run on such ultimate datasets can return segregated results /statistics bearing some gender strata

5. Conflict sensitivity

As usual, the records for land processes are generated from different departments in a complementary manner so as to accomplish the required land transactions. The computerization process should be sensitive to competing mandates with regards to land records and therefore should be inclusive of all the respective institutions/ departments.

What are the overall guiding principles in the computerization/ conversion of manual records?

3.5.5 General Steps in Archival Processes.

1. Brief History of an Organization/Institution

Construct a brief history of the implementing Institution covering items such as its creation, funding, and activities. Also include a profile of staff in the institution. This helps to have an idea of how the institution has evolved over a period of time.

2. Regional Analysis of Related Materials.

It is possible that an implementing institution may have had regional offices distributed throughout the country. Consultations have to be conducted with such offices to see what materials they hold and as to whether they are willing to have them surrendered and archived a central archival facility. Even in cases where such regional offices are not willing to surrender such materials, an inventory of the records in their possession should be made.

3. Creating Inventory of In-house Records with Gender Mainstreaming

It is vital to conduct a census of all records held by an institution in order to identify and create an inventory of all the records. Such documents normally cover the administrative and program activities of the relevant institutions. Documents can be collected into cartons and boxes with provisional numbers and labels affixed to the boxes. The intention is to create a comprehensive catalogue of boxes and cartons with details of documents therein.

In the case of land records, it is of particular interest to create gender sensitive inventories. The categories of the documents such as files, invoices, grants, reports, maps should be taken into account.

4. Spaces for Archival Purposes

The implementing institution should consider establishing archival centers within existing structures. In cases of unavailability of suitable storage spaces, construction of new structures is necessary. However, the Institutions should ensure that the archival structures are established in a safe environment. Adequate space has to be provided for placing of shelves, cabinets, setting up work tables, computer workstations, and any other equipment required. The archival center should be locked when not in use, and should be evaluated for potential threats such as extreme climate conditions- flood, direct sunlight, rain; fire, vermin, unauthorized access and intrusion.

5. Establish Categories of Records

With the aid of the inventory created, the institution should categorize the records and assign a unique number to each of them. The categorization serves as the basic unit for organizing the archives.

6. Determination of Series and Sub Categories of Records

After categorization of the records, it is important to establish series or sub categories of the records. The creation of series can be based on a variety of criteria such as format, date range, genre, source, project, etc. Bear in mind that series and sub-series are often intended to help clarify the internal relationship of parts of records.

7. Filing and Labelling

Upon establishment of the series, boxes or file folders should be labelled according to the series names identified. An important consideration is to remove paper clips and staples as these are harmful to the preservation of documents. Consequently, individual files should be labelled and ordered alphabetically within the box. In case of correspondences, they can be organized chronologically by date, according to the order of creation. In the case of maps, they can be organized by sheet series, or by blocks.

8. Date and Cross Referencing

Cross-referencing of records can be achieved based on the inventory list, box, file or folder. This is realized by creating a range of dates that encompass the contents. Cross-referencing to other files can be done by placing a note written "See Also: ___" in the folder or inventory list that guides the user to the linked records.

It is advisable to prepare and avail a list of abbreviations and the location of the records for ease of access by users.

9. Storage and Keeping Control of Archives

Once the filing is complete and the archival boxes, files and folders have been labelled and adequately cross-referenced, the records should be stored in an environment of moderate temperature and low humidity. Basements are not suitable for storage due to frequent temperature fluctuations. The documents should be also shielded from extreme bright light.

After the initial archiving, the archive should be maintained by systematic arrangement, description and filing of additional records.



Source: Entebbe Records Archives-Uganda

4.0 CHALLENGES INVOLVED IN COMPUTERIZATION OF RECORDS AND SYSTEMS IN THE IGAD REGION

The computerization of Records and Systems comes along with several challenges. Whereas there are generic challenges that are normally associated with the process, it is also possible to find some unique cases that are particular to each of the Member States. An overview of some of the challenges in the IGAD region have been drawn from Uganda, Ethiopia, Kenya and Sudan.

4.1 The Ugandan Experience.

Whereas Uganda has made considerable strides in the Computerization of Records and System to the level of having a functional Land Information System, there were several challenges that were encountered in the process as itemized below;

- Resistance to change both internally from the host Ministry and externally.
- Lack of top management support from both the technical and the political circles.
- Financial resource Constraints.
- Legal barriers arising from non-supportive legislative frameworks and policies.
- Management of public expectations.
- Constraints of human resource in form of low staffing levels, and inadequacy of specialized staff particularly at the initial stages.
- Unsuitable institutional structures
- Lack of the basic infrastructure

4.2 The Ethiopian Experience.

Ethiopia has equally made considerable steps in the deployment and use of its NRLAIS System that has seen a substantial number of agricultural parcels being registered. Nonetheless, the processes have encountered some challenges as summarized below;

1. Deficiencies in Basic Infrastructure

The inadequacy of both hardware and software both at lower level and higher-level administrative units has occasioned poor connectivity and placed constraints into the performance of the system. The replication of data from lower to upper levels of administration has become burdensome.

2. Low Capacity

The institutional and technical capacity is still low in terms of knowledge and skills needed to fully run the system. This requires some training interventions to be undertaken.

3. Poor Institutional Arrangement

The institutions involved in land management are independent in the execution of their duties. Urban and rural lands are managed by different institutions with weak linkages in their operations and lack of data sharing frameworks

4. Low Public Information and Awareness of System in Some Rural Areas

Some of the rural landowners still prefer to operate in the informal land markets and have not embraced the computerized system due to insufficient awareness on the operations of the system. There has not been substantial Public Awareness amongst some of the rural folks.

5. Low Financing

The financing has not been adequate, and has made it difficult to accomplish some of the tasks, such as the carrying out of the necessary Public Awareness campaigns.

6. Lack of Political Will

The low political will and support complicate the sustainability of the System. There is need to enhance the system, but this needs the political will that will translate into financing for the purpose.

7. Danger of Relying on Financing by Development Partners

The design and implementation of the system has relied mainly on the financing from Development Partners. This is very risky in case the support by the Development Partner is discontinued. This will tremendously affect the operations of the system.

4.3 The Kenyan Experience.

Kenya is in the process of computerizing of its land records. There have been earlier unsuccessful attempts for Kenya to accomplish the process. Some of the key challenges that they have met include the following;

1. Lack of Political Will

There has generally been lack of political will to support the establishment of the system. This has had an effect on the system's funding and has also demoralized the staff.. Political support is vital as the computerization requires massive financial investments.

2. Low Stakeholder Engagement

There have been few Public Information Awareness Campaigns, which have have greatly affected the implementation of the System. A case in particular was the slow process of the *Ardhisasa* computerization intervention where the participation of the public was very minimal.

3. Non-Supportive Legislation

There are several non-supportive laws that have hampered the development of the System. Kenya is a litigious society, as evidenced by the ongoing litigation over the National Public Key Infrastructure (NPKI) project due to non-supportive legislation.

4. Low Technical Capacity

There is still computer illiteracy among land administration personnel, and there is a need to train such personnel in the basic fundamentals of the system. This has also hampered the progress of the system.

5. Inadequate Integration and Non-Compliance of MDAs

The digitization process involves integration with other MDAs. However, it requires that those MDAs also have digital systems. It has become quite difficult to integrate with MDAs that do not have digitized systems.

6. Absence of a Modern Geodetic Network

The country has not yet established an operational CORS Geodetic network. This has affected the computerization of the survey processes which are key in the computerization of the land administration system.

4.4 The Sudan Experience

The computerization of land administration in Sudan has been attempted at separate state levels. Significantly, the process has been implemented in Khartoum and Gezira states but only in the urban areas, still leaving out the rural areas and the traditional agricultural areas.

The key challenges that have been experienced include;

1. Lack of Basic Infrastructure

There has been an overall lack of supply of equipment such as computers, servers, internet connectivity, power supply, and operational software. This has been a major setback in the implementation process in the States that have attempted to implement the systems

2. Inadequate financing

There has been inadequate financing to the Land Information System. This has hampered the decentralization of the System to the various States

3. Lack of Capacity

There is insufficient manpower to support implementation activities, but more importantly, there is a dearth of specialized/skilled employees to support computerization operations.

There are no efforts being made to increase the capacity for the computerization process' successful implementation. In addition, the capacity of the current system is inadequate in providing the network to link the different states and in terms of security safeguards.

4.5 Rapid Technological Growth (Contemporary Issues).

One of the key contemporary issues has been the Rapid growth of technology. This has had a key impact on the computerization processes. Member States should put in place provisions and mechanisms to ensure that technological systems are updated on a regular basis in order to protect them from cyber-attacks, avoid technological absoluteness, and meet new technological challenges. There should be internal capacity building and a dedicated team working on upgrades consistently to ensure security of the LIS.

5.0 LESSONS LEARNT FROM BEST PRACTICES IN THE REGION

A few countries in the region have made reasonable strides in trying to computerize land records and establish a land information system. Some of these countries within the IGAD Member States include Uganda, Ethiopia and Kenya. It is important to review their processes as this will offer best practices and also understand the associated challenges in the processes involved.

5.1 Ugandan Case

Uganda has computerized all its land administration functions, and has managed to host all the contributing Departments in the land administration functions onto the LIS. Some of these Department include Surveys and Mapping, Land Administration, Land Valuation, Land Inspectorate, Land Registration, and Physical Planning. There are some best practices that can be borrowed from the Uganda process as summarized below;

1. Integration with Other MDAs

There are several Ministries, Departments and Agencies other than the line Ministry of Lands, Housing and Urban Development that complement the land administration process in Uganda. Some of these MDAs have now been integrated with the LIS. The key examples are

- Uganda Registration Services Bureau of (URSB)
- Uganda Revenue Authority (URA)
- Building Regulations Board (BRB)
- National Identification Registration Authority (NIRA)

There is currently engagement to integrate with more Agencies that include the Judiciary, Administrator General's Office and the National Roads Authority.

2. First in First Out Service (FIFO)

The LIS operates on a FIFO basis for the sake of fairness and also does not give the users of the system discretionary rights to select the transactions they would like to process. FIFO tries to encourage fairness and equity in handling all clients of the System.

3. Capacity Building

The Ugandan LIS has built a considerable capacity in IT related personnel; the System has been maintained by the indigenous Ministry staff across specialties of Business Process Analysis and

System Design, Software Development, System Security and System Administration, Quality Assurance and Testing and Hardware and Network Administration.

4. Centralized Monitoring

The Ugandan LIS has a National Land Information Centre (NLIC) which monitors all the 22 Ministry Zonal Offices in real time. The Monitoring system is fitted with Closed Circuit Television (CCTV) cameras which enable the real time viewing of the Zonal Offices in real time.

The NLIC also hosts the Replication, Disaster Recover, and Network Operation Centers. The replication of transactions at the NLIC is near to real time.

5. Public Portals and Corporate Portals

The LIS has already developed Public Portals, where the public can track the transactions, they have submitted and also track the progress on their submissions. The public can also search status of properties in the system. An effort is being made to integrate several payment platforms for the convenience of the public.

Some Corporate Portals have also been developed but await the official launching. The corporate bodies identified include but are not limited to the Banks, Real Estate Agents, Professional Bodies and MDAs.

6. SMS Notification

The LIS integrates a Short Messaging Service, where the applicants or registered proprietors are notified on key status of their submissions; some of the key stages of notification include reception of submission, completion of preparation of deed plans, the need to pay stamp duty, and the completion of the transactions.

7. Call Centre

The Uganda National Land Information System (UgNLIS) has a 24/7 integrated Call Centre, where members of the public can call in and register all inquiries of interest.

8. Open Space Office Set Up

The LIS has adopted an open office set up for ease of accomplishing the functions amongst staff. This office format also has simplified supervision of the staff and has encouraged transparency in all the transactions performed by the respective staff.

9. Public Information and Awareness Campaigns (PIAC)

The PIAC has been an ongoing activity that started even before the LIS was launched. Even as the LIS is currently operating, the Ministry organizes open days where the public interacts with the system. This has enabled the Ministry to manage the customer expectations and also demystify the operations of the system.

10. Decentralized Service Delivery

In order to move the services closer to the public, the operations of the LIS have been decentralized to strategically chosen regions or zones in the country. There are a total of 22 Ministerial Zonal offices (MZOs) that are evenly distributed throughout the country. This has eliminated the previous inconveniences occasioned to the clients by having all of them travel to Kampala city where all the services were centralized.

11. Benchmarking

During the LIS's development, benchmarking trips were organized for key staff in the design and development of the LIS, including some key administrative staff, to learn about best practices elsewhere. Some of the countries where the benchmarking was done included; Australia, France, the United Kingdom, Georgia, Scotland and Sweden.

5.2 Ethiopian Case

Background

Establishment of efficient land administration system requires a well-functioning computerized LIS. Above all, computerization of the rural land record database has multiple benefits and advantages in handling and managing the voluminous and complex data base generated during land certification.

Therefore, the federal Government of Ethiopia with collaboration of the regional governments and other key stakeholders developed a national comprehensive system called National Rural Land Administration Information System (NRLAIS) which has different modules at all levels with necessary functionalities. This is one of the central requirements of the sustainability and effectiveness of the

rural land administration system with the existence of a comprehensive, transparent, participatory and up to date land registry which records the land rights in respect of each parcel within a Woreda (a District). The system includes both spatial (digitized maps) and textual (names, identities, addresses, land use and so on) databases integrated into one system.

The specific objectives of the system include:

- To improve the land tenure/user rights security through an efficient, transparent and equitable system of rural land administration system
- To map and digitalize more than 50 million parcels
- Efficient and effective systems for all land related transactions
- Supply relevant land information to regional governments, to federal agencies and to the public
- Enhance good governance by implementing efficient, legitimate and accountable land administration system
- Ensure proper land use practices, sustainable natural resources and environment management
- Well maintained cadaster and information for the National Spatial Data Infrastructure (NSDI)
- To minimize land related disputes by institutionalizing a proper and sustainable conflict management system

The NRLAIS system has five modules:

- 1. Kebele (Parish/Ward) Level:** At this level, the NRLAIS system will include the paper-based mechanism for submitting applications, issuing the receipts and forwarding to the Woreda for processing and handling the returns. The Kebele will act as a front window to get access to the system that will be handling paper documents only for the time being due to unstable network infrastructure. There are also Kebele Land Administrative Unit Office and the Kebele Administration will also orient the communities about the benefits as well as the process of land transactions and updating public meetings or by other means.
- 2. Mass registration (MASSREG) Module:** This is used for the mass data capture under Second Level Land Certification (SLLC) and feeds data into the Woreda module. It has specific functionality for efficiently and quickly recording the large volume of data collected under SLLC.

3. **Woreda Module (WORLAIS):** This is the core of the system that is used to handle, post SLLC land transactions, including transfer of rights (e.g., inheritance) as well as encumbrances (e.g., rental agreements). It includes the high levels of security required to ensure land rights records are not tampered with and the appropriate approvals are made before a change is implemented.
4. **Zonal module (ZONLAIS):** for viewing of records and administration by the zonal offices of the regional government.
5. **Regional module (REGLAIS):** with advanced data processing capability and management of cadastral parcel data, managing of all zones and woreda in the region, providing security for woreda level data store, for analysis of land use and holding, providing basis for regional level policymaking with a regional spatial data infrastructure and supporting woreda in carrying out their mandate duties.
6. **Federal module (CENLAIS):** for federal level aggregation and analysis supporting decision making and national policy development, monitoring of land administration and land use and acting as a portal for supply of rural cadaster and distributing data to the National Spatial Data Infrastructure.

In general, the system has textual and spatial components which are integrated to each other and flexibly designed to allow regions to customize their requirements for local needs. Each region, however, has to adhere to a common data model and a set of standards.

The main Achievements

- NRLAIS is one of the largest governance focused information systems and the largest LIS in Ethiopia.
- Focused on support administration of rural land holdings through digital record keeping and computerized process of land holding related transactions.
- NRLAIS is the result of several year of work that includes various study, software development, training, and data production and trial operations.
- After comparative trial, roll-out of the system was initiated

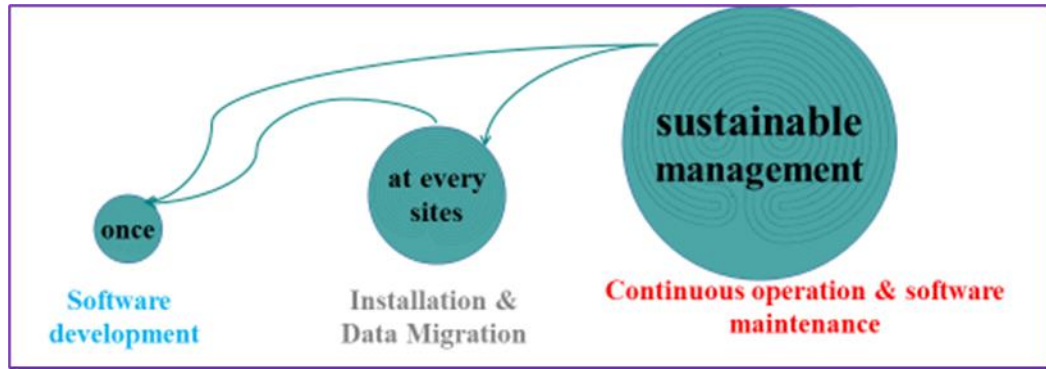


Figure 3:: NRLAIS Roll Out strategy

- Scaling up throughout the country
- Data production projects (SLLC Projects): At national level about more than 20 million parcels were digitized or stored in NRLAIS in more than 300 Woredas (Districts) distributed across regions.
- Development of NRLAIS main applications (MASSREG, WORLAIS, ZONLAIS/REGLAIS and CENLAIS)
- Processing thousands of transactions
- Ongoing support and maintenance of the system on progress
- Developed field computer device that supports demarcation (mobile application).

MASSREG login and Visualizing spatial data in web apps

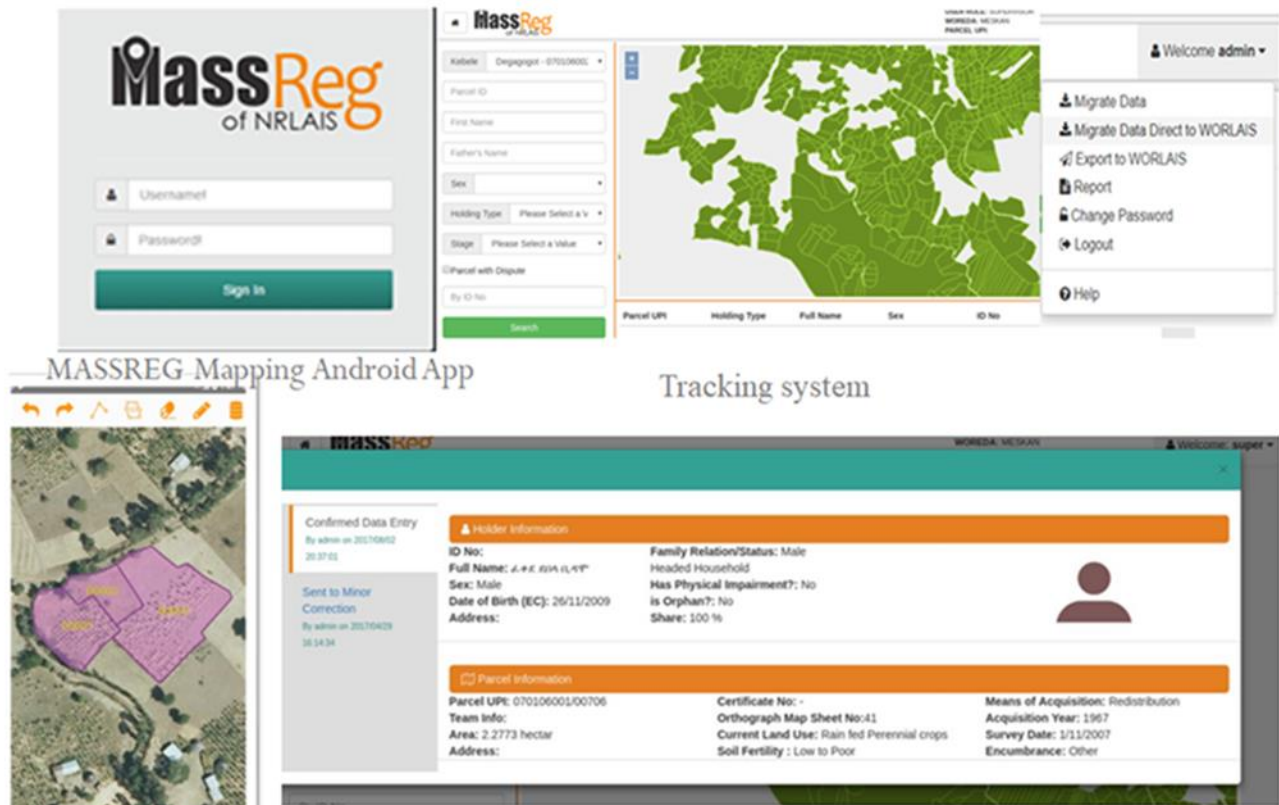


Figure 4: An Example of the MassReg system Interface

Best Practice

Lesson from Ethiopia on practice of computerization noted the computerization of the land records database was designed to handle and manage the voluminous and complex data base generated during land certification and computerization of records has workflow to convert data to digital cadastral system. The computerized national land administration Information system is designed for recording, analyzing and dissemination of land information collected within and throughout the country. The computerization of land information systems includes both spatial (digitized maps) and textual (names, identities, addresses, land use and so on) databases integrated into one system. The land information data recordings pass through different stages from digitization to data migration including;

- **Data records workflow:** Land information data processed as first entry and second data entry to by different user role.

- **Public hearing service:** Displaying draft land record for public hearing and appeal. At this stage quality control of both textual and spatial data is undertaken.
- **Correction:** After public hearing service the corrections made to the textual and spatial data are incorporated before approval of data to the system.
- **Approval of record land data:** after correction of data, approval of certification is done before issuance of the Certificate.
- **Issuance of certificate:** This is the stage where the approved certificate is issued to the land holders.
- **Data migration and data cleaning:** Any recorded land information can be migrated from large scale data conversion tool for further transaction processing. The NRLAIS has excellent data migration capabilities from old systems (guide & web-based) and the existing data can be transferred *partial or complete*.
 - ✓ Data migration has *two* phases:
 - Preparation and analysis of the situation
 - Perform the actual migration on applicable data sets
- **Decentralized Service Delivery:** The NRLAIS System is decentralized across regions which enables the management and manipulation of data and records at regional level. The computerized national land information system provides aggregate data that provides a large set of standard statistical reporting tools and allows aggregation of land records created and maintained at grass root level.
- **System Integration:** The legal valid computerized land records data can be accessed at different administration levels and used for further analysis without affecting its originality. The system is designed to work as a core foundation for other systems, minimize cost for development of other systems, services can be consumed by different applications, like Commercial Agriculture Management Information System (CAMIS) - Geometry of parcel and use right, easy data and information sharing at different administrative levels, normalized and standardize data formats, and supports decision making and national policy development. NRLAIS can provide land related information's for: Land holders, Revenue authority, Micro-

finances, Road authority, Central Statistical Agency, Private sectors, Research institutes, Justices/courts, Investment agencies, Infrastructure providers and so on.

- **Mobile Application:** The System has a field computer device that supports demarcation and offers such advantages as; Minimizing the cost associated with handling of paper field maps, eliminating errors introduced in scanning, geo-referencing and digitizing, reducing topological errors, preventing double parcel ID, automating navigation, and integrating triangulation and other ground measurement calculations.

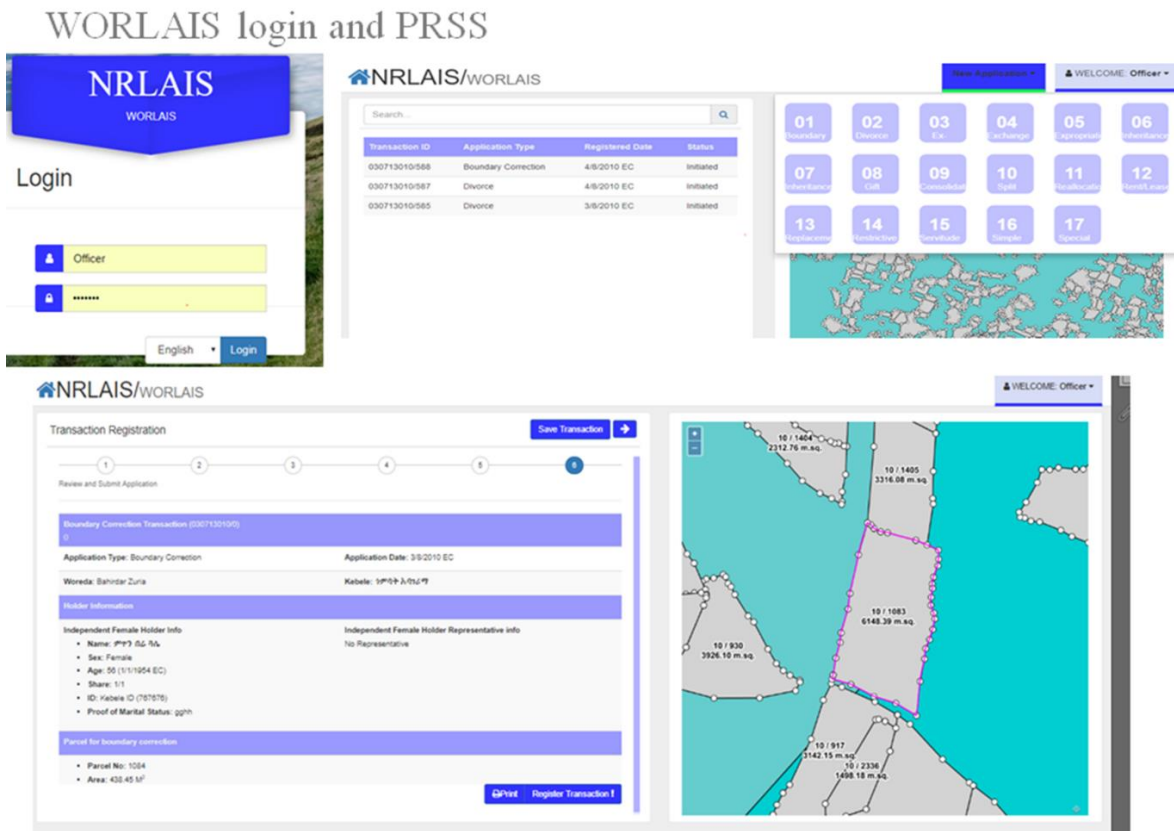


Figure 5: An example of NRLAIS/WORLAIS Interface

- **Benchmarking:** During the development of NRLAIS, benchmarking trips were organized for high officials and key staff in the design and development of NRLAIS in order to learn the best practices. Some of the countries where benchmarking was done are; Vietnam, Netherland, Germany, South Korea, Austria, Rwanda and Finland.

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GLOSSARY OF WORDS

Term	Definition
Availability	The quality of being able to be used or obtained.
Cadastral Maps	A large-scale map showing the boundaries of parcels
Cadastral Surveys	Demarcation and data collection on parcels boundaries
Computerization	The conversion of information into a form that can be stored or processed by a computer
Confidentiality	The state of keeping or being kept secret or private.
Data	Information that has been translated into a form that is efficient for movement or processing.
Database	A structured set of data held in a computer, especially one that is accessible in various ways.
Data Conversion	Process of translating data from one format to another
Data Integration	The process of combining data from different sources into a single, unified view.
Data Replication	The process of copying data from one location to another.
Data Retrieval	Process of identifying and extracting data
Disaster Recovery	The process of maintaining or reestablishing vital infrastructure and systems following a natural or human-induced disaster
Gender	This refers to the socially and culturally constructed differences between men and women; as distinct from sex which refers to their biological differences.
Geo Referencing	The process of taking a digital image, it could be an air photo, a scanned geologic map, or a picture of a topographic map
Hardware	Computer's tangible components or delivery systems that store and run the written instructions provided by the software.

Integrity	The condition of being free from damage or defect
Land Governance	Procedure, policies, processes and institutions by which land, property and other natural resources are managed.
Land Registration	Is any of various systems by which matters concerning ownership, possession, or other rights in land are formally recorded
Land Valuation	The process of estimating the value of land by considering various factors
Mapping	A process of creating maps
Mapping Projection	A broad set of transformations employed to represent the two-dimensional curved surface of the globe on a plane
Ortho-photo	An aerial photography
Physical Planning	A set of actions aimed at improving the Physical, Social and Economic Welfare of a place and its dwellers.
Private Sector	The part of the economy that is run by individuals and companies for profit and is not state controlled
Raster	Images produced from scanning or photographing an object
Records	A record is any document - in any format (paper or electronic, and yes even video) - created or received.
Satellite Imagery	Digital images of the earth's surface compiled from spectral data collected by sensors carried in special-purpose satellites,
Software	The programs and other operating information used by a computer.
Topographical Maps	Detailed, accurate graphic representations of features that appear on the Earth's surface
Vectorization	Process of converting a raster image into a vector line
Workflows	Series of activities that are necessary to complete a task

