



Land Governance in an Interconnected World

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DEVELOPING AN INTEGRATED LAND MANAGEMENT INFORMATION SYSTEM (ILMIS) FOR TANZANIA

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Abstract

Tanzania has not been able to tap many opportunities presented by its land resources because most of the land is not yet planned, surveyed and registered. The process of land parcel registration is complicated and expensive. The Government is committed to land-related reforms and to economic and public sector change as a firm basis to achieve the envisaged strategic development objectives. The design, supply, installation, and commissioning of the Integrated Land Management Information System (ILMIS) project will fully integrate all aspects of land management in two stages: the Pilot Stage and the Development Stage. Service delivery will start with business units in the Eastern Zone and the Ubungu and Kinondoni Municipal Councils and the roll-out to the rest of the country will commence on completion of the pilot stage in July 2018. This paper and presentation will provide insights into the pilot implementation of ILMIS comprising land administration, survey and mapping, registration, valuation and planning.

Key Words: Tanzania, Land Management Information System, Integrated, Administration, Registration, Survey and Mapping



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INTRODUCTION

The Office of the Prime Minister (OPM)) engaged the consortium led by IGN FI to work with the Ministry of Lands, Housing and Human Settlements Development (MLHSD) to implement a pilot initiative to design, supply, install and commission an Integrated Land Management Information System (ILMIS) with support of the World Bank Group in July 2016 under the Private Sector Competitiveness Project (AF-PSCP) “to strengthen the business environment in Tanzania, including land administration reform, and improve access to financial services.” The AF-PSCP aims to improve the delivery of services and address challenges associated with the land sector through the provision of improved land management services to the public. The initiative is currently being piloted in the MLHSD Zonal Office in Dar es Salaam and piloted in the in the Eastern Zone and the Kinondoni and Ubungo Municipal Councils. ILMIS will fully integrate land administration, registration and surveying. It will also support the process of transforming land records and maps into digital formats. The initiative commenced in July 2016 and is on schedule to run for two years until July 2018 followed by a one year maintenance period before being up-scaled nationally in the next phase of the project.

BACKGROUND

With less than 10 percent of land planned, surveyed and registered, Tanzania has been unable to tap into many opportunities presented by its land resources. The land registration process has been managed semi-manually and has been complicated, expensive and vulnerable to error and corruption. The Government of Tanzania recognizes the need for further land-related reforms and economic and public sector change as a firm basis to realize its strategic development objectives. The design, supply, installation, and commissioning of the Integrated Land Management Information System (ILMIS) project supported by the World Bank will fully integrate all aspects of land management in two stages: 1) the Pilot Stage currently being implemented in the Kinondoni and Ubungo Municipal Councils and 2) the national roll-out set to commence shortly after the successful completion of the Pilot Stage. July 2018. This paper and presentation will provide insights and share experiences associated with the pilot implementation of ILMIS comprising land administration, survey and mapping, registration valuation and planning.

According to the Tanzania 2016/17-2020/21 National Development Plan (NDP), Tanzania’s GDP (which grew by an average annual rate of 7 percent in 2002-2015), needs to grow by 8-10 percent to eradicate absolute poverty and put the country on the right path to realizing the objectives of Tanzania Development Vision (TDV) 2025. In other words, to realize the projected per capita nominal income of US\$3,000 by



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2025, economic growth needs to be maintained at a rate of at least 8 per cent per annum from 2016 to 2020 and beyond. This can only be achieved with a shift to higher value productivity through among others, innovative industrialization, enhancing land tenure security and optimal land utilization to enable the country to shift from lower to higher productive activities in both rural and urban areas.

The land sector presents considerable potential to support a shift in productivity in the Tanzanian economy. For example, only about 25 percent of its arable land is cultivated and mostly under subsistence agriculture. Smallholder farmers cultivate between 0.2 and 3.0 hectares, with little use of irrigation and other improved agricultural inputs. However, the potential to increase agricultural productivity is extremely high. Improved productivity can be facilitated through increased land use planning and the certification of customary land rights to improve land allocation for optimal use; increased investment incentives; and provision of access to collateral-based institutional credit to finance investments. Similarly, in urban areas where 70 percent of the land comprises of unplanned settlements, the regularization of land tenure for informal settlements would promote investment in occupied land, improve the living conditions of occupants through better housing and upgraded infrastructure and other services. This would also generate increased revenue for government (through land rent) that could be used to finance more public infrastructure and services.

Access to land in Tanzania is granted either through a Right of Occupancy or Customary Right of Occupancy. Granted Right of Occupancy is for surveyed general land. Legal occupiers of un-surveyed land are deemed to have a right of occupancy and can apply for a Certificate of Occupancy (CO) after having their land surveyed. Legal occupiers of rural village lands can apply for a Certificate of Customary Right of Occupancy (CCRO). Foreign investors can either access land through the Tanzania Investment Centre (TIC) that provides derivate rights or by leasing land from CO holders.

Demand for land resources has been growing rapidly with urbanization at 6 percent and the commodification of land. However, more than 70 percent of urban land remains unplanned and the pattern of urban development has resulted in the proliferation of unplanned settlements and the growth of informal neighbourhoods without basic social services and infrastructure. The limited number of villages with village land use plans and clear village boundaries are among the main sources of land use conflicts, some of which have resulted in loss of property and life. These challenges facing the land sector in Tanzania typify problems in other African countries, most of which revolve around limited property rights. Similar to many other countries, Tanzania has not fully and efficiently utilized its land resources. Most of the arable land is



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still under subsistence farming and animal husbandry. The pace of land surveying, mapping, and registration is not keeping pace with the fast growing human and livestock populations resulting in land conflicts and restraining government efforts to bolster revenue collection to promote socio-economic development.

Informal urban settlements continue to shape the emerging urban forms characterized by land use conflicts, limited accessibility, inadequate infrastructure and poor sanitation. It is noteworthy that only urban landholders with surveyed land currently pay land rent. Current annual land rent revenue in Tanzania amounts to an average of TZS 100 billion (US\$ 445,440,000) which is still inadequate compared to the landed tax base. As more village and general land is registered, planned and surveyed; a proportionate revenue increase will be realized. The realization of this revenue requires an increased pace in terms of registering, planning and surveying more land parcels coupled with the simplification of the process of land registration and parcel adjudication across the country.

On the basis of the foregoing, the government continues to build a sound institutional and legal framework for land administration. First and foremost, the government has formulated the National Land Policy 1995 and enacted the Land Act 1999 and the Village Land Act of 1999 as key policy and legal tools. The Ministry of Lands, Housing and Human Settlements Development and the Local Governments under the President's Office, Regional Administration and Local Governments (PO-RALG) have defined mandates for physical planning, surveying and mapping as well as administration of land. Government has been making necessary interventions, contingent on the availability of resources. Ministry of Lands, Housing and Human Settlements Development (MLHHSD) is implementing projects including the Land Tenure Support Programme in three districts of Kilombero, Malinyi and Ulanga in Morogoro region and the ILMIS project at the Ministry's Headquarters and Kinondoni and Ubungu Municipalities. A nation-wide geodetic network infrastructure has just been installed and MLHHSD has procured 10 cm resolution digital orthoimagery for Dar es Salaam in 2016. The Ministry is also working with USAID in the implementation of a Land Tenure Assistance (LTA) project in Iringa and several informal settlements around the country are currently being regularized.

These interventions aim to address some of the challenges that will contribute towards guaranteed security of tenure to all landholders in the country. Regular land policy and legal reviews are pertinent initiatives undertaken concurrently to address property right issues in the land sector. Capacity building in terms of



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staff training and procurement of equipment, decentralizing land service delivery, strengthening zonal offices, and adopting new technologies in land management are some of the examples of specific initiatives taken by the government. These initiatives are cognizant of the fact that enhanced land tenure security will attract land based investments, guarantee food security, minimize land related conflicts, increase government revenue, promote land markets, promote orderly development of urban and rural areas, create employment and protect the environment. Enhanced security of tenure is a prerequisite component for social economic development.

Despite having a relatively straight forward land tenure system and having made significant strides towards strengthening property rights institutions over the past two decades, Tanzania has not been able to leverage many of the opportunities presented by its land resources. This is primarily due to the fact that most of the land is yet to be planned, surveyed, and registered as well as the complicated process for land parcel registration. To attract land-related investments, it is imperative that all land parcels are identified, adjudicated and registered in a fast, straightforward digitized registration process or electronic means. This exercise will also address most of the potential causes of land related conflicts. Having all land parcels initially registered will significantly enhance security of tenure and promote land market transparency thereby lowering transaction costs. This exercise will also enable the Government to bolster revenue collection from land as a tax base.

The ILMIS project will contribute to the creation of a reliable land administration service for clients and improve public confidence in land administration services. The ILMIS Project comprises of the following six major objectives: 1) Prepare the detailed design and develop the system software and establish the National Land Information Centre (NLIC); 2) Where necessary rehabilitate and convert existing data and land records including cadastral maps and drawings into digital format and upload to the ILMIS database; 3) Integrate all land records into a single data set linking land registration data comprising certificates of occupancy, land administration records and data on cadastral parcels with the appropriate domains within the ILMIS; 4) Establish the implementation of ILMIS involving the architecture of offices, the purchase and installation of the necessary hardware, equipment and consumables according to the system design and improve the security and reliability of the registration and cadastral service delivery; 5) Inform the public and key stakeholders of the ILMIS initiative, increase public awareness on the benefits of formalizing property rights and promote new registration and cadastral services to encourage clients to formalize property rights; and 6) Train MLHSD personnel to operate and maintain ILMIS.



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ILMIS will: 1) Increase land tenure security; 2) Provide affordable, secure and reliable land administration services to the customers; 3) Reduce the time required to check, update and transfer land; 4) prevent encroachment on wetlands, forests, road reserves and other public land; 5) Improve stewardship of land and natural resources; 6) Help to reduce corruption associated with checks, registration and transfer of titles; and 7) Improve public confidence in the land administration system. On the successful completion of the pilot stage, the ILMIS will be scaled up nationally.

INTEGRATED LAND MANAGEMENT INFORMATION SYSTEM (ILMIS) PROJECT

The goal of Integrated Land Management Information System (ILMIS) is to deliver reliable land administration services for the customers and improve public confidence in the land administration services.

The six specific objectives of the ILMIS to achieve this goal are outlined as follows:

Objective 1:

- Prepare the Detailed Design of the ILMIS
- Develop/Customize ILMIS solution/software,
- ILMIS solution Pilot Stage implementation preparation,
- Establish the National Land Information Centre (NLIC).

Objective 2:

- Securing land records, cadastral maps, legacy data, drawings rehabilitation through conversion to digital format,
- Digital data upload to the ILMIS Data Base.

Objective 3:

- Integration of land records data into one data set,
- Linking land registration data (certificates of occupancy, land administration records) and cadastral parcels data,
- ILMIS full data set (Stage 1) is prepared for use in the LIS,
- Upload to the appropriate domains of the database.

Objective 4:

- Establish and implement ILMIS,
- Purchase and installation of hardware, equipment and consumables according to the system design and architecture for offices,
- Improve security and reliability of the registration and cadastral services delivered to customers.

Objective 5:



- Increase public awareness regarding the advantages of the formalisation of property rights,
- Inform the public about the advantages of a new system for land acquisition and registration,
- Promote new registration and cadastral services and encourage the customers to formalise their property rights.

Objective 6:

- Train personnel to operate and maintain ILMIS.

Project Governance

A Project Steering Committee comprising members from the MLHHSO and other key stakeholders has been formed and serves as an overall strategic decision making body to advise the consortium led by IGN FI on the overall direction of the ILMIS project. The tasks and responsibilities of ILMIS Project Steering Committee are outlined below.

- a. Take responsibility for the project's feasibility and achievement of outcomes resulting from technical deliverables;
- b. Ensure the project's scope aligns with the requirements of the stakeholder groups;
- c. Provide those directly involved in the project with guidance on project business issues;
- d. Ensure effort and expenditure are appropriate to stakeholder expectations;
- e. Address any issue that has major implications for the project outcomes;
- f. Keep the project scope under control;
- g. Reconcile differences in opinion and approach, and resolve disputes arising from them;
- h. Report on project progress to the project sponsor;
- i. Check adherence of project activities to standards of best practice, both within the Ministry and in a wider context; and
- j. Take responsibility for any government-wide and cross sectional issues associated with the project

The MLHHSO has identified a Technical Team including the project manager and project coordinator comprising specialists from the various business units involved to head up the implementation of ILMIS and coordinate with the IGN FI led consortium.

Project Management

The ILMIS project is being managed and coordinated by a consortium of companies led by IGN FI and comprising IGN, Geofit Expert and Geofit. Innola Solutions has also been engaged by IGN FI to provide



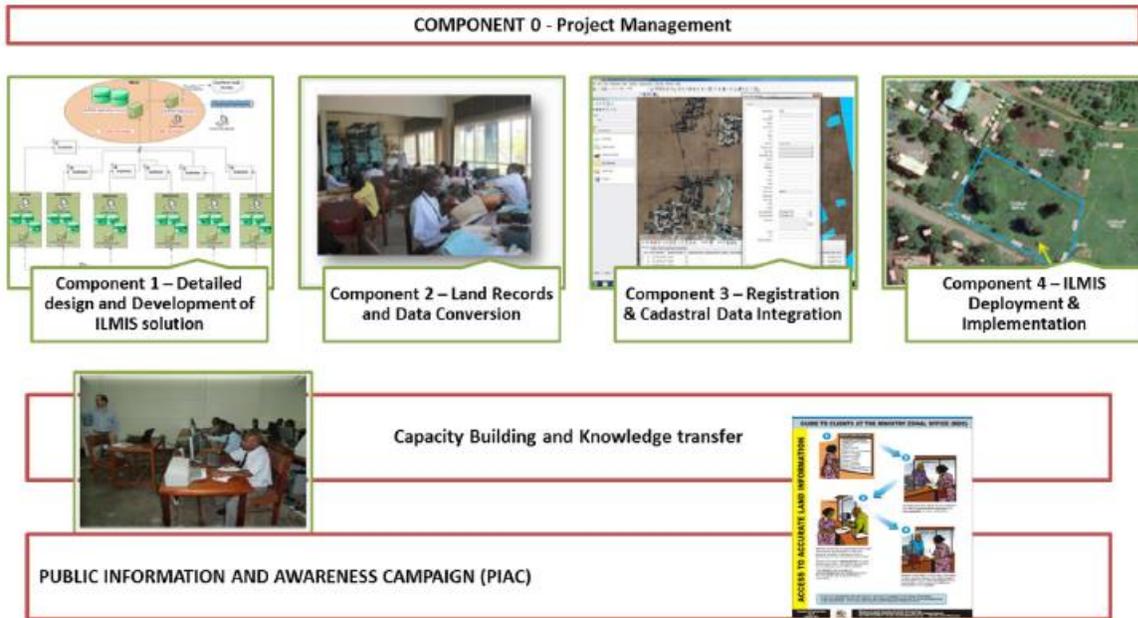
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software solution for ILMIS and management expertise on the implementation of the Project. Each of these companies has a specific area of expertise that they provide to the successful implementation of the ILMIS Project. The Project is divided into two Phases. The specific objective of Phase 1 is to develop an integrated ILMIS solution for the Tanzanian institutional environment; test the approach in selected zones; and establish the foundation for roll-out of the ILMIS solution in Phase 2. Phase 1 is composed of two Stages: Stage 1 Pilot Stage and Stage 2 Development Stage. Stage 1 Pilot will concentrate on the priority areas and include the inception stage, implementation stage and system maintenance and support. Phase 1 of the project includes the following four integrated components to be implemented over 24 months. To manage the implementation of the project, the consortium led by IGN FI has divided the work into the following four components:

- ILMIS Detailed Design and Development (Component 1);
- Land Data Conversion (Component 2);
- Data Integration and Validation (Component 3) and
- ILMIS Deployment & Implementation (Component 4).



The four components outlined above and described in more detail below consist of eight work activities beginning with Work Activity 0 (WA0) Project Management as follows:

- WA0 – Project Management
- WA1 – Detail Design of the System
- WA2 – Data Conversion



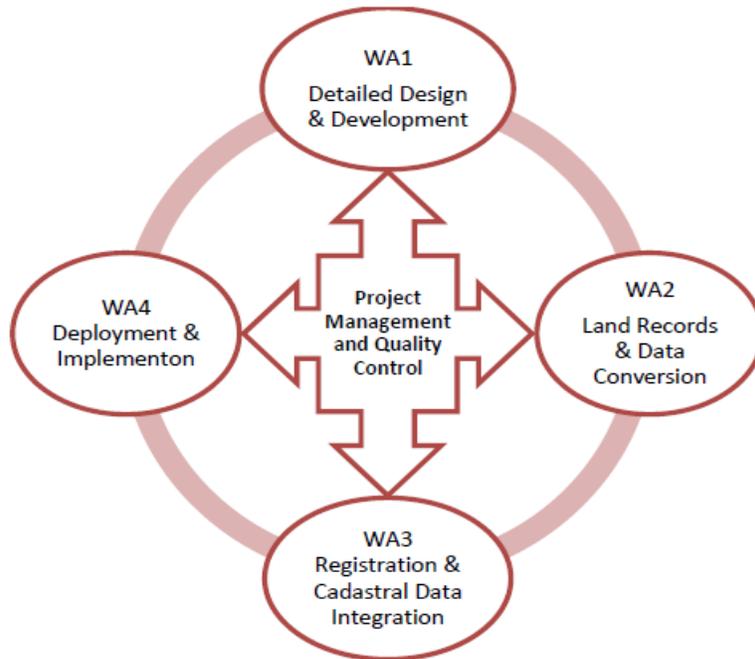
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- WA3 – Registration & Cadastral Data Integration
- WA4 – PIMS Implementation
- WA5 – Capacity building / Support / Training
- WA6 – Campaigns Awareness (PIAC)
- WA7 – Maintenance

Each work activity (WA) interacts within the overall scope of the work with each other and each are controlled by WA0. Capacity building, support and training (WA5) are integrated into the scope of work activities by component while the PIAC activities will take place at times that will have the most impact. This overall linkage among the principal work activities is illustrated in the following chart:



The pilot phase of ILMIS is being implemented in five offices within MLHHSD and the National Land Information Centre (NLIC) in addition to the MLHHSD Zonal Office in Dar es Salaam, and the Kinondoni and Ubungu Municipal Councils. The role and function of these offices is outlined below:

Land Administration Division (LAD)

The Land Administration Division (LAD) is a key part of land administration and works closely with other divisions at MLHHSD. The functions of the LAD extend to supporting villages by defining the boundaries of village land; but a primary function applies to general land and signed Certificates of Occupancy. ILMIS



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has taken into consideration the functions of LAD as part of an integrated land administration system that includes the provision of information and data to the Surveys and Mapping Division (SMD), roles in the Registration of Titles Unit workflows for COs, working with the planning authorities regarding land use plans prior to granting a CO and working with the Property Valuation Unit. The LAD is responsible for land administration regulation and the establishment of the methodological framework for authorised land officers employed by local governments. The business processes include a front office and back office with the former interacting with customers providing advice, applications for land allocation and transfers and accepting fees. The Land Office Registry handles all documents accepted at the Front Office and is responsible for all information, searches, new property file creation and allocating parcel numbers. Other operations in the LAD include the Dispatch Room, Statistics and a Schedule Officer who has authority to accept and reject prepared COs. A signed CO is forwarded to the RTU. The LAD is an integral part of the overall land administration system with extensive responsibilities.

Survey and Mapping Division (SMD)

The Survey and Mapping Division (SMD) provides the spatial foundation for land administration. It conducts, oversees and implements topographic, geodetic, hydrographic and cadastral surveys among other tasks. ILMIS is working to support Cadastral Surveying and establish a data base to manage existing digital topographic base maps and cadastral maps required for ILMIS. The SMD currently uses commercial software including ArcGIS and AutoCAD. The principal areas that receiving support from ILMIS are the tracking of fee payments linked to transactions and improving the distribution system of mapping data, quality control, strengthening file retrieval systems and procedures.

Registration of Title Unit (RTU)

The Registration of Title Unit (RTU) is responsible for the registration of property rights and management of the registry. It also handles the registration of chattels and documents, issuance of search reports and the creation and maintenance of information systems. First registration begins in the office of the Commissioner of Lands which submits the signed Certificate of Occupancy (CRO) and an Index Card to the RTU. Pre-checks are initiated to assure that all necessary documentation is present followed by an additional pre-check by a senior RTU officer. The final CO is then signed and a cover letter is sent to the new title holder to pick up the documents. Subsequent transactions are initiated by an application submitted to the RTU and is similar to first registration but with different documentation to start the process. Searches are also conducted for a fee and a search report on a specific property is produced. Activities, which included the



registration of other legal documents, attract fees tracked by ILMIS. ILMIS has streamlined processes and workflows for registration to improve service delivery, strengthen land governance, and enhance the security of tenure and land related records.

Component One: Detailed Design and Development

Component 1 includes the detailed design of the system architecture, business area analysis, business process re-engineering, and data modelling as well as ILMIS software development and customization. Perhaps the most significant activity was development of the Business Process Re-Engineering (BPR) Report that involved stakeholder inputs, consensus and workshops. The BPR Report was extended to include some elements typical of a User Requirements Document. The report was produced in three volumes that included:

- As-Is Analysis
- Benefits
- Workflows
- User Roles
- Transactions

The ILMIS system was built on open-source technologies and the final source code of the commissioned ILMIS will be provided to MLHSD for full independent control over on-going system improvements and enhancements. The core of the solution is a framework - fully web-based software solution, developed on JAVA and JavaScript. It uses PostgreSQL and GeoServer, and the specific, high-volume cadastre operations in ILMIS are performed with help of QGIS: an advanced and feature-rich open-source GIS desktop application. PostgreSQL and GeoServer have been used for ILMIS, but use of other DBMS and GIS servers is possible, if desired in the future. The framework enables 3 tier web applications and application resides on the web server or the application server, the call from the application server access the database server. The solution tiers are as follows:

- **1st Tier** – PostgreSQL as Database Management with PostGIS Extension to manage spatial data. PostGIS storage has been deployed on the same DBMS instance to simplify maintenance and administration of data. Alfresco CMS has been used to manage file content of the system, such as scanned documents, photos, video and other attachments.
- **2nd Tier** – The proposed solution consists of two application servers, integrated with each other to provide seamless access of data according to the workflow. The Application Server (hosted on



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Apache Tomcat), as main application server, developed on Java, serves for workflow management, business logic processing, registration data management, user security and management, reporting and other capabilities. GeoServer is responsible for GIS/cadastre spatial data management. Servers have been deployed on a CentOS Linux operating system.

- **3rd Tier** – The system has three main web applications that run under Ubuntu Linux environment and 2 Windows desktop applications that end users interact with on daily basis:
 - **Workstation** – fully web-based application to perform document management and transaction processing tasks. It is used to start, track and manage applications and transactions and conduct all required registration data entry and verification, attach documents, print reports, monitor staff productivity etc. It also provides a built-in mapping component to perform certain GIS/cadastre operations directly in this application.
 - **Staff Portal** – fully web-based application on Java Script/HTML5 that provides read-only access for the office staff to the registered data (both registry and cadastre) with the ability to search and display information on property, party, transaction and documents, including their scanned copies. The Staff Portal is deeply integrated with the Workstation that allows them to browse content of the system in an integrated way. In the Zonal Offices, the Portal has a subsystem for the visitor to acquire basic information about applications, properties and transactions; however, this access is only provided from the designated PCs in the LAN and limited for the guest users.
 - **Administrator** is a common application to manage and configure all system aspects such as: user and group management; business rules; permissions; transactions configuration; perform translation to local languages; manage dictionaries; deploy new or updated reports definitions; configure integration with external systems etc.
 - **QGIS Client** – is a Windows desktop GIS application to perform spatial analysis, survey data processing, spatial analysis, conversion of spatial/cadastre data, print larger custom map sheets as needed. The main purpose of this application is spatial data preparation and analysis. Optionally, QGIS can be run on Ubuntu or even Android.
 - **Scan Client** – is a Windows desktop application (on C# .NET) to perform scanning of documents – both from the existing archives and day-forward documents, submitted by applicants or generated by the system in scope of registration process. Scanning Client supports standard scanning protocols. It is fully integrated with Alfresco DMS Server via Alfresco DMS Server API.



Since the system will be provided with the source code, the development team can use open source IDE Eclipse with plugins such as Activiti workflow designer and BIRT report designer for any subsequent customization or development of the system.

Component 2: Land Records and Data Conversion

Component 2 comprises the preparation of the methodology for data conversion; conversion of land registration legacy data (including rehabilitation, scanning and indexing of hard copies); conversion of cadastral legacy data (including scanning and indexing of records and scanning, geo-referencing and vectorising of maps and plans); conversion of land administration data; and conversion of other related data as found necessary.

Security measures were developed, including physical security, to prevent any unauthorized access to the data and documents during data conversion and to prevent loss, damage, alteration and manipulation. This also applies to when data and documents are being transported between offices etc. Data conversion software components such as the scanning module and indexing module are not deliverables under the ILMIS Project. They were designed and developed according to the needs of the data conversion and used as production tools. It was necessary to upload the converted data to the ILMIS database according to the Data Model requirements. The consortium led by IGN FI assisted MLHHS in the establishment of the QA/QC system. The IGN FI led consortium supported MLHHS to train a quality control and assurance team to review, vet and accept scanned land and cadastral records and documents.

The conversion to digital format of land records and data comprising approximately 18,000 maps and plans began in June 2017. The work is being done at the National Land Information Centre (NLIC) at MLHHS in Dar es Salaam and involves a number of stages including registration, restoration, scanning, indexing and geo-referencing. The initial maps to be digitized are town planning drawings known as TP drawings and extracts of TP drawings that are revised extracts of the original plans. Once these have been digitized, the survey plans or cadastral plans that show plot or farm boundaries and beacons will be digitized and incorporated into the Integrated Land Management Information System (ILMIS). In addition to digital format of land records and data there are approximately 220,000 non-spatial land records currently being converted to digital format. The documents being converted comprise textual, statistical, images and multi-media including survey computation files, certificates of occupancy, index cards, and other files from the



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Survey and Mapping Division (SMD), Land Administration Division (LAD) and Registration of Title Unit (RTU). Over 34,000 of these files have so far been digitalized. Approximately 108 people comprising 58 MLHHS staff and 50 non-ministry staff have been engaged to implement this work and efforts are now underway to engage 60 more staff to complete this task. The conversion of data is a complex and dynamic process that requires a very high level of precision. The process is time consuming and dynamic requiring constant modification to manage challenges associated with the varied formats and quality of the hard copy materials, and ongoing development of the data model.

The objective of Component 2 is the rehabilitation, conversion to digital format and securing of land records, documents, survey (cadastral) plans, drawings and other legacy data needed for the land administration process and preparation of digital data to upload to the ILMIS database for the Kinondoni and Ubungo Districts of Dar es Salaam. The data conversion includes all land records (certificates of right of occupancy, registrable instruments, land administration records and other relevant records); survey (cadastral) plans at various scales and land survey records (including Instruction to Survey (IS) records); physical planning records and drawings; land/property valuation/appraisal records and data as well as relevant Topographic Maps and other data required for land administration. The Base Map (DOI) for land information management shall also be acquired from a separate Base Mapping Project, checked and prepared for upload to the ILMIS database.

Component 3: Registration and Cadastral Data Integration

Component 3 involves the validation and scanning of existing digital data sets and integration of the land registry, cadastral and Commissioner of Lands data and data set preparation for uploading to the ILMIS. The objective of *Component 3* is to integrate the land records data in one dataset as well to link the land registration data (certificates of occupancy, land administration records) and cadastral parcels data, prepare the integrated data for use in the ILMIS and upload to the appropriate domains of the Data Base.

The tasks are as follows:

- a. Integration of land parcel (cadastral) data with land registration records data and integration of the data developed by Component 2 above;
- b. Ensure Data and integration quality through the conformance test and data validation;
- c. Discovering and recording of cases of registration and cadastral data inconsistency and incompatibility as well as issues with original documents and land records;
- d. Resolving the issues of data incompatibility and errors of technical nature;



- e. Recording of nontechnical errors and data inconsistency for future resolution;
- f. Registration and Cadastral Data validation and vetting

For the pilot stage, the integration activities comprise:

- Integration of the registration and cadastral data, discovering and recording of data inconsistency and errors.
- Reporting of discovered errors and data inconsistency and establishment of a system for inconsistency tracking and resolution;
- Review of discovered inconsistencies and errors and making the decision regarding data correction;
- Correction of technical errors according to the established procedure;
- Identification and recording in the database of the errors and inconsistencies between title registration and cadastral data.

This shall include the integration of the data converted under Component 2

- Vectorized parcels from the 15,000 Survey (cadastral) plans conversion
- 160,000 Certificates of Title (Certificate of Occupancy [CO])
- 160,000 Land Administration Division (LAD) land records on Kinondoni and Ubungo Municipalities and Dar es Salaam.

The IGN FI led consortium developed the methodology for the land records (registration data) and cadastral data integration and implemented it to ensure the correctness and accuracy of the data integration results. The methodology comprised detailed security measures to eliminate any possible unauthorised modifications of the data, fraud or back door practices during the integration process. The cadastral digital data quality is being checked and controlled according to the requirements and the correction of all discovered data errors is being completed before integration. The data integration methodology and process applied ensures accurate and non-biased linkage of the Certificates of Occupancy and land administration data with respective land parcels data. The Registration and Cadastral data integration includes the validation and checking for conformance of the integrated data. The data integration comprises digital land records, certificates of occupancy and registerable instruments, instructions to survey, cadastral land parcels, land administration and other data related to the land registration procedures. The data integration is being implemented only by properly trained and reliable personnel with previous experience of cadastral and title registration work, knowledge of land administration legal framework and good computer and



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software skills. Following the conversion of existing data from component 2, the main target of component 3 is to tie the electronic parcels to any electronic land related information from the system. Linking together this information allows the access of registry data from a given parcel and also the access to a geo-referenced parcel from a given title. In other words, this allows for a spatially localized digital title.

The value of the mass integration linkage is to minimize the manual work of finding the related parcels of each title. This concept implies the use of tools. Strategically speaking, the mass linkage must be implemented close to the end of the data conversion activities. The current section provides details on the methodology and the activities of mass linkage are a repetition of the following actions:

- Make a temporary copy of the data:
 - certificates and their properties
 - parcels
- Find and apply several automatic rules for linking titles to parcels
- Check, store and analyze the quantity and quality of the results
- Detect and clean data inconsistencies
- Redo the process of mass linkage until:
 - the stagnation of the mass linkage result and
 - the end of the data conversion activities

The basic assumption is that a piece of land is identified by its District, its block and its plot number. Therefore, to link automatically a title to a parcel, the tool used must match using the previous rule. To ensure the effectiveness of the mass integration, it is mandatory to monitor it timely to avoid above all bad linkage and to avoid the processing of unnecessary corrections of the data converted. A series of checks are used to detect potential inconsistencies in the identity of a property record inside a digital title. The second phase occurs simultaneously with the commitment or validation of converted titles by the Ministry staff and the quality control is implemented following ISO standard 2859-1 for the definition of the sample size and of the severity of the control. After the data conversion activity, MLHSD validates the digital titles one by one and prior to any subsequent registration through the commitment procedure. As such, the linkage from title to parcel is a systematic activity contained within the validation of digital titles. The following aspects shall be detailed in the documentation submitted for the Data Integration activities.



Component 4: ILMIS Deployment and Implementation

Component 4 includes hardware purchase and installation, ILMIS deployment in the selected offices and data centre, on the job training and User Acceptance Test and a Final Report on this component. All components of the ILMIS Project conform to the Tanzanian environment. The objectives of the ILMIS deployment and implementation managed under Component 4 comprise:

- a. Deployment of the ILMIS and upgrading of the offices included in Pilot stage to enable them to carry out the title registration functions and improve land administration services provision;
- b. Upload the Integrated data and land information populating the ILMIS Data Bases in all of the offices of the ILMIS;
- c. Testing the approach and proposed land information system detailed design and User Acceptance Test of the ILMIS;
- d. Increasing of public awareness regarding the ILMIS, promotion of the new system and its services;
- e. Establishment of the centralised land information database through the technical and methodological support of NLIC comprising of production, testing and training environments;
- f. Training of personnel for operations of the system per the scope of the project;
- g. User Acceptance Test (UAT) of the system according to the UAT Plan;
- h. Correction of discovered errors and inconsistencies
- i. Support of daily operations of ILMIS

The Deployment and Implementation of the ILMIS Solution encompasses two aspects of integrating the final LIS Solution with the legacy data and other systems (especially NLIC). The data upload process will ensure that data is correctly transferred into the ILMIS solution (including the combined integrated data sets to the NLIC Data Base) so that the system is ready for use at the final implementation stage. The System will also meet the required interfaces with other applications (NLIC).

The system will be configured following an Agile development cycle with cumulative releases.

User Acceptance Testing has been timed to allow time for iterative improvements and four key steps described below will facilitate the final roll-out and implementation of ILMIS:

- **Test Phase:** Engineers have developed the program code and adapted the database schema as required to provide the additional functionality. This approach ensures that the project stays on target and allows for incremental adjustments as testing progresses. A Quality Assurance team make releases available for initial viewing by MLHSD after they are satisfied that new application code has been satisfactorily tested.



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- **Training:** Training has been provided during the implementation and will be delivered again at the end of the Solution delivery. Experienced trainers, instructors and software specialists who bring expert knowledge of specific software modules and applications have been employed as needed to assist with all aspects of system roll-out.
- **Deployment:** The Consortium works closely with MLHHSO to conduct a series of User Acceptance Tests. This testing ensures that the ILMIS solution satisfactorily provides MLHHSO with the facilities to perform day-to-day tasks and generate the required operational and other mandatory reports. Upon successful acceptance of the new system, a turnover date will be set, the final conversion will be run and the system will be ready for live operation.
- **Migration to Support:** After implementation, the project will be transitioned to the support team.

Data Upload and Populating the ILMIS Database

After completion of Component 3, the data produced and validated will be subject to a “data check-in” control before populating ILMIS. The verification process will include the use of different tools to ensure the consistency of the data at all levels; spatial data will be cross-checked to verify topology, geometry, attributes and completeness. In the same way the data from the legacy registration system and digitally stored data will be cross-checked with the new data model to ensure compliance with the requirements. After performing all necessary verification procedures, the Consortium will upload the consolidated data in a test environment for final verification of the integrity of the data together with the Client. At that stage the data exchange feature will be verified and the Consortium will ensure that the ILMIS personnel understand the necessary protocols to be performed for the interchange of information with other data providers. The database will be populated and the necessary and planned user acceptance tests will be performed on the data population and exchange activities.

Training of Personnel

The on-going training is essential for the success of the project; training activities are going to be conducted during the life of the project from the early stages. Initially the training will focus on the prioritized 5 offices that will have the pilot system, later some of the personnel from the MLHHSO will assist on the iterative testing activities. Upon project completion, Tanzania’s Land Administration experts and trainers will be fully able to maintain a robust training capacity. The Consortium will provide training to the MLHHSO team. The Consortium LIS expert assigned to provide support will provide additional training if needed



coordinating with the MLHHS D training team and gradually the local teams will become responsible for the end-user training, as well as for incorporating the use of the System into their businesses processes. The Consortium will also work with the MLHHS D to define best practices in establishing a local future training capacity.

User Acceptance Test

As described previously, user acceptance tests have been performed at various stages during the implementation phase ensuring the quality of the ILMIS solution. AGILE development methodology which meets both product and industry standards has been used, based on an iterative release strategy. Under this approach, periodic versions of the product suite have been made available MLHHS D for validation and testing. This approach assures that the project stays on target and allows for incremental adjustments as testing progresses. The QA team controls when releases are made available for initial customer viewing, after they are satisfied that new application code has been satisfactorily tested.

Public Information and Awareness

The primary challenges associated with land management and administration in Tanzania are the general lack of public knowledge and awareness about land tenure, related policies and legislation; Lack of information about the importance of land titles/certificates of ownership and the offices mandated to deliver these services; Lack of relevant information concerning the requirements and information on land transaction procedures; General lack of relevant information about the role of the official land-related institutions; and Poor capacity and quality of service provided by local land offices. As such the objectives of the Public Information Campaign and requirements of the plan and implementation procedures are as follows:

- Increase public awareness regarding the advantages of the formalisation of property rights.
- Inform the public about the advantages of the new system for land acquisition and registration.
- Promote new registration and cadastral services, and encourage the citizens of Tanzania to formalise their property rights.
- Inform the project stakeholders including MLHHS D staff, government agencies and business about the project progress, achievement and benefits for the stakeholders.

The Public Information and Awareness Campaign (PIAC) was designed and implemented in close cooperation with MLHHS D and is also intended to inform MLHHS D staff about the project activities and



involvement of the personnel in decision making to increase the project ownership by staff. The PIAC is being implemented throughout the entire project cycle to keep the public, main stakeholders and MLHHS concerned staff fully informed of activities and the strategy implementation strategy is based on the following approaches:

- Inform the clients directly by taking into account their level of knowledge,
- Involve the professional institutions, federations, associations, relevant NGOs, media, and local opinion leaders so that they can relay the messages and inform themselves their members and communities,
- Keep stakeholders continuously informed of the project progress so they can receive feedback from clients on acceptance and evaluation of the registration services provided.

The target groups consist of all the stakeholders comprising individuals and groups or organizations that have a direct or indirect stake in the project. These may broadly be divided into two main groups. 1) Internal Stakeholders and 2) External Stakeholders. Not all stakeholders are equal and are being targeted differently with different information and variations in the type and level of detail required. Maximum effort has been made to identify and exploit existing synergies between internal and external stakeholders focused on the same functional areas such as the MLHHS Registrars and the Tanganyika Law Society (TLS); MLHHS Surveyors/Cartographers and Institution of Surveyors Tanzania (IST), and MLHHS Valuation Department and Tanzania Real Estate Entrepreneurs Association (TREE-A), etc... Where possible, such organizations have been brought together and engaged as “thematic unions” for example in joint meetings and other activities. The implementation of the Public Information and Awareness Campaign (PIAC) comprises the design, development and implementation of the activities listed below to effectively reach out and engage relevant stakeholders.

- Design Workshop
- Development of the PIAC Plan
- Baseline and End of Project Survey
- Publications
- Leaflets
- Posters
- Television
- Internal Information Dissemination for the MLHHS and ZO Staff
- Workshops



- Public Briefings
- Project Webpage
- Language Translation

CONCLUSION

The ILMIS Project has already made significant progress in building a functional, integrated and unified infrastructure to achieve the project's goal and contribute to the land tenure security by improving the security and reliability of land transactions through the establishment of a land information system that provides affordable, secure and reliable land administration services for customers. Since commencement, the project has succeeded in the implementation of the detailed design and develop the system software and establish the National Land Information Centre (NLIC); the rehabilitation and conversion of existing data and land records including cadastral maps and drawings into digital format upload to the ILMIS database; integration of all land records into a single data set linking land registration data comprising certificates of occupancy, land administration records and data on cadastral parcels with the appropriate domains within the ILMIS; implementation involving the architecture of offices, purchase and installation of hardware, equipment and consumables according to the system design and improve the security and reliability of the registration and cadastral service delivery; informing the public and key stakeholders of the ILMIS initiative, increasing public awareness on the benefits of formalizing property rights and promote new registration and cadastral services to encourage clients to formalize property rights; and training MLHHSD personnel to operate and maintain ILMIS.

Continued political and institutional support is vital to provide the impetus for change at levels of government to improve service delivery and make the land transactions easier, more secure and affordable to the general public. Efficient land governance reassures both citizens and potential national and international investors to achieve the government's development goals and realize the full potential of the countries land resources. Nonetheless, while ILMIS has the potential to deliver a significant improvement to land governance, it cannot stand alone and requires strong political will and institutional support at all levels to realize the full benefit of the digital technology that has been introduced to the land sector in Tanzania.