How to Implement a Land Inventory

UN HABITAT

United Nations Human Settlements Programme (UN-HABITAT)
P.O. Box 30030, Nairobi, Kenya
Tel: +254 20 7621 234
Fax: +254 20 7624 266
Web: www.unhabitat.org

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Principal authors: Remy Sietchiping with substantive inputs from Chukwudozie Ezigbalike, United Nations Economic Commission for Africa. Dr. Boipuso Nkwae prepared the background paper for this publication.

Contributors: Clarissa Augustinus and Guglielma da Passano of UN-HABITAT

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GLOBAL LAND TOOL NETWORK

Contents

Why a land inventory is important

A complete land inventory should support the administrative needs for equitable land allocation, sustainable land management, sustainable agricultural, urban and rural development, transparent land administration and land use planning in a given jurisdiction. In order to achieve such a goal, the information collection may encompass plot details[1]; ownership and transaction details; boundary information about plots, wards, village, sub-district, district, international boundary, sub-land board area, main land board area, planning area, agricultural area, wildlife management area, etc; topographic data in the form of contours, hydrography, road network; land use data (e.g. residential, commercial, industrial, civic, agriculture, wildlife, mining); and thematic data such as geology, soil types, vegetation, forestry, hydrogeology, climate, rainfall patterns, and land forms. These data are a prerequisite to the formulation of land policies and the integrated management of land resources.

An inventory of land resources determines to a large degree the possible kinds of land uses on a given parcel of land as well as the desirable land use options in a regional context. One of the major aims of a land inventory is to define land parcels in such a way that they can be mapped conveniently and can be easily recognized on the ground. A land inventory is also an indispensable tool for sustainable management of the land resource base, similar to the need for a complete inventory of any asset being managed such as a register of firearms or medical practitioners in a jurisdiction. In the context of land management and administration, it can support land allocation, decision-making, land use planning, conflict prevention and dispute resolution as well as the general land administration support. However, a land inventory system is not an end by itself.

1 Plot details include information about its location, size, owner, plot number, allocated, unallocated, planned, unplanned, developed, undeveloped, boundary description, date of survey if surveyed, name of surveyor, registration information, tenure type, land use type, land use, land use changes.

A simplified land inventory differs from a land information management system as it may not encompass all aspects of the land-related information system. Its purpose may be to identify land occupants and to locate and delineate the plots of land on which they have a house or ploughing field. The process of delineating boundaries does not necessarily need to be as accurate as in a formal land registry (generally accepted to be 2cm accuracy in positioning[2]). The choices of what information or data to include in a land inventory will depend on the available sources of information, the existence of qualified personnel, the level of the user's acceptance of the system, the availability of technical and financial resources, and the local administration concerned. Compared to land information systems, land inventories are simpler, cheaper and less complex in terms of legal requirements, and require fewer resources to set up. In the case of a comprehensive land inventory system, the features listed below are desirable.

Key features of a land inventory system

- *completeness* – for all interests and all parcels.
- *reliability* – for parcel location and for certainty of ownership of interests.
- *currency* – should be up-to-date.
- *security* – adequate provisions to ensure protection of the information.
- *effective public access* – including decentralized access to information.
- *parcel-based* – each land parcel should have unique parcel identifier for cross-referencing with other land records.
- *administrative status* – not the official status of a legal land register.
- *multipurpose* – capable of being used for many purposes.

2 Although this positional accuracy is not specifically stated in the Land Survey Regulations, it is generally accepted to be 2cm.

"A land inventory system may take 10 to 15 years through to when the system is finally operational."

The design and development of a comprehensive land inventory system is a major, long-term undertaking. The entire process, from when an organization is aware of the benefits of a land inventory system may take 10 to 15 years through to when the system is finally operational. To most people, the acquisition of GIS software and hardware is critical to implement a comprehensive land inventory system. Important as these issues may be, they are not the only ones that determine whether the system will succeed or fail. Experience has shown that the problems that lead to the failure in implementation of land information systems are almost always *people problems* [Aronoff, 1990, p.245].

Requirements and procedures

When developing a land inventory system, a prime decision area concerns the type of questions to be answered with the help of the proposed system. These questions need to be identified and formulated as analytical requirements. After the requirements for land inventory have been identified, the following series of steps and phases are followed:

Step 1. Awareness and planning: Awareness and planning is the first step in any systems development process. This step involves asking the what, when, who, how and why questions in systems development. Questions may include: What land inventory system to develop? When to develop the land inventory system? Who should be responsible to develop the specific land inventory system? How or what tools and methods should be used to develop the system? And Why public participation is important during the systems development process?

In case of Tribal Land Integrated Management System (TLIMS) in

Botswana, a Land Management Reference Group consisting of senior management staff from the Department of Land Board Services, Department of Lands, Department of Surveys and Mapping and senior Land Board officials was set up in 1996 to brainstorm and agree on the requirements for computerizing land allocation records and procedures and also to oversee the implementation of the proposed solution in all the Land Boards. The team proposed a tribal land integrated management system.

Step 2. Scoping: This step examines the systems development process of a specific system. Here, the organization focuses on one specific system and its development. Most importantly, the problem is clearly defined. In the case of TLIMS, a Land Management Reference Group (LMRG) was formed and was tasked with clarifying the problem. Because of the nature and complexity of TLIMS, LMRG engaged the consultants, Price Waterhouse & Coopers to help define and clarify the problem. By 2001 the consultants came up with a Statement of User Requirements for TLIMS. The processes undertaken during the scoping study included: (i) assembling the project team which consisted of LMRG, Local Authority Information Technology Support Unit (LAITSU) and Price Waterhouse & Coopers, (ii) reviewing existing Land Board functions and processes and which new applications will be required, (iii) performing initial feasibility study. The aim of the study was to answer such questions as: "Is there hardware and software for what we want to do, and do we have the money and the expertise to acquire and to work with the hardware and software, to do data collection and conversion? Do we have the time and resources to develop the new system?" If the answer is no to the above questions, then the system development will have to be outsourced. (iv) developing a plan for proceeding with the project.

Step 3: Requirements analysis and definition: This step was used to determine the logical requirements of TLIMS. This step is not concerned with any implementation or details. The consultant who carried out

the feasibility study modeled and analyzed the current Land Board functions and business processes. It went on to define new information and processing requirements for TLIMS. The role of LMRG was to provide the consultant with how the land Board functions and processes information, provides information concerning new information and processing requirements, monitors and justifies the new feasibility review.

Step 4: Systems Design: The purpose of this step is to build a technical blueprint of how the proposed system will work. The role of LMRG was to provide quality assurance of the proposed system. An invitation to tender was issued to specialists to come up with a proposal for the new system. The role of the LMRG was to review all technical proposals submitted and select the most cost-effective, short delivery timeframe and technically feasible.

Step 5: Implementation: This step is meant to bring the proposed system to life and place it in organization.

- ***System development:*** The job of TLIMS system development and testing was finally awarded to a consortium consisting of Geoflux (Pty) Ltd, RPC Data and FFM (Botswana). The system development started from 2002 ended in 2004. When the system development was complete in 2004, it was realized that there was no data to test the system.

- ***Pilot tests:*** A tender was later awarded to MNO Surveying Consultants to collect data at the pilot sites of Serowe and Palapye to populate the TLIMS database.

- ***TLIMS roll-out:*** Upon completion of the pilot conversion in 2006, the government decided to roll-out TLIMS to other Land Boards throughout the country. Instead of aiming for maximum results from pilot sites, the government felt that it was more appropriate to

look for results that are satisfactory as opposed to a perfect solution to the problem of record keeping. The real essence of TLIMS was to strive for the best whilst living with feasible compromises. This is exactly in line with the approach of strategic choices in planning and implementing an information system as advocated by De Man [1990]. The experience from TLIMS has shown that there are no easy and ready-made solutions or recipes available for implementing a land inventory system, hence the need to learn by doing.

Step 6: Provide ongoing support: This final step ensures that the system continues to meet stated goals. The system has to be monitored and continually improved and this may involve making minor changes, re-training the workforce in new geo-spatial information technologies, and reviewing the system to ensure that it continues to move Botswana's land administration system toward its strategic goal of pro-poor land management.

Botswana has embarked on an ambitious programme of a comprehensive tribal integrated land management system. According to Crain and MacDonald [c1995], there are three characteristic phases in the development of an integrated land management system: I- Inventory Applications, II – Analysis Applications and III – Management Applications. However, TLIMS is still in its early phase of this long-term 10 – 15 year process.

Phase I: Inventory

The principal activities here involve data collection and conversion, data input and editing. These activities ensure the accuracy and integrity of the database. Currently, the system has capabilities of simple data retrieval, can answer direct queries, and display data by a variety of ways as well as routine reporting. In this phase the bulk of the activities involve data collection and conversion.

Phase II: Analysis

It would take sometime before TLIMS can reach this phase in its evolution. For example, the Canada Land Data System started in the early 1960s, but only reached this phase in the mid-1990s. As Crain and Macdonald stated: "The emphasis in this phase is much more on complex retrievals, and queries which may generate additional queries in an unexpected or unstructured way, hence the implications of a need for extensive user interactions." Here we should see a shift in emphasis from data collection and conversion to data retrieval and manipulation. Systems that have reached this stage should have the ability to sort, select, derive new data from old, extract and re-display data on the basis of complex geographic, topological and statistical criteria.

Phase III: Management

This is the final phase in the land inventory process. A true integrated management information system must provide the tools to assist directly in the decision-making process – not merely an inventory of what exists, but also analyses of data relationships that might hint at problems or solutions. The Canada Land Data System is at the threshold of reaching this management phase. For a land inventory system to reach this stage, it must have the ability to forecast and answer the "what if' questions. A sample "what if" question would be: what is the impact of an alternative land use policy on land values and land markets, on the ability of the poor to access land.

At this stage, TLIMS would have reached the required level of maturity. However, the transition to this stage of the process is difficult. There are many challenges such as resource and financial constraints, lack of multi-skilled personnel, and the constantly changing technologies. This does not mean that TLIMS will never reach this final stage as there is potential for systems developed in the third world to leapfrog into Phase III.

Do's

1. Before embarking on a land inventory project, undertake a user requirements study. This was done in the case of TLIMS. But often there is very little emphasis placed on surveying user requirements for data; and on specifying the capturing of data to meet those requirements [Aronoff, 1990]. When the design of the TLIMS was done, it was assumed that the data to populate the database would be readily available in the right format. As a result there was no adequate budget for data collection and conversion and this delayed the testing the system. Identify possible problems within existing land records such as multiple land allocation, unrecorded plots, etc. This is necessary to define procedures to eliminate or minimize such problems.

2. The major challenge faced by TLIMS was in writing comprehensive and robust data specification requirements. What is needed is a data specification requirement that would also meet future requirements. In addition, establish guidelines for: (i) sustainable land management; (ii) transparent land administration system; (iii) determining property boundaries; (iv) adjudicating actual ownership, and (v) resolving boundary disputes. The land inventory system should be able to accommodate a variety of land tenure arrangements such as overlapping rights, conflicting rights, rights of cattle farmers, rights of cultivators, rights of hunter-gatherers.

3. Include capacity needs assessment prior to the implementation of a land inventory. After all, a well functioning land administration system requires knowledgeable staff, with competence in all areas of land administration, e.g. land records management, public administration, land surveying, land law, land registration, land valuation and information technology.

4. Give priority to the issue of training and change management. The successful implementation of a land inventory system depends on the development of technical skills and managing change as well as changing the mindset of the people.

5. Carry out public awareness campaigns about a land inventory project. Public awareness is crucial at the grassroots level among the user-community and at the local level among the community and traditional leaders. The information provided to each of these groups must be vchosen carefully

to respond to their specific concerns, taking into consideration their spheres of activity and influence. For instance, land occupants might be concerned about the tenure security of their plots, and of the requirements and benefits of a land inventory project. They should be made aware of how land inventory will contribute towards the tenure security of their plots. Involving all stakeholders (e.g. general public, academic, private sector, and other government departments) in all stages of the land inventory process could do this. This has the potential to ensure 'buy-in', ownership of the land inventory system as well as ensuring higher chances of success.

6. Choose appropriate tools for the job. A variety of technologies for data collection, conversion and storage exists in the market. There is a danger to select inappropriate tools for the land inventory process in terms of lack of technical support, inadequate skills to operate the equipment, as well as inadequate resources to maintain the equipment. Such a choice will lead to wastage of limited resources. There is need to balance the perspectives of technology optimists that technology will solve all problems with an understanding of the fundamental problems and implications for acquiring such a technology.

7. Government should make it a legal requirement to report all land transactions to land agencies. Such an approach would require linking the land inventory to the land registration system, and possibly a change in land registration laws requiring compulsory registration. Without any legal requirement to report land transactions, the land information in the land inventory will quickly become obsolete, despite the high cost of establishing it.

8. Develop procedures for: (i) parcel identification system through which parcels can be uniquely and easily identified and cross-referenced with the descriptive records i.e. assign parcel identifiers in a manner that they are not duplicated; in addition, (ii) develop quality control and quality assurance procedures for isolating errors and inconsistent records during the data collection and conversion phases. Apply these procedures for both paper-based and digital systems.

9. Simplify data capture, conversion, verification, maintenance, storage and retrieval processes without compromising accuracy or data integrity.

10. Establish procedures for the land inventory system to be upgraded to fully-fledged LIS when resources become available. Due to financial constraints, less accurate topologically structured map may be used to provide a suitable starting point for land managers/administrators. But accurate maps have greater potential for spatial analysis in support of land-related decision-making. In the future, there will be need to improve upon the spatial accuracy of the land inventory spatial data.

11. The land inventory system should be able to function in a dynamic environment such as peri-urban and rapidly urbanizing areas (where there are constant land transfers, parcel subdivisions, new forms of spatial units, new rights and responsibilities to land, new land development concepts, and new forms of rightful claimants).

12. Government organizations should adopt a phased approach in developing a land inventory system. This approach should also be flexible and scalable. A land inventory system imposes a heavy burden on government budgets. Tembo and Simela (2004) have described the implementation of TLIMS as a 'big bang' and this should be avoided as it risks system failure.

13. The system should offer decentralized services. Data should be easily accessible at the local level and should be user-friendly to women and the poor who are often uneducated.

14. Train all employees so they are sufficiently competent to work in this new environment. The lead organization should develop a highly motivated and flexible team to work in this new environment.

15. Develop and maintain an 'organization-wide' ICT strategy. In case of non-ICT equipped jurisdictions, a paper-based system can be designed taking into consideration the database approach to information storage. This has the advantage of making it easier to migrate to computers when resources become available in future.

16. Government organizations tasked with implementing a land inventory strategy should ensure that there is communication with users/customers. A helpdesk should be available for internal and external customers. This has the benefit of ensuring customer satisfaction (this was overlooked in the implementation of TLIMS).

Don'ts

1. A land inventory should not be treated as a substitute for adequate policies for managing land resources but instead it should be used as a tool to support sustainable land management, transparent land administration and land use planning.

2. Do not adopt a 'big bang' approach to land inventory implementation. Mistakes made on a large scale may be too costly and difficult to rectify. An incremental approach to land inventory implementation is essential.

3. Do not keep the process secretive. To avoid unnecessary suspicion and mistrust amongst the various stakeholders, the whole process should be open and transparent. Status reports on project information should be publicized on the organization's website, news bulletin boards, and there should be public demonstration of the system.

4. Do not collect land information haphazardly.

5. Avoid duplication of effort and equipment in data collection and conversion.

6. Avoid overemphasis on technical systems such as computerization. There are other issues to be addressed such as dual land tenure systems and land adjudication.

7. A land inventory involves many stakeholders. The development of a land inventory cannot be done in isolation.

8. Do not proceed without political commitment from the highest level of government. The Land Registration and Information Service (LRIS) in the Maritime Provinces of Canada succeeded because there was political support from the Council of Premiers.

9. Do not impose false or unrealistic deadlines on consultants. TLIMS consultants were required to collect and convert data within a period of 3 months, however due to logistical constraints and the size of some villages, only 10-15% of data was collected. This problem was compounded by the use of inexperienced consultants in land administration issues.

Ingredients for successful implementation

Governments in developing countries should recognize the importance of developing strategies for implementing information systems, be they national land inventories or land information management systems. The following ten key ingredients are necessary for a successful implementation:

1. Prepare and execute an information campaign, informing all landholders in the area or village about the reasons for the project inventory, why they should get involved (i.e. how they will benefit), and how they can get involved (i.e. what they need to do).

2. Develop a systematic land adjudication process for the clarification of the tenure situation i.e. ownership, size and extent of tribal plots. This task should be one of the first tasks of a land inventory process. The absence of a systematic adjudication process slowed down the data collection process in TLIMS.

3. Assign unique parcel identifiers to each plot. The introduction of unique identifiers should be a priority and probably one of the first major tasks of a land inventory process. The Swedish real property computerization program started with a property identity reform in each area of implementation. In the case of TLIMS, there was no comprehensive property identity reform and the assignment of plot identifiers was done on an ad-hoc basis.

4. Carry out a comprehensive review of all land administration processes, including digital and paper-based processes.

5. Form a working group with representatives from all involved stakeholders. A baseline document should be prepared specifying the competence of each internal stakeholder.

6. Develop a sustainable strategy on how best to manage the transition

from a paper-based system to a digital environment i.e. training, IT system development, support, operation and maintenance and looking into outsourcing as an alternative for countering lack of local competence.

7. Undertake a user requirements study. This was done in the case of TLIMS before embarking on a land inventory project. But often there is very little emphasis placed on undertaking user requirements for data; and on specifying the capturing of data to meet those requirements.

8. Include capacity needs assessment prior to the implementation of a land inventory.

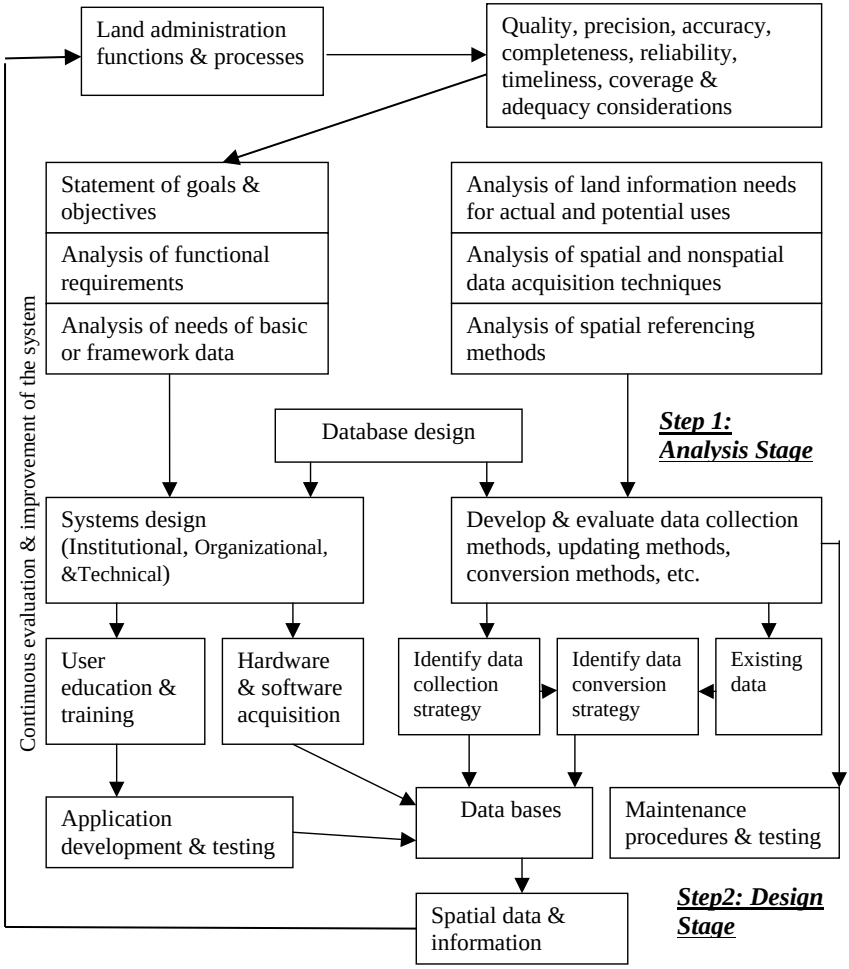
9. Design a land inventory that can accommodate a variety of land tenure arrangements such as overlapping rights, conflicting rights, rights of cattle farmers, rights of cultivators, rights of hunter-gatherers.

10. Develop and maintain an 'organization-wide' ICT strategy. A successful system depends on the availability of efficient and effective information and communications technologies.

Systematic approach

These guidelines would be inadequate without a systematic or methodological approach. The advantage of a systematic approach is that it enables a comprehensive approach to problem-solving, and allows gaps to be detected during the design process. Figure 1 shows a conceptual framework for designing and implementing a GIS-based land inventory system. It is divided into two stages: the analysis stage and the design stage.

Figure 1: Framework for the design and implementation of a GIS-based rural land inventory system (based on Eade and Hodgson 1981).



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The Global Land Tool Network

The main objective of the Global Land Tool Network (GLTN) is to contribute to poverty alleviation and the Millennium Development Goals through land reform, improved land management and security of tenure.

The Network has developed a global land partnership. Its members include international civil society organizations, international finance institutions, international research and training institutions, donors and professional bodies. It aims to take a more holistic approach to land issues and improve global land coordination in various ways. These include the establishment of a continuum of land rights, rather than a narrow focus on individual land titling, the improvement and development of pro-poor land management, as well as land tenure tools. The new approach also entails unblocking existing initiatives, helping strengthen existing land networks, assisting in the development of affordable gendered land tools useful to poverty-stricken communities, and spreading knowledge on how to implement security of tenure.

The GLTN partners, in their quest to attain the goals of poverty alleviation, better land management and security of tenure through land reform, have identified and agreed on 18 key land tools to deal with poverty and land issues at the country level across all regions. The Network partners argue that the existing lack of these tools, as well as land governance problems, are the main cause of failed implementation at scale of land policies world wide.

The GLTN is a demand driven network where many individuals and groups have come together to address this global problem. For further information, and registration, visit the GLTN web site at www.gltn.net.

About this Guide

How to Implement a Land Inventory provides an overview of the critical role of a land inventory as an indispensable tool for sustainable management of the land and its resources. The guide shows how a land inventory can support land management and administration, land allocation, decision-making, land use planning, conflict prevention and dispute resolution.

This document takes you through the necessary practical steps, requirements and procedures for developing, implementing and maintaining a successful land inventory system. The critical questions you needed to be asking throughout the process are presented. Drawing lessons from the Tribal Land Integrated Management System in Botswana and other experiences around the world, this guide provides a quick checklist, Do's and Don'ts and ingredients for a successful implementation.

Decision-makers involved in land administration and inventory at any level will benefit from reading this booklet. If you are a representative of national or local government, work for bilateral or multilateral implementing agencies and donors, or for a non-state actor, this guide is for you.

UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME
P. O. Box 30030, GPO Nairobi 00100, KENYA
Telephone: 254-20-762 3120; Fax: 254-20-762 4266 (Central Office)
Email: infohabitat@unhabitat.org; Website: http://www.unhabitat.org

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