

Towards Kenya's Profile of the Land Administration Domain Model (LADM)

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Key words: Land Administration, Kenya, LADM Profile, Land Laws, Land Administration Regulations

SUMMARY

The application of computer technology in land administration is touted as one way of ensuring efficient and transparent land administration. Although this true, one major concern is not only how to create a computerized land information system that is interoperable across different government departments responsible for different land administration functions, but also how to ensure interoperability between national and devolved levels of government departments responsible for land administration. This dual challenge of interoperability can only be addressed if the land information systems are based on a common data model.

Data modeling can be done from scratch or adopting an already existing model. Adoption is better than the re-inventing the wheel, the danger though is that the already existing model might not be suitable for local circumstances. It is against this background that this paper sets the stage for creating a profile of the ISO 19152 - LADM standard for Kenya.

Since land administration systems cannot be understood, modeled or reformed unless the core processes are understood, this paper presents a description of the current land administration system in Kenya, followed by a comparison of the system with standard on the basis of the basic packages. Currently, the land administration system is being changed from centralized to a mixture of centralized and devolved. It was established that there are a number of aspects that are very similar between the Kenya land administration system and the LADM in all, except the Basic Administration Unit package. Whereas the Kenya land administration system considers the land parcel as the basic unit in the system, the LADM considers property as the basic unit. The standard can be adopted by mapping some concepts of the Kenyan system into the LADM or vice versa. A first draft of the profile can therefore be delineated from the standard on the basis of this paper.

Towards Kenya's Profile of the Land Administration Domain Model (LADM)

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1. INTRODUCTION

A land administration system entails determining, recording and disseminating information about the ownership, value and use of land when implementing land management policies (FIG, 1995). The two main functions of land administration systems are: keeping the contents of the relationships between man and land up-to-date (based on regulations and related transactions); and providing information from the registers. Although land administration systems differ from one country to another because of different cultural practices and colonial histories, the goal of information management underlies all such systems, even in cases where the functions of land administration are not managed under one agency or department.

Land administration systems especially in many African countries are generally not efficient and transparent. For instance, the Kenyan land administration system has previously been described as being bureaucratic, expensive, undemocratic and prone to abuse, resulting in inordinate delays and injustice in the administration of land (Republic of Kenya, 2009). The inefficiency and lack of transparency provides opportunities for corruption and other malpractices.

The application of computer technology in land administration has been touted as one way of ensuring efficient and transparent land administration. Again, in almost all countries in the world, there have been efforts in digitizing the land administration. In Kenya, there have been similar suggestions and isolated efforts to computerize the land records (LDGI, 2011); however, this has not amounted to any significant digitization of the entire land administration system. In any case, mere digitization of what may be largely outdated data from a very old system will have no economic benefit (Saxena, 2005).

The current constitution of Kenya (Republic of Kenya, 2010) and the subsequent land laws that have been enacted emphasize the need to computerize land records or generally to create a land information system that will facilitate efficient and transparent land administration. To that effect, the National Land Commission Act (Republic of Kenya, 2012a) in particular, provides that a land information system be established both at the national and county governments.

Besides the fact that it is not a simple matter to change from one system to another because of possible resistance to change, one major concern is not only how to create a land information system that is interoperable across the different government departments responsible for different land administration functions, but also how to ensure interoperability between county and national land information systems. This dual challenge of interoperability can only be addressed if the land information systems are based on a common data model. There are a

number of government-initiated and donor funded projects that have been carried out primarily to digitize land records. For example, the project which entails the development of a Modern Land Administration System involves Data Capturing, Safeguarding of millions of Land Records and the Automation of Land transactions. This and other similar efforts however do not make reference to land administration data model. Equally, within the academic spheres, some of the existing and on-going academic works are limited to cadastral data modeling.

The Land Administration Domain Model (LADM) (ISO, 2012) provides a good starting point to develop land information systems that are interoperable across government departments responsible for land administration and also across different administrative units. The model covers common aspects of land administration all over the world and is very generic; it is not intended to be complete for any particular country, instead country profiles can be created based on the model. The purpose of this paper is therefore to highlight the LADM and to present Kenya's country profile of the model, in the light of the old and the current land law regime. This will be after reviewing the land administration system, which is still based on regulation developed for a number of repealed land laws.

2. LAND ADMINISTRATION IN KENYA

2.1 Geographic context

The Republic of Kenya is located in the Eastern part of the African continent lying between latitudes 5° North and 5° South and between longitudes 34° and 42° East. It is almost bisected by the equator, and shares borders with Ethiopia and South Sudan to the North; Uganda to the West; Tanzania to the South; Somalia to the North East; and the Indian Ocean, the natural boundary to the South Eastern side, with a coastline of about 536 Kilometres.

Kenya has an area of approximately 582,646 (Km²) comprising 97.8% land and 2.2% water surface. Only 20% of the land area can be classified as medium to high potential (suitable for arable agricultural) and the rest of the land is mainly arid or semi-arid (suitable for extensive livestock production, wildlife and irrigated farming). Table 1, adapted from Vision 2030 Medium Term Plan (2008-2012) (Republic of Kenya, 2008) shows the land usage categories and their proportions.

Table 1. Land usage categories in Kenya

	<i>Category</i>	<i>Area (Km²)</i>	<i>Percentage of Total Land and Water Area</i>
1	Forest	7,084	1.2
2	Government Reserve	492	0.1
3	Townships	1,812	0.3
4	Alienated Land	33,397	5.7
5	Game Reserves	13,691	2.3
6	National Parks	3,149	0.5
7	Trust Land	457,449	78.5
8	Total area of water	11,230	1.9
	<i>Total Land and Water</i>	<i>582,646</i>	<i>100.0</i>

2.2 Organization structure

Land administration in Kenya since independence in 1963 has been under the Ministry responsible for land matters variously referred to under different names. The Ministry (now renamed Ministry of Lands, Housing and Urban Development) carries out the basic functions of land administration, which include juridical (land tenure), fiscal (valuation) and regulatory (land use planning) through its four (4) departments, which are further divided into either divisions, branches or sections. The organization structure presented in Figure 1 illustrates the current structure without considering the reorganization proposed in the national land policy (Republic of Kenya, 2009), which was enacted prior to the current constitution and the additional departments of housing and urban development according to the current government structure.

The National Land Policy (Republic of Kenya, 2009) proposed devolved structure of land administration in regard to land administration, which involves the establishment of local-level mechanisms for sustainable land rights administration and management among them the Land Control Boards (LCBs) and Land Disputes Tribunals (LDTs). The current constitution also provides for a decentralized to-tier government consisting of National and County governments. According to the already enacted land laws, in particular, the National Land Commission Act 2012 (Republic of Kenya, 2012a), the legislative framework envisages a situation where the National Land Commission shall establish county offices and on behalf of county governments to carry out physical planning, land surveying and mapping, land adjudication and consolidation, and settlement. A study carried out by the Institution of Surveyors of Kenya (ISK) to provide a suitable model on devolution of land administration, recommended a devolution relationship model, where both *deconcentration* and *devolution* are adopted depending on the legislated institutions and the functions to be undertaken (Institution of Surveyors of Kenya, 2012). Deconcentration is a decentralization process where the central government designs a structure that enables its agents to work close to the local people in field units/ agencies of central government. Devolution is a process of transferring decision making and implementation powers, functions, responsibilities and resources to legally constituted local governments. It is hoped that as the devolution process gets underway, the recommended model will be considered.

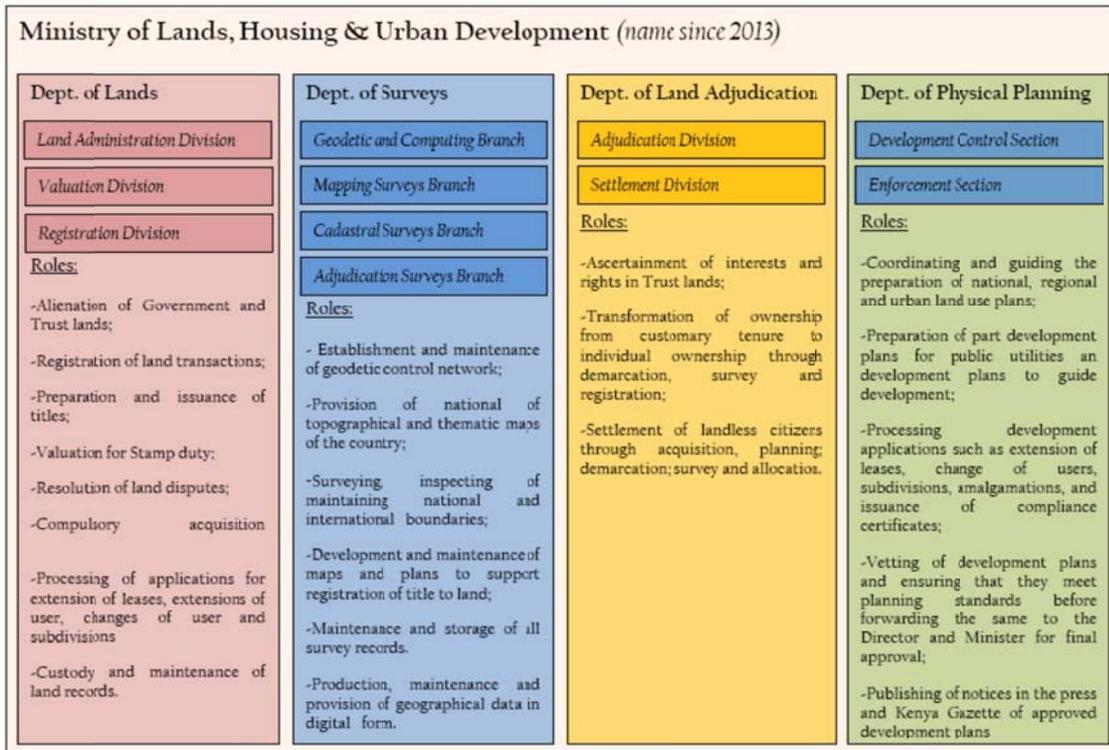


Figure 1. Current organization structure between the Ministry in charge of lands and the national land Commission

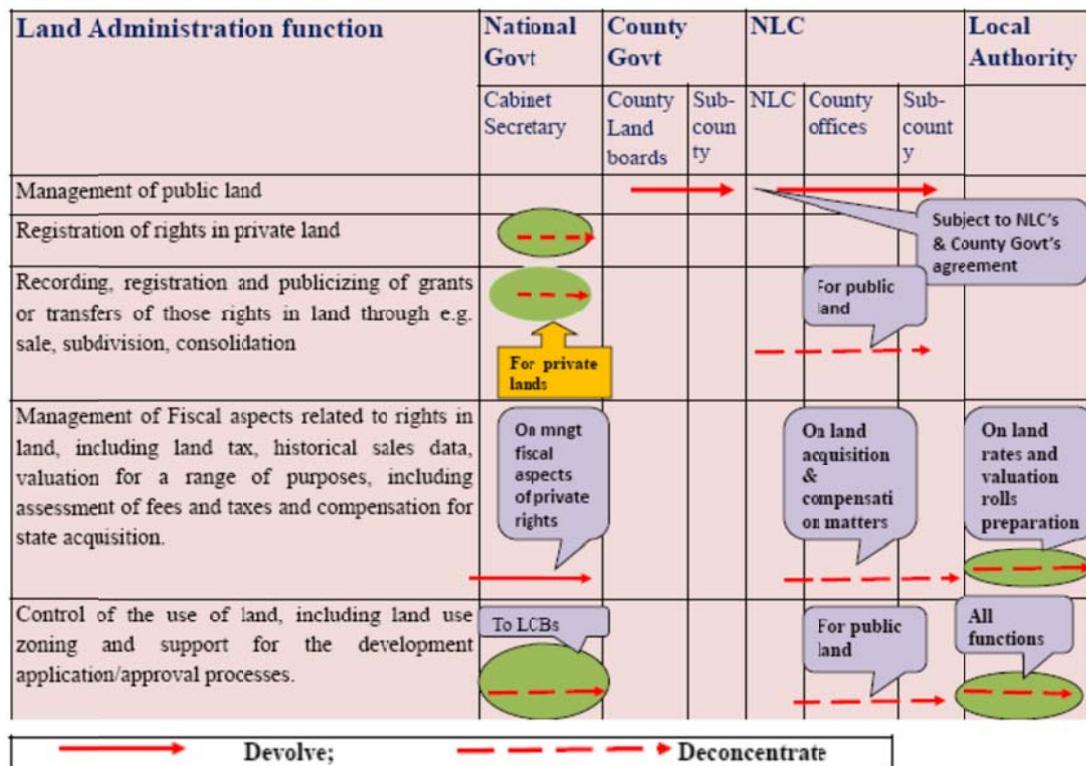


Figure 2. Proposed Decentralized Land Administration and Management Model (Institution of Surveyors of Kenya, 2012)

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2.3 Land administration processes

Land administration is primarily about processes and not institutions. An examination of the processes a jurisdiction uses for tenure, valuation, use and development, not its institutions, reveal its administrative approach – as such, land administration systems cannot be understood, modeled or reformed unless the core processes are understood (Williamson, Enemark, Wallace, & Rajabifard, 2010). In the rest of this section, the core land administration processes in Kenya will be described as a basis for delineating its profile of the LADM.

2.3.1 Land tenure

Prior to colonial rule, land was owned communally. This was however changed by the colonial government which introduced land title deeds and therefore individual ownership of land. At the time of independence, there were two substantive regimes in property law and five registration systems supported by administrative institutions to effect the objects of the regime. The dual land tenure system comprises of individual title and customary rights to land - in other words, land ownership in Kenya has been under a complex mixture of English law and traditional customary law. The English system was introduced to facilitate the appropriation of prime agricultural land, the ‘white highlands’ into individual tenure system. On the other hand, there were parallel policies that restricted the access to and control by Africans to designated reserves under customary tenure system.

At independence, the government adopted and retained individual land tenure system from the colonial period and in addition restated its resolve to accelerate adjudication, consolidation and registration of land. This was premised on the link between agricultural development and individual tenure. Over the years, it has been observed that, agricultural production has not increased due to individualization of land tenure. This is because despite adjudication, land registration only served to marginalize areas that were not in the former ‘white highlands’; subsequent attendant laws emerged that were inimical to the very objectives they were set to promote, for example, the Land Control Act; and finally, land speculation, which defeats the primary objective of individual land tenure (Odhiambo & Nyangito, 2002).

Land legislations in Kenya have over the years given rise to three types of land tenure systems/categories. These are private, customary and public tenure system. It gave prominence to private land over indigenous/communal land. The current constitution and subsequent land laws recognize indigenous/communal land and consequently categorizes land into public, community and private land and these are in the ratios of 10%, 70% and 20% respectively (Siriba, Voss, & Mulaku, 2011). Public land is the land that was formerly crown land that is now held by the government, for example, army barracks, forest lands, national parks, game reserves, wetlands, riparian reserves and protected areas. Trust land is the land held by the local authorities (county governments) on behalf of the people ordinarily resident in their areas of jurisdiction. Trust land includes un-adjudicated land in the rural areas, rural markets, rural public schools etc. Private land is land held by individual persons or legal persons like private companies and co-operative societies after alienation from government land or adjudication from trust lands.

For historical reasons, Kenya uses the title system of land registration, that is, the title is recorded and secured (Williamson et al., 2009). Although cases of Deeds system of land registration still exist. Both the Torrens and English systems of title land registration are used. The English system of land registration has been used in the trust lands mainly in the rural areas and mainly based on the provisions of the now repealed Registered Land Act (RLA) (Republic of Kenya, 1963b). The RLA has been replaced by the Land Registration Act, 2012, (LRA) (Republic of Kenya, 2012b) although the regulations developed under the RLA are still being used awaiting the adoption of new regulations.

The regulations under the RLA require that a register be opened for each land parcel. A form of ledger card (called the register) is opened and filed using loose-leaf system. All details on the parcel of land such as the size, ownership, encumbrances are shown. There are two types of cards depending on the ownership interest on the parcel of land: for freehold, the card is in green colour, while for leasehold the card in white colour. Each register is divided into three sections: the Property section, Proprietorship section and the Encumbrances section. The Property section contains information on the “unique” number of the land parcel, the size and location. The Proprietorship section contains information particulars of the owner. The Encumbrances section gives information about all adverse interest to the owner, for example leases and charges.

This English system of registration is supported by general boundaries mapped by approximate techniques. The resultant maps commonly called Registry Index Maps (RIM) are only provisional and the boundaries can only be considered legal once they are fixed by means of more accurate survey and mapping techniques. The Torrens system of land registration is supported exclusively by fixed boundary survey. The Private land under the settlement scheme and the company and cooperative farms programmes are registered either under the Torrens or the English system. The cadastral surveys in areas under these programmes are relaxed in the sense that only the boundary corners of blocks of parcels are fixed, while the boundaries of the parcels within the block are approximately surveyed.

The Deeds system of land registration was carried out under the regulations of the now repealed Registration of Titles Act (RTA) (Republic of Kenya, 1920). Under RTA, the document, which could either be a grant or a certificate of title, is given a registration reference number. One copy of the document is retained in the registry and the other returned to the owner. The copy retained in the registry constitutes the register for the particular parcel of land and all subsequent documents relating to the land are endorsed on that document. Whenever any document related to the parcel of land is submitted for registration, it has to be accompanied by the original title held by the owner. It has been the government policy to convert from RTA to RLA.

Land registration and the main land tenure process is part of other land tenure processes involved in the conversion of land parcels between the different categories as illustrated in Figure 3. These and other land tenure processes like land transfer by agreements, land subdivision and boundary determination are described in the rest of this section.

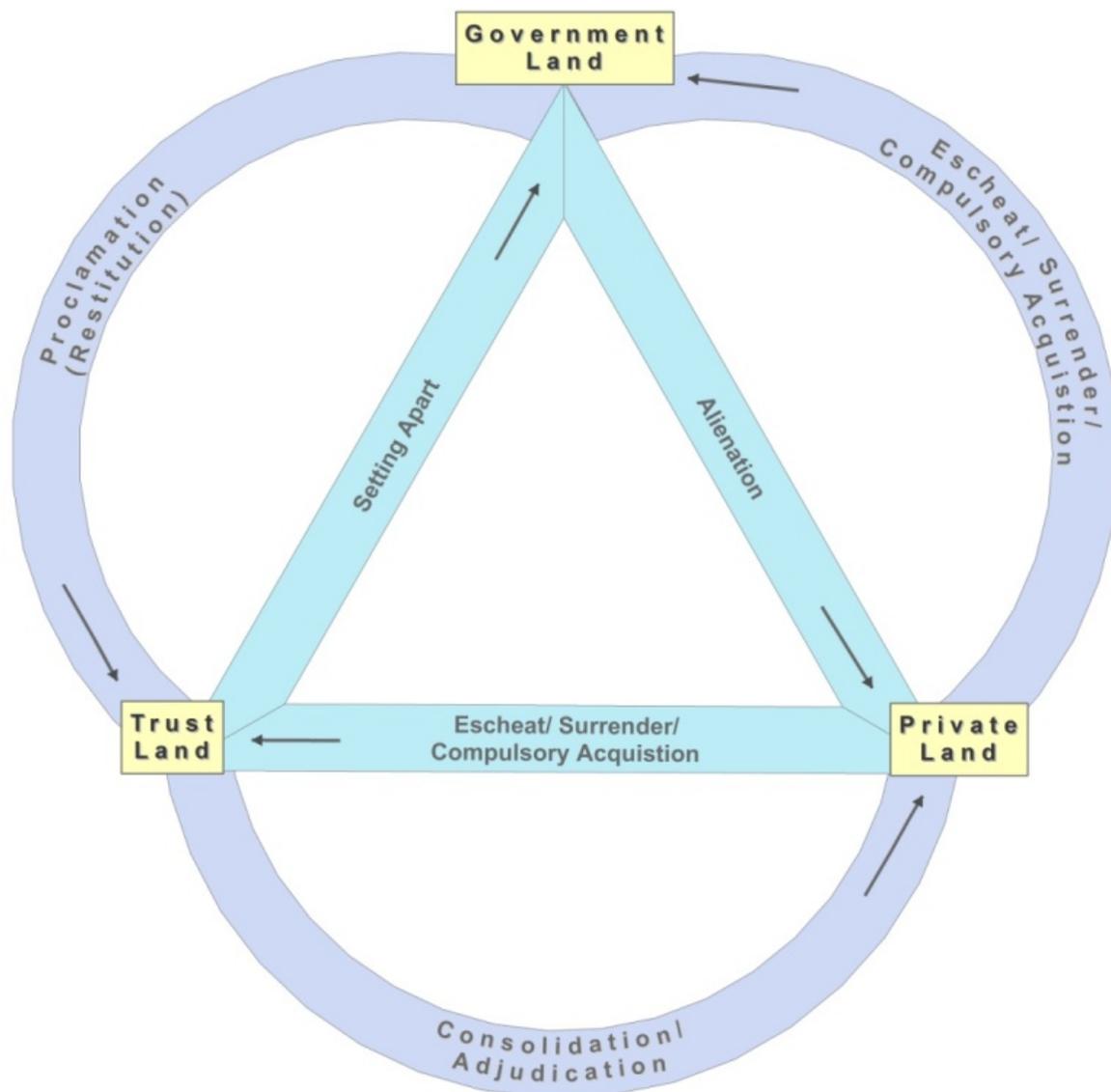


Figure 3. Land tenure processes involved in the conversion between different categories of land in Kenya; Government and Trust lands are now called Public and Community lands respectively

A) Conversion of Trust Lands

The earlier constitution provided that Trust land shall cease to exist upon registration as either private land or government land in accordance with the law. The relevant laws for that purpose include: the Land Control Act (Republic of Kenya, 1967), the Land Adjudication Act (Republic of Kenya, 1968a), the Land Consolidation Act (Republic of Kenya, 1959), and the Land (group representative) Act (Republic of Kenya, 1968b). The primary land tenure processes that affect trust land include land adjudication, land consolidation and setting apart.

(i) *Land Adjudication*

Land adjudication (or formalization) is the main process of individual land titling in trust lands. It includes a number of sub-processes: identification of boundaries, demarcation, ascer-

tainment of rights (adjudication), surveying and registration. Although adjudication is only one of the sub-processes, the entire process is referred to as land adjudication. Because there have been no formal surveys or land adjudication in the vast and former North eastern Province, land is still held communally by various communities under customary tenure.

(ii) *Land Consolidation*

Land consolidation or land adjudication through land consolidation as a process of converting trust land to private land in Kenya is of a traditional nature. This is because the only ongoing land consolidation in some parts of Meru and Tharaka Nithi Counties is of limited extent. The objective in this process is to consolidated scattered and/or uneconomically shaped parcels without the necessity to create a new road system or water resources projects. The procedure is usually initiated by a state authority.

(iii) *Setting Apart*

Trust land is converted to government land for public purposes through the process of setting apart. This process is initiated by the government or the county council concerned and carried out under the provisions in the earlier Constitution Articles 117 and 118 (Republic of Kenya, 1963a) and those of the Trust Lands Act (Republic of Kenya, 1939). Once the site to be set apart has been identified, topographic maps (to scale) showing the boundaries, the area and bearings of the site in question are prepared, and the county council or the central government gazettes the intention to set apart. Once any appeals to the intention to set apart have been determined, the District commissioner demarcates the boundaries of the land using the map by placing appropriate marks on the ground. Applications for compensation are invited from any affected people and once the payments have been made, the land is set apart.

B) Conversion of Government land

Government land is converted to private land or to trust land through the processes of alienation and proclamation respectively. Land alienation (alternatively referred to as land distribution, land allocation or land grants) has been the main avenue for delivering government land into private ownership. The process is initiated either by the Plot Allocation Committees or through direct application or by reservation and carried out under the provisions of the now repealed Government Lands Act Cap 280 (Republic of Kenya, 1915).

(i) *Land Alienation*

The process of land alienation involves mainly leasing of government land to private ownership. This process is sporadic in nature based on need and has been going on for more than 100 years; It mainly depends on prevailing development needs such as housing, industries, etc. The Director of surveys prepares a base map of the area intended for alienation. Based on this base map, the director of physical planning prepares the physical land use plan called a Part Development Plan (PDP) in accordance with the Physical planning Act Number 6 of 1996 (Republic of Kenya, 1996). The commissioner of lands identifies prospective land owners and land from the PDP that can be alienated.

(ii) *Proclamation*

Proclamation alternatively referred to as land restitution is the process by which government land reverts to community (trust) land. This process is necessary in jurisdictions where indigenous communities may consider themselves to have been dispossessed of the land by the government through compulsory acquisition without compensation. In Kenya land dispossession may be traced back to the imposition of colonial rule through the declaration of a protectorate in 1895. The indigenous people who were disposed of their land continue to agitate for the return of their ancestral land. However the existing legal framework limits the indigenous people's ability to reclaim their land (Wachira, 2008). A section on land restitution is provided for in the new land policy, which requires a review of all previous acquisitions of community land to facilitate restitution, if deserved, for the affected communities (Republic of Kenya, 2009).

C) Conversion of Private land

Private land is converted to trust or government land through the processes of either escheat of rights in former trust (or government) land or surrender or compulsory acquisition. According to the constitution, if a person (or company) in whom (which) is vested any estate, interest or right in or over land dies without heirs (is dissolved), then that estate, interest or right escheats to the county council in whose area of jurisdiction the land is situated.

Surrender of private land consists mainly of the surrender of leased land upon the expiry of the lease period or under other circumstances, for example, the irregular allocation of land in the Mau Forest Complex where a number of individuals have surrendered their titles to land (Orengo, 2010). The cadastral survey and mapping process to be conducted is meant to reaffirm the existing beacons as they were.

The government or county council may acquire land from private holding for a public purpose after compensation through the process of compulsory acquisition (or expropriation). The principal legislation that confers powers of compulsory acquisition on public bodies includes the earlier Constitution of Kenya (Republic of Kenya, 1963a), the repealed Land Acquisition Act (Republic of Kenya, 1968c), the Water Act (Republic of Kenya, 2003), the Electric Power Act (Republic of Kenya, 2006), and the Local Government Act (Republic of Kenya, 1963).

The process of land acquisition starts when the Commissioner of Lands or the local authority gazettes a notice of the intention to acquire land. Through this, the Commissioner gains power of entry to the land and cause the plan of the land to be prepared. Once any appeals are determined and compensations paid, the government (or local authority) takes possession of the land. A survey of any remaining part of land is carried out.

D) Other land tenure processes

There are other processes that involve the transfer of land within one category between individuals. They include: land redistribution; land transfer or conveyance; land subdivision; and boundary re-establishment, either for the purpose of extension of lease or for dispute resolution.

(i) *Land redistribution*

In land redistribution processes, two approaches are used: government initiative and private initiative. Whereas in the former, the government bought land from the British settlers and settled people, in the latter, land buying companies, co-operative societies or self-help groups buy land and redistribute it to people by selling. Under this programme, over 433 settlement schemes and 2700 company and cooperative farms have been established, together covering a land area of about 3.2 million hectares (Mwenda, 2003).

(ii) *Land conveyance*

Land transfer or conveyance is the process of moving the legal ownership of land from one person to another. Land transfer is achieved either by agreements (buying, selling, leasing and mortgaging) or by social events (death, birth or divorce). It can involve any category of land, i.e., either freehold or leasehold. The process is usually initiated by a transferee who signs the transfer agreement together with the transferor in the presence of a witness preferably an advocate of the High Court of Kenya.

In respect of a land sale, the process of land transfer begins when the parties to a land transfer enter a sale agreement specifying the terms of transfer which include the purchase price, method of payment, names and addresses of the buyer and seller and the location of the land. The sale agreement is signed by the parties preferably in the presence of an advocate of the high court. This is followed by the signing of land transfer forms from the Lands Office. After verifying the duly signed forms and the necessary consent by the local Land Control Board, the Land Registrar effects the transfer in the register and issues a title deed to the buyer.

(iii) *Land Subdivision*

Land subdivision is one of the land tenure processes carried out after approval by land use planning authorities. The subdivision process under fixed boundaries requires the land owner to make an application to a registered physical planner to prepare a development application. The application requires approval by the local authority after considering the specifications, conditions and issuance of development permission. A licensed surveyor on the request of the land owner undertakes the subdivision and prepares a survey plan based on the development permission. The survey plan is submitted to the Director of Surveys for approval and subsequent preparation of the Deed Plan or amendment of the RIM. In the new land law regime, the RIM is renamed the Cadastral map under the LRA. The signed and sealed deed plan or amended RIM is forwarded to the Land Registrar for registration and issuance of the title deed.

For land subdivision under general boundaries, the owner makes the application for a mutation (subdivision under general boundaries) instead of requesting a registered physical planner to prepare a development application for development; and also the District Planner in addition to local Land Control Board makes the approvals instead of the Local Authority. The proposed scheme of subdivision is shown in red and the approximate dimensions of the sub-plots and the proposed means of access, road or lane system clearly indicated in blue. The rest of the process is the same.

(iv) *Boundary Re-establishment*

Boundary re-establishment is not a stand-alone process; It is carried out either as part of a court process in boundary disputes cases or as a prior process in development and construction projects. Boundary re-establishment is also required in respect of applications for extension of lease, in which case it is called a re-survey. Provided the boundary is well documented and monumented, it normally raises no difficulties. It involves a series of sub-processes: marking boundaries on the ground, including boundaries in the cadastral map; and maintaining consistency between the ground and recorded boundaries.

2.3.2 Land valuation and taxation

Valuation and taxation of land serves a number of functions, namely: generating public revenue, providing a stable fund for the acquisition of land for banking, servicing land, facilitating the efficient utilization of land, providing incentives for appropriate land uses, and discouraging speculation. Existing laws empower the State and local authorities to assess and collect taxes such as stamp duty, estate duty and rates.

Land valuation in Kenya is carried out for the purposes of either levying property taxes (rates) or buying and selling of land or in cases of compulsory acquisition. The two main components of the fiscal cadastre in Kenya are the valuation roll and the property tax information. The valuation roll is broken into the private valuation roll and the public valuation roll and typically covers only land located in the established, gazetted areas of local councils. The valuation roll contains land information and values for properties taxed under an ad valorem rate (i.e., according to value). Property tax information is used for area rating purposes for land outside the gazette area of town and municipal/town councils. Usually the preparation of the valuation roll depends on a complete cadastral map (the RIM) showing all the existing registered properties within the boundaries of the rating authority.

2.3.3 Land use planning

Managing the use of land is an essential land administration process. Land use planning and control systems differ from one country to another. In Kenya, the preparation of the physical development plans makes reference to the survey plans or the RIMs. The physical plan correctly plotted to scale in the series of 500s shows the existing plot boundaries and their dimensions, the areas of the plots, the location, reference or registered number of the plot and such contiguous plot, the contiguous boundaries of all adjacent plots and road system (both existing and approved).

The main land development processes that depend on or affect the cadastre includes the change of land use or the extension of lease once the period of lease has expired. The process of change of land use requires the preparation of the Deed Plan or the RIM of the land parcel.

3. KENYA PROFILE OF THE LAND ADMINISTRATION DOMAIN MODEL

A comparison of the basic methodologies used by different jurisdictions to develop their models are presented in (Hespanha, 2012). This section provides an overview of the Land Administration Domain Model (ISO, 2012) and then for each package of the model profiles Kenya model based on the current land administration regulations and practice.

The LADM International standard (in Figure 4) (Lemmen, 2012) provides an abstract, conceptual model with four packages related to: i) parties (people and organizations); ii) basic administrative units, rights, responsibilities, and restrictions (ownership rights); iii) spatial units (parcels, and the legal space of buildings and utility networks); and iv) spatial sources (surveying), and spatial representations (geometry and topology). The three basic packages include the Party package, the Legal/Administrative package and the Spatial Unit package. The Surveying and Representation sub-package of the Spatial Unit package. These packages are implemented using a various classes.

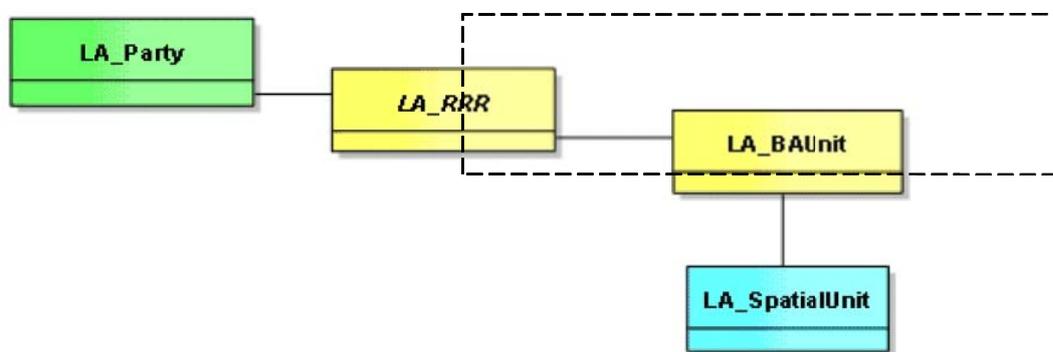


Figure 4. The four core classes of LADM

3.1 The Party package

The main class of the Party Package is the basic class Party. A party could be a natural or non-natural person that plays a role in a real property interest or transaction, for example, a citizen, surveyor, conveyer, farmer and bank. A non-natural person is a juridical person who could be a company, a municipality, the state, a county, a farmer's cooperation, or a church (each juridical person is represented by either a delegate, who could be a director, chief, CEO, etc.). The Party class has a specialization class called GroupParty, which is any number of parties, forming together a distinct entity, with each party being a registered member, for example, a partnership. A group party may be a party member of another group party.

The LA_Party, LA_GroupParty and the LA_PartyMember can be identified in the Kenyan land registration system. The Party can be identified in the title deed as either natural person(s) (name, Identity Number, Address) or companies (name, address). The particular clause in the title deed that identifies the Party reads in parts as follows:

*“This is to certify that
.....
is (are) now registered as absolute proprietor(s) of the land comprised in the above-mentioned title...”*

In the certificate of lease, the Party is identified using exactly the same clause excluding the word absolute. The GroupParty and PartyMember can also be identified in the above clauses, where the names of all the members of the registered group are identified in the title deed/certificate of lease and in the land registry (in the Proprietorship section). According to the regulations, twenty or any lesser number of persons may be registered as the proprietors of any land, lease, or charge where the title to the land restricts its to any purpose other than agriculture and in the opinion of the land registrar. Since land under customary tenure has not been adjudicated, it cannot be mapped into the LADM, in which case the Social Tenure Domain Model (FIG, 2010) can be applicable, especially for informal tenures. The Land Registrar is another Party identified in the title deed and in the certificate of lease other than the proprietor(s). Licensed Land Surveyor is a nother Party identified in maps used for land registration. Other Parties like lawyer (conveyor), are also identified in other land administration documents like Land Transfer, Lease, Charges among others.

The Party package is applicable to the Kenya land administration and almost all attributes of the Party package are also applicable. More attributes that should be considered in the Kenyan case include the photograph (of the natural perosns) and their Personal Identification numbers (PIN).

3.2 The Administrative package

The administrative package has two basic classes: Interest and the Basic Administrative Unit (BAUnit). The interests class has three classes as specializations: Rights, Responsibilities and Restrictions. Rights provides a formal or informal entitlement to own or do something. Responsibility is a formal or informal obligation to do something. Responsibilities in land administration include, for example, maintaining a survey monument within ones land parcel, or fence. Restrictions are formal or informal entitlement to refrain from doing something.

The interest class of the Administrative package can be identified in the Kenya land administration system. Section 6 of the Land Registration Act, 2012 (Republic of Kenya, 2012b), provided that a register in respect of each parcel in each registration section be created. Acoording to the current regulations and practice, the register is divided into three sections. Section A, the property section, contains a brief description of the land or lease, together with particulars of its appertenances (i.e., easements and the like) and reference to the registry map and filed plan if any; Section B, the proprietorship section, contains the name, and where possible, the address of the proprietor and a note on any inhibition, caution or restiction affecting the right for disposition. The restrictions are defined by a number of authorities, the planning departments, the National Environmental management Authority, the Kenya Airports Authority among other on land use restrictions. The third section, i.e., the encumbrances section, contains a note of every encumbrance and every right adversely affecting the land or lease, for example, sub-leases, charges etc.

The Basic Administrative Unit in LADM is an administrative entity consisting of zero or more spatial units against which (one or more) unique and homogeneous rights (e.g. ownership right or land use right), responsibilities or restrictions are associated to the whole entity. BAUnits are needed, among other things, to register 'basic property units', which consist of several spatial units, belonging to a party, under the same right (a right must be 'homogeneous' over the whole basic administration unit). The BAUnits in the current Kenya land administration system could be considered abstract, mainly because the basic unit in the land register is the land parcel and not the property. BAUnits are potential derivable from the current system. A condominium unit as an example of a BAUnit is however one of the real examples of a BAUnit in the Kenyan context under the name of sectional properties.

Although the grouping and terminology used in the Kenya land administration system is different from that in the LADM, the model provides a potentially useful template to map the Kenyan system to. Alternatively, the Kenyan system can be used and considered as a specialized version of the LADM Administrative package.

3.3 The Spatial Unit package

A spatial unit is a single area (or multiple areas) of land and/or water, or a single volume (or multiple volumes) of space. A Spatial unit can be a parcel, which may be grouped into two forms: First, sub spatial units, or sub-parcels, that is a grouping of a spatial unit into its parts; secondly, spatial unit group, which is any number of spatial units, considered as an entity. An example of a spatial unit group is a municipality.

In Kenya, the Spatial Unit class can be identified in the different types of cadastral maps used to support land registration. Cadastral maps from which land parcels are plotted can be identified on the basis of blockname/number, registration section and district (now county) in which the parcel is. This information is available on every cadastral map (cadastral plan, RIM, PID).

Spatial units are refined into two specializations: First specialization is building unit, which is a component of building (the legal, recorded or informal space of the physical entity). A building unit concerns legal space, which does not necessarily coincide with the physical space of a building. The second specialization is the utility network, which is a network describing the topology of a utility. A utility network may be attributed with information about its legal, recorded or informal space, and can be modeled as a basic administrative unit. An example of a utility network is legal space needed to access and to keep in repair a cable or pipeline utility network. A utility network concerns legal space, which does not necessarily coincide with the physical space of a utility network.

The special cases of the spatial unit, i.e., buildings and utility network are identifiable in the Kenyan cadastre, in terms of sectional properties and easements respectively. For properties to be registered as sectional properties, reference is made to the cadastral plan on which the land parcel containing the building lies on. Similarly, any easement that is registered in respect of a particular land parcel is plotted on the cadastral plotting showing the affected land parcels.

3.4 The Surveying and Representation sub-package

Spatial Units are structured in such a way to support the creation and management of Basic Administration Units. The surveying and representation sub-package is used for the identification and representation of the spatial units. Surveying involves the identification and acquisition of point locations of boundaries of spatial units. A boundary is a set that represents the limit of a spatial unit. Spatial units can be represented as points, polygons (boundary face strings) or polyhedral (boundary face) surfaces for 3D spatial features.

A document that provides facts about the spatial representation of one (part of) or more spatial units is called a spatial source. A spatial source may be the final (sometimes formal) documents, or all documents related to a survey (Geodetic control points, a field survey sketch, an orthophoto, or a satellite image with evidence on the location of boundaries (collected from the field)). Sometimes, several documents are the result of a single survey. A spatial source may be official, or not (i.e. a registered survey plan, or an aerial photograph). Paper based documents (which may be scanned) can be considered as an integral part of the land administration system.

The Kenyan cadastre consists of different types of maps going by different names. In the survey plans (the most geometrically accurate), land parcels boundaries are plotted as lines from coordinates of individual corner points measured in the field. For the Registry Index Maps (RIM), parcel boundary lines are plotted from field measurements (considered to be approximate) of the sides of the land parcel. For the few cases of digitized cadastral maps, the polygon is the main form of representation. Similarly, for sectional properties, which are still in analogue form, the building and floor plans are represented plotted as lines. Recently there has been a research to integrate building into cadastral databases and to find the best means of representation and visualisation. The LADM in this context considers digital aspects of the cadastre, which should be considered in the Kenyan system, once large scale digitization is initiated.

3.5 Special classes

Land administration activities on one hand deal with huge amounts of data, which moreover are of a dynamic nature, and on the other hand require continuous maintenance. As such, different classes of the land administration system have to be versioned to manage and maintain historical data in the database. History requires that inserted and superseded data, are given a time-stamp. In this way, the contents of the database can be reconstructed, as they were at any historical moment. Almost all in the LADM might have to be versioned.

In the Kenya land administration system, entries in the land register are time-stamped. The same applies to amendments in the Registry Index Maps. The histories help to trace the evolution of a particular land parcel from different editions/versions of the map. Normally, register of parcels that have been sub-divided into new ones, are closed and no more historical information is available. Establishing the lineage of land parcels can be a daunting task if the records (land register and the map) are not in digital form. The Kenyan Land Administration system already has sufficient information in the registers and maps that can facilitate the implementation of this aspect of the LADM

3.6 External classes

A land information system never operates in isolation. Instead it is dependent and depends on other information systems and/or databases. Some of the relevant external databases include: Registry of persons database, address database, taxation database, land-use database, property valuation database, utility networks database and the registration of sources database. Already in Kenya, sufficient information in terms of names, addresses, National Identity Number, Personal Identification Number, photos is collected that can potentially be linked to relevant external databases for corroboration.

4. CONCLUSION

The motivation for this paper is the on-going restructuring of the land administration system in Kenya. Currently, there is no blue print (model) that exist as guide in creation of the land information management system(s) envisaged in the land policy and in the new land legislations.

The paper started by describing the land administration system in Kenya in terms of current organisational structure and land tenure processes. The description is important to provide a better understanding of the system prior to any improvement or modeling. The ISO: 19152 LADM standard has also been briefly described on the basis of the basic packages. A comparison of the different aspects of each package with the Kenyan land administration system has been made. The comparison identifies aspects where concepts are similar or different. There are very similar aspects in all, except the Basic Administration Unit package. Whereas the Kenya land administration system considers the land parcel as the basic unit in the system, the LADM considers property as the basic unit. Although the package is abstract in a sense, it is potentially derivable from the Kenya land administration system.

It therefore follows that the standard is suitable for the land administration system in Kenya and can be adopted by mapping some concepts of the Kenyan system into the LADM or vice versa. A first draft of the profile can be delineated from the standard on the basis of this paper. This works sets the stage and the foundation for defining the Kenyan profile of the standard to guide the on-going restructuring efforts in land administration in Kenya and countries with similar circumstances.

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