Tenure and Tools, two aspects of innovative land administration

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1. INTRODUCTION

Worldwide land registration and cadastral boundary survey is the domain of land registrars and land surveyors. They apply the (land) law with regard to the definition of property rights, the procedures for establishment, transfer and abolishment of property rights, the registration process and the cadastral boundary survey. The basic legal concept of many conventional land laws is individual property, although the rightful claimant might be a group in the form of a legal entity, which is defined in the law as a non-natural person. Regarding the spatial unit of exercise of property rights, many existing land laws recognise an individual plot of land, the so-called cadastral parcel.

The reference for land registrars and land surveyors therefore is the *individual* property right that is exercised on an *individualised* land parcel with accurately known boundaries. An exemption here is made for some common law countries, which apply the general boundary rule which is a graphical indication of the boundary on a large scale topographic map, such as applied in England and Wales.

In section 2 we explain our understanding of what 'land administration' is, and which purposes it serves.

In section 3 we attempt to understand the status of land administration systems throughout the world.

Based on these sections we conclude that there is a need for the development of a variety of land administration arrangements that better fulfil the needs of a particular society.

Additionally, we try to develop some concepts that might be useful for land registrars and land surveyors for a better understanding of the role of land administration in a society and for a better understanding of options that are eligible to be applied.

2.   WHAT IS LAND ADMINISTRATION

The definition of 'land administration' as 'the process of determining, recording and disseminating information about ownership, value and use of land, when implementing land management policies' has proven to be a guiding principle in policy documents, research programmes, and education and training (UN/ECE, 1996). Although other definitions are used (e.g. Dale & McLaughlin, 1999), and also the definition is challenged (e.g. Fourie, Groot & van der Molen, 2002), the definition still stands firmly especially when the concepts of 'ownership', 'value', and 'use' are interpreted in a broad sense.

The concept of '*ownership*' should -in our view- be understood as a relationship between people concerning land within any jurisdiction, so the mode in which rights to land are held, and therefore based on *statutory law, common law, and customary traditions*. '*Value*' should be understood as all the values that could be assigned to land, depending on the purpose of the value, the use of the land, and the method of valuation.

'Land use' should be understood as both the use to which the land can be put, depending on the purpose and nature of the land, classification, methodology, and land cover according to defined classification systems (e.g. FAO Land Classification System, 2000). The concept of *'land'* should be understood as the surface of the earth, the materials beneath the surface, the air above the surface, and everything attached to the surface – i.e. it should be perceived as more than just the 'land' as such.

The definition reveals that land administration is a process, which brings application of process-modelling and related topics (e.g. workflow management, process re-design, and system-support), within the scope of land administration

Finally, the definition makes very clear that the land administration activity is not an end in itself, but that it facilitates the implementation of land management policies. So, the way land administration should work depends on the requirements defined by the various instruments, which are at the disposal of governments in order to allow appropriate implementation of its land policy.

Unlike many other geographic information systems, which provide information about geographical objects and their attributes, land administration systems reflect in principle the social relationship between people concerning land, as they are recognised by a community or a state. Therefore such a system is in no way just a 'GIS'. Data recorded in a land administration system have a social and legal meaning, and are based on accepted social concepts. That concerns both to owners, rights and land objects. It is not relevant whether these concepts are laid down in the law or in unwritten customs. In both cases the way how rights to land, the right-holders and the land itself is understood by the individual people, determine the content and meaning of the land administration system. These rules, constituting the basic principles for the system and justifying its existence, form the institutional context for land administration. Without rules land administration is not possible, as it will be without a societal and legal meaning. By consequence it will be a meaningless activity, not worth to put any effort in.

Institutional aspects are therefore of paramount importance, The legal framework for land issues, and the mandates and tasks as they are allocated in the public administration to perform the land administration function, determine how the system should function. Other institutional measures also do, although they might be more specific and down to earth, like a requirement to the financial conditions that the government wants to apply on the land administration activity for example that the work should be executed under a cost recovery regime. Rules for investments in the system, the way it should operate, the way the government wants to keep control, all of these can form operational constraints.

Land administration serves various functions in a society. Documents like Agenda21, Habitat etc. relate the land issue very much to poverty reduction, sustainable housing, sustainable agriculture and the strengthening of the role of vulnerable groups in society, like women, farmers, and indigenous groups. Land administration systems are –as said earlier- not a purpose in them. They are part of such a broader land policy.

Land policy reflects the way governments want to deal with the land issue in sustainable development, or as the Guidelines say 'land policy consist of the whole complex of socio-

economic and legal prescriptions that dictate how the land and the benefits from the land are to be allocated'. That of course depends on the culture, history and attitude of a people. It is worthwhile to draw up a picture of the support land administration systems give to the implementation of (the most important) land policy instruments, as there are -at least- (GTZ, 1998):

- *improvement of land tenure security*
- *regulation of the land markets*
- *implementation of urban and rural land use planning, development and maintenance*
- *provision of a base for land taxation.*

Concerning the *improvement of land tenure security*, the legal framework of land administration systems (related to the registration or recording of rights and interest in land) is determining the nature of the security provided. Within the context of the definition of these rights 'in rem' (as an institutional prerequisite), deed-systems provide a different (in casu: less) security compared with title systems. The combination of a strong notary-system (e.g. *Latin Notary)* and a deed registration might however provide as much security as the combination of non-authentic (underhand) documents with a title registration (strong role of the registrar).

Concerning the regulations for the *land market,* land administration systems provide transfer procedures of a different nature. On one hand there are plain procedures of submission of a transfer document and a recording after a minimum of formalities (e.g. *simple deed registration*). On the other hand there are more complex procedures regarding investigations prior to the approval of the legal impact of the transfer (e.g. *issuing of a title certificate*). Some countries require approval by a chief surveyor, a chief planner or another authority. Advantage is that e.g. a building permit is granted together with the title, while in the first case the procedure for planning- and building permits starts just after the transfer. The process-time necessary for the transfer procedure (for example from the obligatory agreement to the official recording or registration, that is often used as a benchmark) therefore might result in a different '*value*' for the applicant.

Concerning *urban and rural land use planning, development and control*, the support of land administration systems lies foremost in the phase of development and control of a given land use. This activity is to be seen as an intervention by the government in private rights to dispose. Without knowledge about who owns what and where (also in *customary areas*) land management will be hardly possible for the government. From the landowner's point of view, intervention by the government specifically limits his private right to dispose on the actual parcel, being the legal object of his private rights. The intervention takes an ultimate form in the execution of pre-emptive rights and expropriation. Regarding protection of third parties in good faith, pre-emptive rights and expropriation decisions should therefore be recorded in the land administration system.

Concerning the support of *land taxation,* the fact is that land tax is an outstanding example of local tax. Without knowledge about taxable persons, taxable objects and land values (all data to be provided by the land administration system), the generated revenue can not be high. Land taxation in many countries is based on land administration systems.

The *management of environmental resources* is of increasing importance. The measures a government can take, are in many cases executed by imposing restrictions on the use of land. A good example is soil sanitation, where governments can impose to owners of land a compulsory soil cleaning, and can give such measures the status of real right, which means that these orders have legal power against third parties (e.g. new owners). Therefore these public encumbrances are eligible for registration.

3.   INVENTORY OF LAND ADMINISTRATION

An inventory of the status quo will be conducive to an understanding of the development of land administration systems.
This inventory must necessarily be 'quick and fast' in nature, a restriction which is due both to the abundance of information about land administration and to the poor quality – or at the very least non-systematic nature – of the statistical documentation that is available. Although FIG is endeavouring to develop specific benchmarks, this programme is still somewhat premature (Steudler & Kaufmann, 2002).

Industrialised countries
Industrialised countries (such as the countries in Western Europe and Canada, Australia, New Zealand, Korea) possess land administration systems encompassing the entire country (UN/ECE/WPLA 2001a). These countries are confronted with problems in the registration of public land rights. The public-law rights and interests in land are becoming increasingly important, and of almost equal importance as private rights to land. In addition, they encounter difficulties with the incorporation of native titles (Maori, Aboriginal, Inuit, Indian, etc.) and, from a more technical perspective, the re-engineering of their legacy systems (Williamson, 2001) (FIG, 1999)

Central and Eastern Europe
Countries in Central Europe and the former Soviet countries possess land tenure forms based on longstanding traditions (civil-code families) which are generally accepted by their societies. They do encounter some problems with the tenure rights of minorities (such as members of their populations of Roma origin); they are also confronted with challenges in the enforcement of their legislation on land issues and the completion of their land registers and cadastral systems. However many of these countries have now made excellent progress in the implementation of their systems. The differences exhibited between the various countries largely reflect the extent to which their traditional land registers and cadastres were maintained during the Communist era (Ossko & Hopfer, 1999):
-   were present *and* maintained: Hungary, the Czech Republic, Slovakia, Poland (to some extent), and the former Yugoslavian states
-   were present but *not* maintained: Rumania, Baltic states, Bulgaria
-   were not present: the former states of the Soviet Union
For example, Hungary has almost completed the implementation (scheduled for 2005) (Ossko & Niklazs, 1998), as has the Czech Republic (scheduled for 2006) (Šima, 2000), whilst Armenia has already issued 2.5 million what are referred to as *temporary titles* for all

agricultural land and all urban apartments (Vardanyan, 2001), and Albania has issued what are referred to as *cadastral certificates* for 3 million properties (Dubali, 2000).

Latin America

Countries in Latin America are making continued efforts to implement land reform (efforts which date from the beginning of the 20th century, and were first initiated in Mexico, in 1917) that are intended to provide the poor and landless members of their societies with some form of secure property (Zoomers, 2000). These land-reform measures have not always proven successful, since problems have frequently been encountered with:
- the excessively slow issue of titles
- land records which bear little resemblance to the current situation
- registration of the land which often exacerbates uncertainty and conflicts with respect to titles
- registration which threatens the security of many holders of customary rights
- the issue of land titles which do not result in the reallocation of land to the most efficient users

For example, during the years between 1990 and 1996 only 80,000 of Brazil's 4.8 million landless families were issued with titles; moreover some 45% of the country's total agricultural land is still comprised of ranches with an area in excess of 1000 hectares (Osava, 1999). Extreme forms of land concentration are still encountered all over Latin America. IMF and the WB perceive the redistribution of land as possessing the highest priority in the region. Most countries have adopted what is referred to as a *neo-liberal land policy* that entails a preference for the privatisation and individualisation of property. However analyses have revealed that, depending on the local conditions, communal tenure systems could constitute a more cost-effective solution to the problem as compared to the abandonment of these systems in favour of freehold titles and the subdivision of common land (Zoomers, 2000).

The Ecuadorian cadastre encompasses only 50% of the country (Salazar, 2001), although the country is making excellent progress.

Guatemala could be representative of the post-conflict countries (Nicaragua 1989-1990, San Salvador 1992); 95% of the rural parcels have not been registered. Consequently one section of the 1996 Peace Treaty (Par. 38) stipulates the objective of arriving at a multi-user land registry and cadastral system (Godinez, 2001).

Africa

Africa's land administration systems are still essentially of the nature of what is referred to as a *dual system of land tenure*, i.e. their systems encompass a variety of types of land tenure concepts within one specific country. These countries combine Western-style ownership based on an individual relationship between man and land (although often based on feudal relationships) with customary concepts of tenure based on the ownership of land by communities – a village, family, tribe or clan – of which each individual is a member. In the customary concept the relationship between an individual and the group to which they belong dominates their relationship with the land. Although the majority of African countries have adopted western-style legislation, experience has revealed that this does not exert an influence on the conduct of their populations with respect to their existing normative system – i.e. what is referred to as *legal pluralism* (von Benda-Beckmann, 1991). It has been established that 31 of 44 African countries have implemented individual ownership as the official form of land tenure and at least 9 possess a combination of individual and customary forms of land tenure, whilst customary tenure is the de facto form in 36 countries (Bruce, 1998). It is an interesting

question as to whether people in these non-registered areas perceive themselves as possessing security of tenure. Bruce & Migot-Adholla (1993) studied land tenure security in Africa in collaboration with the World Bank, the International Crop Research Institute, and the Land Tenure Centre of the University of Wisconsin (USA). Their study revealed that people governed by customary rights to land possess a feeling of security with respect to the strength and duration of the tenure of their land, as well as with respect to the assurance provided for their title. These people are cognisant of the unwritten traditional rules, and they can anticipate and predict the impact of their conduct. The unwritten customary-tenure rules can provide for a normative system that is sufficiently transparent, reliable, predictable and practicable. The study cited the example of Burkina Faso, where the problems began on the government's introduction of new land-tenure legislation that was vague with respect to the relevant definitions; as a result of the debates on and discussions about these definitions the legislation was not implemented. However the proclamation of this legislation did immediately result in uncertainty. In Ghana the flimsiness of the existing cadastral system resulted in an increased amount of litigation about overlapping rights to land. In Uganda the land law transformed landowners into holders of leases issued by the government, in turn exposing them to new risks of losing their land (new legislation has since been introduced, although there are problems with enforcement) (Worldbank, 2002).

For example, in Ghana 80% of the land is governed by customary tenure, whilst the remainder is government land and private land. Registration pertains primarily to urban land, whilst work has now begun on the registration of rural land (Abu, 2001). In Zimbabwe 42 % of the land is communal land, whilst the rest is freehold (large farms) (Chimhamhiwa, 2000).

Africa has adopted an extremely innovative approach to the creation of new forms of land tenure that are intended to speed the land-registration process. Well-known examples of these forms include village titles (Tanzania, Zimbabwe) (Lugoe, 1996), certificates of occupancy or rights of occupancy (Tanzania, Nigeria) (Sule, 2000), group ranches (Kenya) (Waiganjo, 2001), flexible titles (Namibia) (Juma, 2001)(de Vries, 2000), customary rights issued by Land Boards (Botswana, Uganda, Namibia) (Toulmin, 2000), co-ownership (Mozambique) (Worldbank, 2002), communal titles for Community Property Associations (South Africa, which will probably be replaced by the customary commonhold system) (van den Berg, 2000) (Cousins, 2002)(Durand-Lasserve & Royston, 2002).
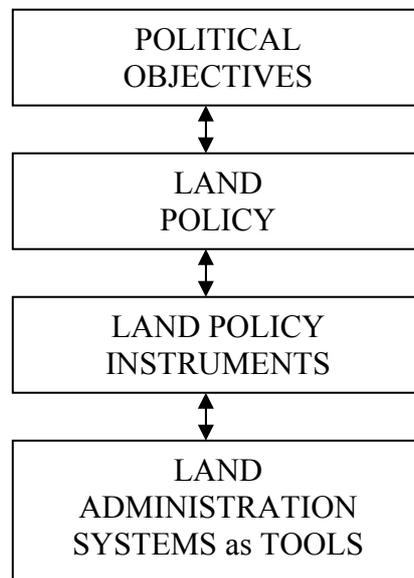
Asia and Australia
Countries in Asia, and Australia, possess a variety of forms of land tenure. Turkey possesses a western-style land tenure system, and is making good progress in its registration of built parcels of land: all the urban land and 64% of the rural lands have now been registered (Erdogan & Sahin, 1998). Arabic countries employ a form of land tenure based on the Islamic faith (Mulk, Miri, Waqf, and Musha). Little information is available about their land registry and cadastral systems (Mouyen Sayegh, 2002). Land ownership in China is vested in the State (the people), whereby members of the public are entitled to land-user rights. Many other countries, in analogy with Africa, possess dual tenure systems. In Fiji 84% of the country is under customary tenure, i.e. what are referred to as *native leases* (Rakai, 1995). In Tonga all land owned by the King (the feudal system), whereby all male Tongans are entitled to the allocation of one plot of land for a house – a title which, however, cannot be bought or sold (Vi, 2001). In the years following the overthrow of the Khmer Rouge in Cambodia 10% of the country has been registered; it was decided to grant occupiers of land a certain title provided that they could furnish some evidence of occupancy during the last 5 years. A total of 4.5 million claims to land were submitted in 1992, of which – as mentioned above – 10% have

been granted to date. Consequently in practice the country's population perceive a claim stamped for approval as a title to land – land which can even be mortgaged (Thörhönen, 2001). Thailand does not possess a form of customary tenure, since the occupancy rights of farmers are no longer recognised and are replaced by ownership (the Land Code, 1954). Land users in Vietnam are entitled to exchange, transfer, lease, inherit, and mortgage land use rights allocated to them by the State (Land Law Amendment 1998). At present there is no registration of land rights. The Philippines possesses some customary tenure (*ancestral domains* totalling about 2 million hectares) in combination with land reform (4 million hectares) and a Torrens system (coverage unknown; in 1996 this pertained to about 800 of the 1500 municipalities) (Guillermo, 2000).

4.   LAND ADMINISTRATION AND ITS PURPOSE

We consider that the land administration activity – in whatever form- is not as an end in itself, but is a tool serving certain purposes. With other words, investments in land administration systems should be justified by their functions in society. Those functions might be the improvement of land tenure security, better functioning of the land market, more profitable land taxation, better land use planning, development and control, better management of natural resources, better land reform and land redistribution etc. These functions are de facto the instruments a government has at its disposal to implement a land policy, defined as 'the whole complex of socio-economic and legal prescriptions that dictate how the land and the benefits of the land are to be allocated' (UN/ECE 1996). No need to say ideological elements might come in here. In the form of a diagram we model this understanding as follow.

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┌─────────────────────────┐
│        POLITICAL        │
│       OBJECTIVES        │
└─────────────────────────┘
             ↕
┌─────────────────────────┐
│          LAND           │
│         POLICY          │
└─────────────────────────┘
             ↕
┌─────────────────────────┐
│      LAND POLICY        │
│      INSTRUMENTS        │
└─────────────────────────┘
             ↕
┌─────────────────────────┐
│          LAND           │
│     ADMINISTRATION      │
│    SYSTEMS as TOOLS     │
└─────────────────────────┘
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On one hand this diagram is in line with the finding that land administration has no sense, when it is not embedded in a wider development policy (Deiniger, 2003). On the other hand the diagram shows that investments in land administration systems must be justified by their functions for land policy instruments. Ultimately the idea is that if people consider their land

tenure as sufficiently secure, no land market exists, no land tax is levied etc., there might even be no justification for land administration system.

The legal and technical system specifications differ dependent of the purposes of the system (van der Molen, 2003). Land registrars and land surveyors should design land administration systems that serve.

Societies develop. Firstly a society will develop with regard to the above mentioned land policy instruments. Where no land market existed before, a market might develop. Where no land use planning took place, the authorities might take interest in planning and developing land use. Where people experience secure land tenure, there might occur deterioration of security for various reasons. That means that the functions of land administration systems might develop in correspondence with those developments. Apart from that, land administration systems are anyhow operating in dynamic environment. This goes further than the regulated changes caused by transfer of property rights, and parcel subdivisions. It pertains to new forms of rightful claimants, new rights to land and new forms of spatial units.

Starting with a simple system could be an appropriate approach in system design. The dynamic nature however causes extra requirements to flexibility and scalability. This safeguards the sustainability of the investments in such systems.

5. STATUS OF LAND ADMINISTRATION IN THE WORLD

At present there is no systematic worldwide monitoring of land administration activities, although FIG Commission 7 is making some endeavours to provide for monitoring of this nature (benchmarking symposium Gävle 2001, benchmarking booklet (FIG 2002), standardised country reports –see www.cadastraltemplate.org-). Nevertheless the simple survey in chapter 3 provides a basis for some cautious conclusions.

From the inventory we conclude that land administration is almost always restricted to land tenure based on conventional common law and civil codes (*statutory land tenure*); land administration systems would appear to have difficulties with catering for other forms of land tenure. The legal significance of the registration of land and the concomitant benefits (if any, since their nature depends on the institutional context) is consequently not always apparent to the population of the country concerned. Governments underestimate the importance of communal land tenure, and their recognition of common ownership patterns and implementation of a commensurate system of registration may well be at least as cost effective – and possibly even more cost effective.

Land tenure arrangements are both complex and locally determined. They cannot readily be replaced by statutory forms of land tenure. Many examples are known of populations which continue to exhibit their traditional conduct even after their government has introduced new statutory forms of land tenure and the registration of land (von Benda-Beckmann, 1991) (Bruce & Migot -Adholla, 1993). In other words, these new forms of land tenure are alien to the population, probably because they are not compatible with the country's traditional societal structure.

The reform of land tenure needs to take account of the prevailing standards and values in the country's society.

The allocation of duties, responsibilities and competencies in public administration (inclusive of land registration and cadastral systems) is not always commensurate with the public's

understanding of the structure of their society, as a result of which they do not always feel an affinity with the organisation of their government.

Land administration agencies need to take account of the population's perception of their governance structure.

Some governments fail to enforce their (land) legislation with the appropriate stringency, which in turn results in uncertainty and insecurity in society with respect to their rights to and interests in land. Careful consideration should be given to new forms of land tenure, since they will need to be maintained for a long period of time. Land-tenure reforms that are carried out without due caution can have a devastating effect on the confidence of the population.

Land-tenure reform is not without risks, and it is imperative that new systems can be implemented without a need to make subsequent amendments to correct errors in the system.

Some governments immediately endeavour to achieve the ideal objective of a land administration system, i.e. individual state-guaranteed titles to land together with accurate demarcations of the boundaries of the parcels of lands. However an endeavour to achieve such an objective will impose a heavy and long-term burden on the government's policy and budgets.

An approach based on the introduction of a simple system followed by a gradual migration to the more complex ultimate system is manageable.

6. UNCONVENTIONAL RELATIONSHIP MEN-LAND APPROACHES

Although the rigidity of the 'Western' approach is often challenged (e.g. Bruce & Migot-Adholla, 1993) the four World Bank seminars on land policy held in Budapest (reference), Kampala (reference), and Phnom Penh exhibit (reference), in our opinion, a major breakthrough with respect to the recognition of what have been referred to as *indigenous systems of land tenure*, i.e. customary tenure and other forms of non-formal tenure. The World Bank states that 'it now is widely recognised that the universal provision of secure land rights within a country does not require uniformity of the legal arrangements, and that there is some form of consensus on the desirability of having legal recognition for customary forms of tenure and land right for the indigenous people; the Bank recently devoted greater attention to the sustainable management and evolution of customary tenure systems; communities should be allowed to choose between different types of tenure' (Worldbank, 2001).

Land administration systems should be able to accommodate various land tenure arrangements.

Experience reveals that some countries develop land legislation, which endeavours to integrate customary tenure within the formal system. Bosworth (2002) reports on Uganda where the Land Act enacted in 1998 provides for methods to adjudicate on customary rights and the issue of certificates of customary ownership and occupation certificates for tenants on *mailo* land as well as the establishment of a Land Fund to assist in the market-based transfer of rights between tenants and landowners. These certificates will be mortgageable. Consequently the Act recognises group rights to land by means of the registration of communal land associations with elected management committees. Quadros (2002) reports on Mozambique, where the new Land Act, 1998, recognises customary rights in the form of co-

titling and the need to consult with the local communities as part of the authorisation process for new investments.

In Namibia a new Land Law is pending that will address the broad issues of communal land reform by means of the creation of regional land boards (Pohamba, 2002).

Van den Berg (2000) states that under a new Act in South Africa communal titles can be granted to Communal Property Associations.

In Bolivia the INRA Act (1996) (Ley Instituto Nacional Reforma Agraria) provides for the recognition of *Tierras Comunitarias de Origen* (TCOs), i.e. land belonging to indigenous groups (Zoomers, 2000).

Land administration systems should cope with new forms of statutory tenure.

The recognition of customary rights also devotes attention to rights of sheep and cattle farmers. In many countries there are serious conflicts between traditional nomadic sheep or cattle farmers and arable farmers about grazing and farming lands (such as Kenya, Tanzania, Rwanda). Tanzania's new village Land Act provides for the sharing of pastoral and agricultural land by sheep and cattle farmers and arable farmers on the basis of adjudication and mutual agreements (Mutakyamilwa, 2002). In analogy with pastoral rights, the problem of overlapping rights has yet to be resolved in many countries.

Land administration should not neglect rights of others.

This brings us to the issue of the nature of the spatial unit, which forms the basis for registration. Objects on which customary rights are exercised are not always accurately defined (Neate, 1999). Within this context Österberg (2002) advocates a flexible and non-traditional approach to the spatial component. Land rights might pertain to a relationship with the land that is in accordance with the standards and values of the relevant community, although these rights will need to be defined to provide third parties with meaningful information. In these situations the parcel of land, i.e. the object on which the rights are exercised, might be defined in a manner other than accurate land surveys and geometrical measurements. Österberg (2002) shows pro's and con's of various perspectives.

Fourie (2002a, 2002b) notes that non-cadastral information should be integrated in spatial information systems since 'the high accuracy's and expensive professional expertise associated with the cadastre has meant that there is too little cadastral coverage in Africa'.

Land administration systems should be able to accommodate a variety of spatial units.

In the absence of an in-depth understanding of land tenure arrangements it will prove difficult, if not impossible, to identify the processes involved in the determination, recording and dissemination of information about tenure arrangements required for the provision of the services needed to ensure for the requisite security of tenure, markets, planning, taxation and management of resources.

When viewed from a land-tenure perspective land administration systems entail the registration of the existing land tenure in a manner which imparts a given added value – i.e. the certainty offered to the persons possessing registered rights that those rights will remain in force until such time as they might be revoked in a legal and comprehensible manner. In our opinion the meaning of the term *legal* within this context should be understood as any system of standards and values that offers transparency, reliability and predictability to the relevant community. This in turn implies that customary rights or indigenous standards should be regarded as being fully eligible for land registration and cadastral purposes. In fact this also needs to extend to what are referred to as *informal settlements* (irrespective of their precise

nature); these should also be eligible for the purposes of registration of titles to land, subject to the proviso that the land relationships are generally accepted and perceived as being legitimate within society – i.e. provided that the relevant society regards the rights to land as being legitimate, and provided that the population is familiar with the rules pertaining to the allocation, acquisition and transfer of land. This once again demonstrates that in essence it is possible to register or maintain records of relationships between man and land irrespective of the nature of the country's jurisprudence; this ability offers opportunities for the integration of statutory, customary and informal arrangements within land administration systems. In fact the converse is actually true; the registration and recording of relationships between man and land will be meaningless when those relationships are not accepted and the standards and values pertaining to those arrangements lack transparency, reliability, and predictability. In such situations the system is comprised of nothing more than the maintenance of records of the persons who make use of the land, i.e. records of a form of pseudo-physical attribute of specific parcels of land. The land administration system will then contain solely factual information without a legal basis.

A land administration system is more than a GIS because it represents social relationships which are meaningful in a society, and not attributes to a geographical object only.

Governments are, irrespective of the situation in the relevant country, exhibiting an increasing tendency to incorporate some form of recognition of customary land tenure in their land legislation. These measures provide for the registration of these rights to land in their existing land administration system or, in some cases, in separate 'official' registers (such as native title registers) (Neate, 1999). This would appear to be preferable to the imposition of a foreign land tenure system on a society with its own land standards and values, as is also apparent from Bruce & Migot Adholla's discussion of the *replacement paradigm* or *adaptation paradigm* (1993). However in some situations it may well be necessary to replace these rights, i.e. in the event of the collapse of customary structures as a result of:
- population pressures resulting in the implementation of personal forms of land tenure;
- the scarcity of land, thereby rendering the traditional allocation of land impossible;
- the need for credit for smallholders
- the growth in land-market initiatives
- the increasing migration of the population
- the development of conflicts between the customary groups at the periphery of their lands
- the need for the deployment of land management tools (planning & development, taxation)
- the need for effective land and water-resource management
In such situations preference is given to an inter-disciplinary approach to the formulation of land administration policy in which land surveyors, for example, co-operate closely with sociologists, anthropologists and lawyers (Fourie, 2002a). A good example is the case of Malawi (Enemark & Ahene, 2002).
Land registrars and land surveyors should work together with social scientists.

The conclusion to be drawn from this Section is that the conventional basic concepts of land administration are affected in three ways:
- the subject: group ownership with non-defined membership
- the rights: the recognition of types of non-formal and informal rights
- the object: units other than accurate and established units

7. UNCONVENTIONAL TECHNICAL APPROACHES (WITH THE HELP OF CHRISTIAAN LEMMEN)

From technical perspective the following areas are highlighted:

- System development and the related need for cadastral standards
- Data acquisition
- Data Dissemination

Until today many countries (or states or provinces) have developed their own cadastral system because there are supposed to be *huge differences* between the systems. The one operates deeds registration, the other title registration, some systems are centralized, and others decentralized. Some systems are based on a general boundaries approach, others on fixed boundaries. Some cadastres have a fiscal background, others a legal one. However, it is also obvious that the separate implementation and system's maintenance of a cadastral system is not cheap, especially if one considers the ever-changing requirements. Also, the different implementations (foundations) of the cadastral systems do not make meaningful communication very easy. Looking at it from a little distance one can observe that the systems are in principle mainly the same: they are all based on the relationships between persons and land, via (formal) rights and are in most countries influenced by developments in the Information and Communication Technology (ICT). The two main functions of every cadastral system are: 1. keeping the contents of this relationship up-to-date (based on transactions) and 2. providing information on this registration.

A *standardized core cadastral domain model,* covering land registration and cadastre in a broad sense (multipurpose cadastre), will serve at least two important goals: 1. avoid reinventing and re-implementing the same functionality over and over again, but provide an extensible basis for efficient and effective cadastral system development based on a model driven architecture, and 2. enable involved parties, both within one country and even between different countries, to communicate based on the shared ontology implied by the model. This paper regards to an improved and extended version of the existing cadastral domain model (Lemmen et al, 2003), and the introduction of a modular approach (packages). One of the main preconditions of the model development is to keep the model as transparent and simple as possible in order to be useful in practise.

A main characteristic of land tenure is that it reflects a social relationship regarding rights to land, which means that in a certain jurisdiction the relationship between people and land is recognised as a legally valid one (either formal or non-formal). These recognised rights are in principle eligible for registration, with the purpose to assign a certain legal meaning to the registered right (e.g. a title). Therefore land administration systems are not 'just handling only geographic information' as they represent a (lawfully or customary) meaningful relationship amongst people, and between people and land. As the land administration activity on the one hand deals with huge amounts of data, which moreover are of a very dynamic nature, and on the other hand requires a continuous maintenance process, the role of information technology is of strategic importance. Without availability of information systems it is believed it will be difficult to guarantee good performance with respect to meeting changing customer demands. Organisations are now increasingly confronted with rapid developments in the technology, a

technology push: internet, (geo)-databases, modelling standards, open systems, GIS, as well as a growing demand for new services, a *market pull*: e-governance, sustainable development, electronic conveyance, integration of public data and systems. Cadastral modelling is considered as a basic tool facilitating appropriate system development and re-engineering and in addition it forms the basis for meaningful communication between different (parts of the) systems.

Standardisation is a well-known subject since the establishment of cadastral systems. In both paper based systems and computerized systems standards are required to identify objects, transactions, relations between real estate objects (e.g. parcels) and persons (also called subjects in some countries), classification of land use, land value, map representations of objects, etc. etc.

The relationship between real estate objects (e.g. parcels) and persons (sometimes called 'subjects') via rights is the foundation of every land administration. Besides rights, there can also be restrictions between the real estate objects and the persons.

The variety of rights is already quite large within most jurisdictions and the exact meaning of similar rights still differs considerably between jurisdictions. Usually one can distinguish between a numbers of categories of land rights. Because property and ownership rights are based on (national) legislation, extendable 'lookup tables' can support in modelling this. E.g. (Christensen, 1999) proposes rights related to 'starter tiles', 'landhold titles' and 'freehold titles' as a 'step by step' development in Land Registration in Namibia. This can be classified in a model. 'Customary Right' related to *a region* or 'Informal Right' can be included; from modelling perspective this is not an item for discussion. For example the observation of Ősterberg (2002) that 'in customary land tenure systems land use rights are allocated based on the traditional rules, and once acquired, the rights are exercised individually within the family structure' can be modelled in the 'object', 'right' and 'subject' approach. The same is valid for forest and rangelands, which is often under common property management in customary systems. State owned and controlled land can be represented in this model. The same is valid for possession, occupation, use, usufruct, tenancy or long lease. Or: 'indigenous' rights. Of course, for the actual implementation in a given country or region, this is very important. Customary, informal and individual rights, or even a variety of tenures (Fourie, 2002a) can be integrated in one standardised system. Even *'illegal relationships'* between persons and land, e.g. in case of uncontrolled 'privatisation', see Trinidade, 2003, could be represented, as well as 'unknown', cases of 'disagreement', 'occupation' or 'conflict', resulting in overlapping claims to land. In this way a systematic registration of conflicts on lands could support to solutions.

The class 'Person' has as specialisation classes 'NaturalPerson' or 'NonNaturalPerson' (see figure below) like organisations, companies, communities, co-operations and other entities representing social structures. It should be noticed that a person can hold a *share* in a right, e.g. in case of marriage or groups of persons holding rights. Person identification is not a primary responsibility of cadastre and land registry but might be of relevance in cadastral processes. Biometric approaches are coming more and more available.

In the data model, as it is under development now (Lemmen et al, 2003), parcels are considered as objects. 'Parcels', 'PartitioningParcels' and 'ServingParcels', are not explicitly represented as 'closed polygons' in the *ideal* situation. Attributes can be linked to individual boundaries; this allows for example classification of individual boundaries based on the administrative subdivision of the territory. In this way double, triple or multiple storage of the

same boundary can be avoided, thus avoiding all kind of 'gap and overlap' problems, which don't have a meaning in reality. This means planar topology in the represented parcel objects as *an ideal* situation. An intermediate situation can be a representation of boundaries without topology, e.g. in case spatial data are being built up from different data sources (existing maps, aerial photographs, satellite images, etc. See below). In case of overlapping claims a 'closed polygon' approach is required. The overlapping polygons have to be identified, e.g. in the conventional way or using the co-ordinates of its centroids. For further approaches see (UN 2004, under printing). Single point representation must be possible in the standard model (Home & Jackson, 1997). This approach as investigates the potential for applying spatial technologies (GPS, GIS/LIS) to record progressive land rights of informal settlements at the level of community controlled land office. Note: such office could perform in a standardised environment, standardisation does not mean by defintion centralisation (but there must be a central unit responsible for the contents and extensions of standards).

The proposed UML class diagram (Lemmen & van Oosterom, 2006) for the cadastral domain contains both legal/administrative object classes like persons, rights and the geographic description of real estate objects. This means in principle that data could be maintained by different organisations, e.g. Municipality, Planning Authority, Private Surveyor, Cadastre, Conveyancor and/or Land Registry. The model will most likely be implemented as a distributed set of (geo-) information systems, each supporting the maintenance activities and the information supply of parts of the dataset represented in this model (diagram), thereby using other parts of the model. This underlines the relevance of this model; different organizations have their own responsibilities in data maintenance and supply and have to communicate on the basis of *standardized processes* in so called value adding production chains. One software supporting the development of workflows is ArcCadastre (Ollén, 2002).

The CCDOM can be distinguished in separate but comprehensive parts, representing UML 'packages': legal/administrative aspects, real estate object specializations, geometric/topological aspects.

It is likely that more packages will be developed. Besides being able to present/document the model in comprehensive parts, another advantage of using packages could be that it is possible to develop and maintain these packages in a more or less independent way. Domain experts from different countries could further develop each package. It is not the intention of the model that everything should be realized in one system. The true intention is that, if one needs the type of functionality covered by a certain package, then this package should be the foundation and thereby avoiding reinventing (re-implementing) the wheel and making meaningful communications with others possible. Furthermore basic packages could be implemented by software suppliers, e.g. GIS suppliers like ESRI, are providing models for several domains like agriculture, topographic mapping, biodiversity/conservation, defence, energy utilities, environmental regulated facilities, forestry, geology, historic preservation, hydrotropic/navigation, marine, petroleum, pipeline, system architecture, telecommunications, urban, water utilities, water resources. One domain of interest for ESRI is Cadastre 2014 (Kaufmann, Steudler, 1998). The principles op Cadastre 2014 are integrated in our approach. In the following subsections the different packages will be described in more detail.
To speed up the development of cadastral systems standardised (but extendable) data models and standardised inter-organisational work processes combined with standardised

functionality should be developed by GIS industry. A good step is the link with ISO (currentlhy under consideraton). The link to surveying processes has to be included.

At data collection side modern technology can be integrated with positioning systems. Barodien and Barry (2004) recognise that effective upgrading of informal settlements require accurate and up to date social and spatial information. Two pilot studies are presented where residents, with moderate level of literacy, volunteered as field workers to collect data. A palm top computer linked with GPS has been used and, using a Cybertracker system collected socio-economic and spatial information in an informal settlements and in a rural reform project in South Africa. Icons have been developed to represent questions or items of data to be collected. A combination of Boolean (true/false) data, numeric and textual data was collected. The GPS provided the location. Home & Jackson (1997) use a point position (collected with hand held GPS) to relate the property identifier number, land cover, crop type, soil condition, and number of structures, etc.. In San Pedro Sula (Honduras) 130,000 parcels, both urban and rural were identified. Montoya (2002) combines Digital Video, GPS and GIS as a rapid ground data capture methodology from a car. Compare the use of the Cyclomedia system in some European cities. Digital Video data and data from Cyclomedia provide spatial information on the front side of buildings. Combined with tape measurement this could result in the co-ordinates of boundary points at street level. In our opinion a further combination with GPS co-ordinates from the inner side of the street blocks could complete the map. A similar approach should be investigated in relation to LiDAR (Airborne Laser Altimetry). Those systems, operating from an aircraft or helicopter, are multi-sensor systems consisting of a reflectorless laser range system and a positioning system. A flying height of 1.000 metres is typical. The positioning system determines the position and altitude of the laser ranger. This is necessary for geo-referencing purposes. The final accuracy depend on many factors, but could be 15 centimetres (Lemmens, 2001). Combination of the results with tape measurements (street level) and GPS (inner side of the street blocks) could, in our opinion, result in cadastral maps produced in an efficient way. It should be noted that the tape instrument is easily to understand for its users and for right holders. Tape measurements could be related to buildings and other landmarks in the field and the co-ordinates can be calculated from the LiDAR results in the office. A field sketch is required.

The availability of a geodetic network can be provided by global positioning satellites such as GPS, Galileo and even from Glosnass. A positioning service can be established using Real Time Kinematics RTK-GPS for fast, accurate and cheap co-ordinates. In general a 'move' from national reference systems to WGS/UTM has to be considered. Monumentation of boundary points is not required anymore, easy reconstruction is possible. The costs of establishment of such service have to be compared with its benefits; experiences are available in many areas in Europe. In 2008 the *Galileo* system will be really available and will bring a second revolution in positioning. According to Teunissen (interviewed by den Boer and van der Meer, 2004) the GPSs problems in urban area's will be solved. Everything will be much more easy, systems will be better integrated. The double number of satellites compared to GPS results in improved efficiency and location based services will get an enormous push. This development disserves, in our opinion, much more attention in the cadastral (research) community.

Further Fugro's Omnistar system should be remembered. OmniSTAR is a wide-area differential GPS service, using *satellite* broadcast techniques. Data from many widely-spaced

Reference Stations is used in a proprietary multi-site solution to achieve sub-meter positioning over most land areas worldwide, see www.omnistar.com.

Further research may be: the relevance of field sketches (could be based on ortho photo's where people identify their properties), the use of cheap laser devices replacing tapes, the use of satellite images (see for example Trinidad, 2003), the development of quality labels related to spatial data representing the level of accuracy and providing information on how many co-ordinates are within this level of accuracy, area calculation (legal and calculated area, allowed difference), link to SDI, mapping of trees (in some area's more important then the parcels), the use of forms for collection of legal administrative data, electronic conveyancing, introduction of postal addresses.

Another important point of attention is the introduction of different versions of representations of the same objects in a spatial data-base, for allow for example an approach as:

1.   Identification of the buildings: building identifier linked with one reference co-ordinate. For apartment buildings *one reference co-ordinate* is sufficient. Individual apartments get an index to the building identifier. As soon as this products is available the ownership data can be linked
2.   Link with object address.
3.   Rough *estimation* of parcel boundaries (contours, based on the existing spatial information sets, including satellite images)
4.   Systematic *accurate definition* of its boundaries based on terrestrial observations. There could be (sporadic) cases where accurate boundary definitions are required immediately, e.g. in case of foreign investments, development of real estate projects.

Combinations of data collection methods and technologies for cadastral purposes should be further investigated

At data dissemination side it looks that a thin client approach in a 3-tier architecture with a web based seems to be the recommended approach today. Data protection and secure remote access, is of vital importance (https, firewalls, virus scanning).

8.   REDEFINING CONVENTIONAL PRINCIPLES OF LAND ADMINISTRATION

With reference to the earlier mentioned sections, we might redefine a few conventional principles.

First of all it concerns the understanding that property rights are to bee seen as a social contract, which forms the basis for legal pluralism (Benda, 1991).

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            │ norms & values│ │ norms & values│ │ norms & values│
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            │ statutory law │ │ customary law │ │ informal rules│
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            │property right 1│ │property right 2│ │property right 3│
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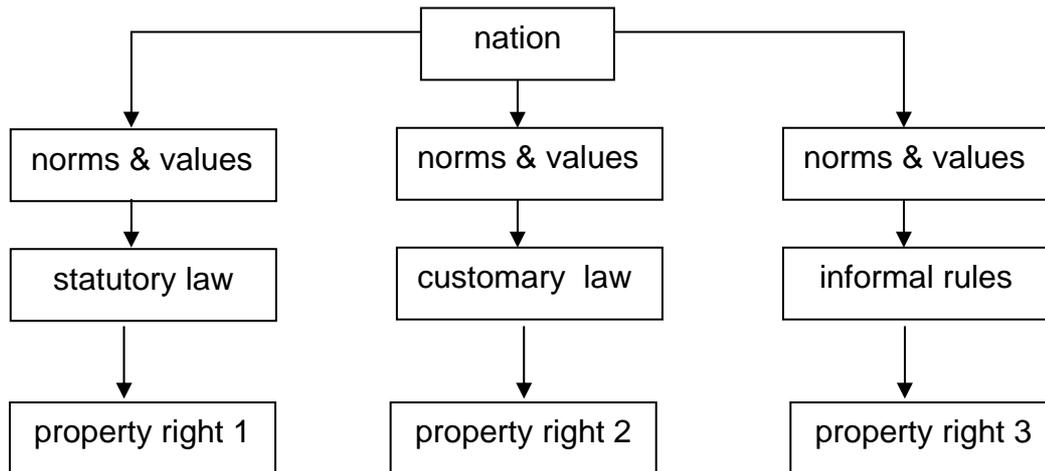
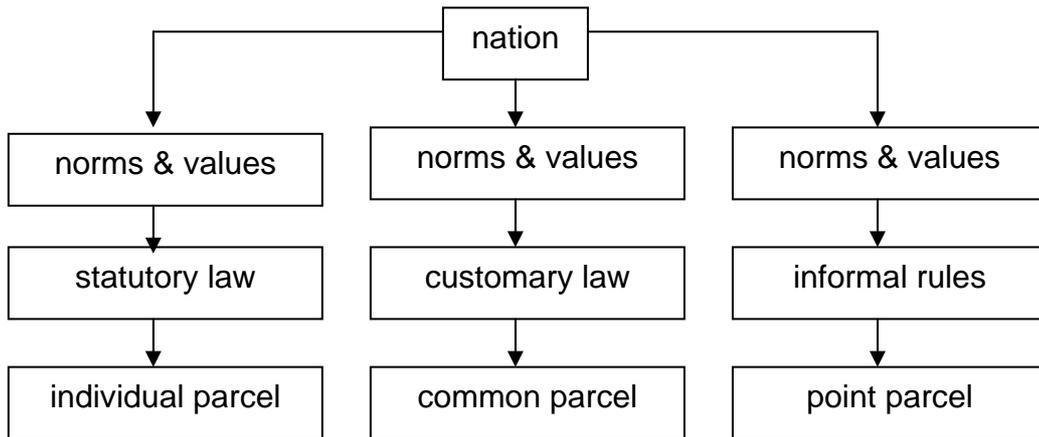This means that within a nation various property rights arrangements might be possible, based on the norms and values of different communities. Problems might occur when different regimes are overlapping, which is reported e.g. by Neate (1999). We, as land surveyors, see this as parallel to a normal land adjudication process, which is the process whereby all existing rights in a particular parcel of land are finally and authoritatively are ascertained (Lawrance, 1985), namely 'the process whereby jurisdictions to land are…. ascertained'. It appears this definition also applies to various land tenure regimes.
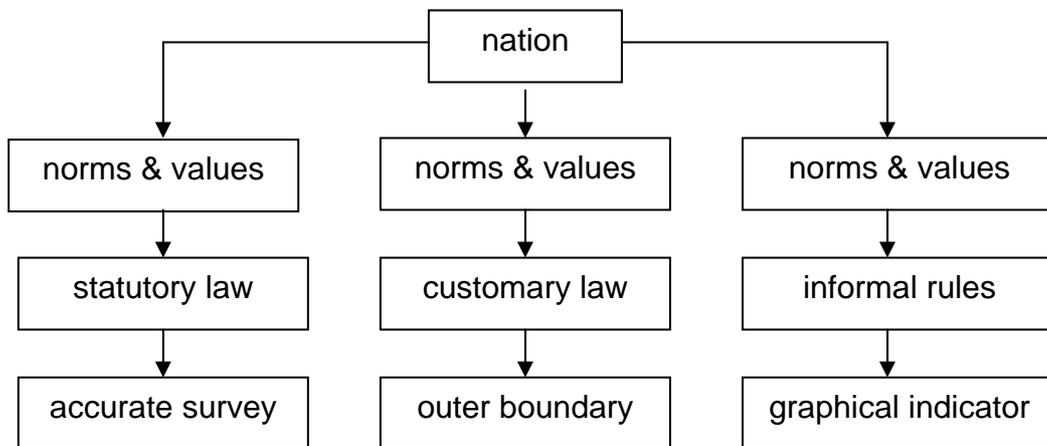The concept indicates that as soon as within social structures written or oral codification takes place about acceptance and recognition of relationships between men and land, these kind of relationships are as much valuable as -say- statutory freehold and leasehold.

The second part of this section pertains to the registration activity. The basic forms are still the deed- and title registration, although we know that there are many forms in between. Who doesn't want to have a full title to land, guaranteed by the State? This gives maximum security, at least if the government respects the rule of law. In the deed system investigations are needed to feeling secure. In these countries, notaries take over and take care of legal transfers and the validity of the legal consequences. But why start with such a title system, knowing that the authorities have to do a lot of work in order to feel sufficiently secure to issue a guaranteed title. It is up to the society or community to decide what level of land tenure security it wants, but it appears starting with a simple registration of deeds or similar documents, and then on the long run growing to title system, is not a bad idea.

Thirdly there is the aspect of the parcel as the basic form of spatial unit. Parcels are often characterised as individualised land plots, subject to individual rights to land. However, cadastral parcels are just an object of rights as they are defined within the jurisdiction mentioned earlier. Thus if in an informal settlement it is appropriate to focus on point co-ordinates only in stead of fully surveyed boundary, this is equally valid to accurate parcels. For example:

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      │ norms & values│   │ norms & values│     │ norms & values│
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      ┌───────────────┐   ┌───────────────┐     ┌───────────────┐
      │ statutory law │   │ customary law │     │ informal rules│
      └───────┬───────┘   └───────┬───────┘     └───────┬───────┘
              ▼                    ▼                     ▼
      ┌───────────────┐   ┌───────────────┐     ┌───────────────┐
      │individual parcel│ │ common parcel │     │  point parcel │
      └───────────────┘   └───────────────┘     └───────────────┘
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The fourth part of this section pertains to the cadastral boundary survey. The requirements to the accuracy of the determination of cadastral boundaries is in our view not a technical matter but basically a social question. The evidence for that can be seen in reality: for example in 3 neighbouring countries Germany, Netherlands and England, where the requirements for boundary survey in Germany are very precise, in England the graphical indication on a topographic map without prior field survey suffices, while in the Netherlands a field survey is required, but the accuracy on the map remains graphical. The matter is thus not a technical one, but a social one, in the sense that it is up to the society or community how it values accuracy. For example:

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              ┌─────────────│    nation    │─────────────┐
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              ▼                    ▼                      ▼
      ┌───────────────┐   ┌───────────────┐     ┌───────────────┐
      │ norms & values│   │ norms & values│     │ norms & values│
      └───────┬───────┘   └───────┬───────┘     └───────┬───────┘
              ▼                    ▼                     ▼
      ┌───────────────┐   ┌───────────────┐     ┌───────────────┐
      │ statutory law │   │ customary law │     │ informal rules│
      └───────┬───────┘   └───────┬───────┘     └───────┬───────┘
              ▼                    ▼                     ▼
      ┌───────────────┐   ┌───────────────┐     ┌────────────────────┐
      │ accurate survey│  │ outer boundary│     │ graphical indicator│
      └───────────────┘   └───────────────┘     └────────────────────┘
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In all these four aspects it became clear that land administration systems should be flexible and scalable to meet the evolutionary developments in society. The design should allow for evolution in stead of immediately focussing on the highest achievable individualisation and accuracy. For example:

rights to land	→ full and state guaranteed title
registers of documents/deeds	→ registers of titles
graphical parcel	→ surveyed parcel
point coordinate	→ accurate boundary survey
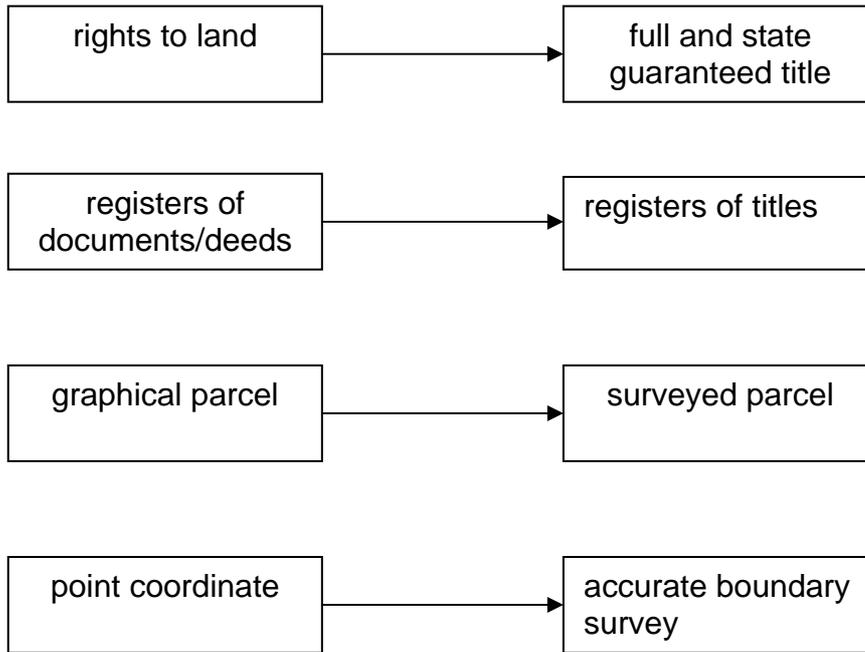
In the sixth place the decision whether to embark on a certain type of land administration system and the level of complexity and accuracy should be determined by the purpose of the system has to serve. The magnitude of the purpose justifies the level of investments.
For example:

Economic magnitude of land policy instruments
↓
Investments in land administration systems
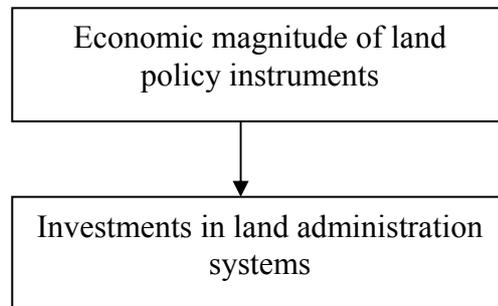
9.   CLOSING REMARKS

Land registrars and land surveyors usually consider it their professional duty to aim for the registration of full titles to land and accurately surveyed cadastral boundaries. As such nothing is wrong with that, as this provides for the maximum security of people's rights to land and boundaries. At the same time however they should understand that this attitude hampers the provision of security to people that live in countries that cannot afford the huge investments in the establishment and maintenance of such quality systems. Therefore unconventional approaches should be included in the service they offer society, in such a way

that on one hand the immediate requirements of the people are met, while on the other hand professional standards of consistency, flexibility and scalability guarantee the sustainability of the investments in land administration systems.

CAVEAT: This paper is based on earlier publications.

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