THE DIGITAL CADASTRAL MAP
FIG COMMISSION 7 OPEN SYMPOSIUM
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# The Evolving Role of Cadastral Systems in Support of Good Land Governance

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*The paper facilitates an understanding of how the cadastral concept has evolved over time into the broader concept of Land Administration Systems in support of sound Land Governance. The role of land professionals and FIG is underlined in this regard.*

## 1. INTRODUCTION

In most countries, the cadastral system is just taken for granted, and the impact of the system in terms of facilitating an efficient land market and supporting effective land-use administration is not fully recognised. The reality is that the impact of a well functioning cadastral system can hardly be overestimated. A well tailored cadastral system is in fact acting as a backbone in society.

The famous Peruvian economist Hernando de Soto has put it this way: “Civilized living in market economies is not simply due to greater prosperity but to the order that formalized property rights bring” (De Soto, 1993). The point is that the cadastral system provides security of property rights. The cadastral systems thereby paves the way for prosperity – provided that the basic land policies are implemented to govern the basic land issues, and provided that sound institutions are in place to secure good governance of all issues related to land and property. This institutional context is of course country unique.

Since the early 1990´s there has been a major evolution in this area of land administration. FIG has played a significant role in terms of facilitating the understanding of the role of land administration, and by establishing a powerful link between appropriate land administration and sustainable development.

## 2. EVOLUTION OF CADASTRAL SYSTEMS

Throughout the world, the cadastral concept has developed significantly over the past few decades. The most recent examples are current world concerns of environmental management, sustainable development and social justice.

The human kind to land relationship is dynamic and is changing over time as a response to general trends in societal development. In the same way, the role of the cadastral systems is changing over time, as the systems underpin these societal development trends. In the Western world this dynamic interaction may be described in four phases as shown in figure 1 below.

| | Feudalism - 1800 | Industrial revolution 1800-1950 | Post-war reconstruction 1950-1980 | Information revolution 1980- |
|---|---|---|---|---|
| Human kind to land evolution | Land as wealth | Land as a commodity | Land as a scarce resource | Land as a community scarce resource |
| Evolution of cadastral applications | Fiscal Cadastre Land valuation and taxation paradigm | Legal Cadastre Land market paradigm | Managerial Cadastre Land management paradigm | Multi-purpose Cadastre Sustainable development paradigm |

**Figure 1:** Evolution of Western Cadastral System (Developed from Williamson and Ting, 1999)

Over the last few decades land is increasingly seen as a community scarce resource. The role of the cadastral systems has then evolved to be serving the need for comprehensive information regarding the combination of land-use and property issues. New information technology provides the basis for this evolution. This forms the new role of the cadastral systems: the multi-purpose cadastre.

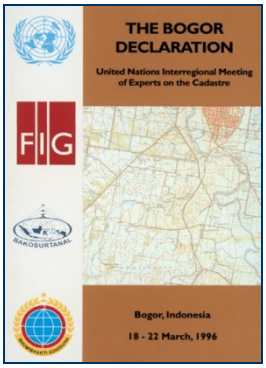
### 2.1 The FIG Agenda

The international development in the area of Cadastre and Land Administration has been remarkable with FIG taking a leading role. Throughout the last 10-15 years a number of initiatives have been taken with a focus to explain the importance of sound land administration systems as a basis for achieving “the triple bottom line” in terms of economic, social and environmental sustainability. International organizations such as UN, FAO, HABITAT and especially the World Bank have been key partners in this process.

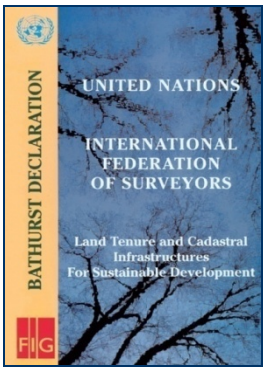
The International Federation of Surveyors (FIG, 1995) defines a cadastre as a “parcel based and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (valuation and taxation), legal purposes (conveyancing), to assist in the management of land and land-use control (planning and administration), and enables sustainable development and environmental improvement”.

A rage of publications is presented below showing the impact of the FIG agenda.

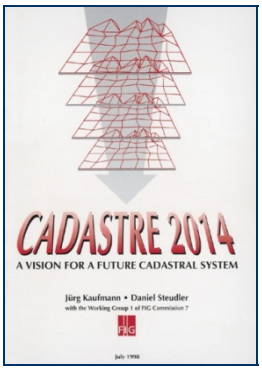

In 1995 FIG published an important and very timely publication entitled "The FIG statement on the Cadastre". In many countries throughout the world the cadastral systems were revised, mainly due to technology development. Cadastral reform was on the agenda in most developing countries. At the same time, there was also an increasing focus on the cadastral systems in Eastern Europe – the so-called countries in transition. And in the third world there was an increasing awareness about the importance of these systems as a basis for developing a modern and market oriented society. The FIG Statement on the Cadastre, this way, established a standard. The concepts were explained, settled, and made operational according to the specific conditions in different parts of the world.




The co-operation between FIG and the UN-organizations was strongly intensified through the second half of the 1990´s. The so-called Bogor Declaration is a good example as a result of an interregional meeting of cadastral experts held in Bogor, Indonesia, March 1996. The Bogor meeting was based on a recommendation from the UNRCC-AP Conference in Beijing in 1994. The meeting was also part of the efforts to develop an active response to the problems of land management and environmental protection as stipulated in Agenda 21 from "The Earth Summit" in Brazil 1992. The cadastral systems were hereby officially recognized for the first time as a core part of the infrastructure supporting a sustainable environmental and nature resource management.




The Bathurst Conference was organized by FIG Commission 7 and attracted 40 invited experts from 23 countries. Half of the participants were surveyors from FIG, the other half experts from other professions and representatives from UN organizations such as UNDP, FAO, UN-HABITAT and the World Bank. The Bathurst conference examined the major issues relevant to strengthening land policies, institutions and infrastructures. The resulting Bathurst Declaration on Land Tenure and Cadastral Infrastructures for Sustainable Development established a powerful link between good land administration and sustainable development and provided a range of recommendations on ho land tenures and land administration infrastructures should evolve to meet the challenges of upcoming 21st Century.




The cadastral systems differ throughout the world in terms of purpose, content and design and the technical and economic effectiveness vary a lot. There was a need for a vision for future cadastral systems to fulfil a multipurpose role and in response to technology development. "Cadastre 2014" presented such a vision in terms of six statements for development of cadastral systems over the following years towards 2014. The vision is based on a fully digital environment and using privatisation and cost recovery as the core organisational components. This publication of FIG Commission 7 has obtained remarkable international attention and established a new agenda for discussing the cadastral issues. The publication is translated into a range of foreign languages.

## 2.2 Cadastral Systems

In the Western cultures it would be hard to imagine a society without having property rights as a basic driver for development and economic growth. Property is not only an economic asset. Secure property rights provide a sense of identity and belonging that goes far beyond and underpins the values of democracy and human freedom. Historically, however, land rights evolved to give incentives for maintaining soil fertility, making land-related investments, and managing natural resources sustainably.

Therefore, property rights are normally managed well in modern economies. The main rights are ownership and long term leasehold. These rights are typically managed through the cadastral/land registration systems developed over centuries. Other rights such as easements and mortgage are often included in the registration systems.

Cadastral Systems are organized in different ways throughout the world, especially with regard to the Land Registration component (Figure 2). Basically, two types of systems can be identified: the Deeds System and the Title System. The differences between the two concepts relate to the cultural development and judicial setting of the country. The key difference is found in whether only the transaction is recorded (the Deeds System) or the title itself is recorded and secured (the Title System). The Deeds System is basically a register of owners focusing on "who owns what" while the Title System is a register of properties presenting "what is owned by whom". The cultural and judicial aspects relate to whether a country is based on Roman law (Deeds Systems) or Germanic or common-Anglo law (Title Systems). This of course also relates to the history of colonization.

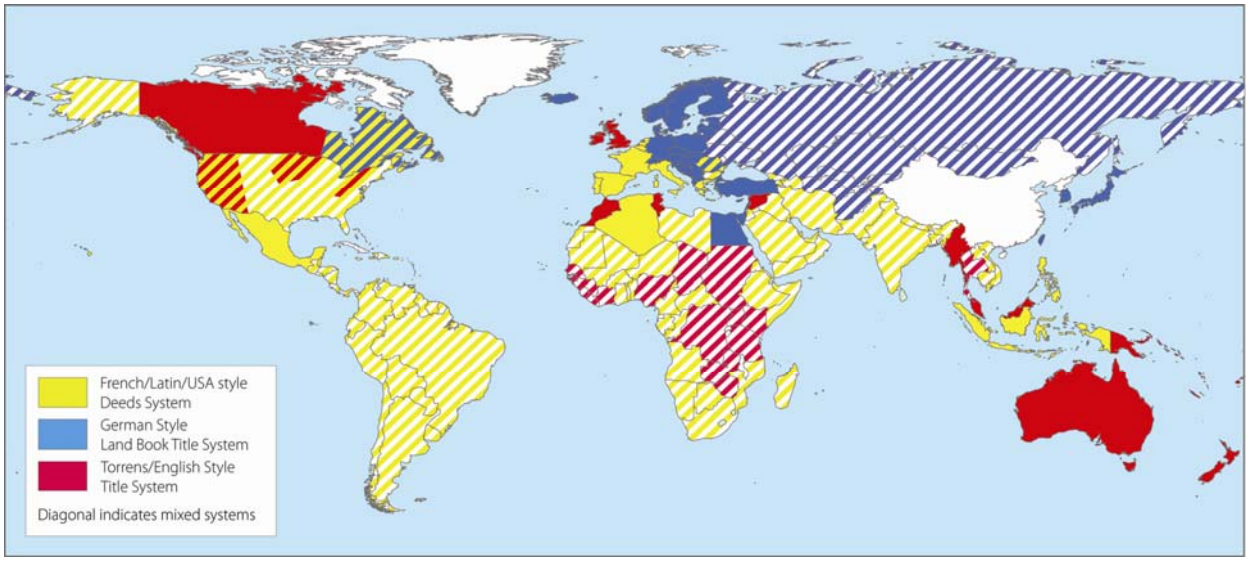



**Figure 2.** World map of land registration systems (after Enemark 2004)

International experience suggests three basic approaches to cadastral systems. These approaches are based on countries grouped according to their similar background and legal contexts

(German style, Torrens/English approach, and French/Latin style). While each system has its own unique characteristics, most cadastres can be grouped under one of these three approaches. Just as there are three different styles of land registration systems, these translate to three different roles that the cadastre plays in each system. Again, while the role of the cadastre and the land registration styles are not definitive, figure 3 describes the three approaches in general terms.

| STYLE OF SYSTEM | LAND REGISTRATION | CADASTRE |
|---|---|---|
| **French/Latin/U.S. style** | Deeds system<br>Registration of the transaction<br>Titles are not guaranteed<br>Notaries, registrars, lawyers, and insurance companies (U.S.) hold central positions<br>Ministry of justice<br>Interest in the deed is described in a description of metes and bounds and sometimes a sketch, which is not necessarily the same as in the cadastre | Land taxation purposes<br>Spatial reference or map is used for taxation purposes only. It does not necessarily involve surveyors.<br>Cadastral registration is (normally) a follow-up process after land registration (if at all)<br>Ministry of finance or a tax authority |
| **German style** | Title system<br>Land book maintained at local district courts<br>Titles based on the cadastral identification<br>Registered titles guaranteed by the state<br>Neither boundaries nor areas guaranteed | Land and property identification<br>Fixed boundaries determined by cadastral surveys carried out by licensed surveyors or government officers<br>Cadastral registration is prior to land registration.<br>Ministry of environment or similar |
| **Torrens/English style** | Title system<br>Land records maintained at the land registration office<br>Registered titles usually guaranteed as to ownership<br>Neither boundaries nor areas guaranteed | Property identification is an annex to the title<br>• Fixed boundaries determined by cadastral surveys carried out by licensed surveyors (Torrens)<br>• English system uses general boundaries identified in large-scale topographic maps<br>Cadastral registration integrated in the land registration process |

**Figure 3.** General relationships between land registries and cadastres.
(Williamson, Enemark, Wallace, Rajabifard, 2010)

## 2.3 The Multipurpose Cadastre

Modern land administration theory acknowledges the history of the cadastre as a central tool of government infrastructure and highlights its central role in implementing the land management paradigm. However, given the difficulty of finding a definition that suits every version it makes sense to talk about cadastral systems rather than just cadastres (Figure 4). These systems incorporate both the identification of land parcels and the registration of land rights. They

support the valuation and taxation of land and property, as well as the administration of present and possible future uses of land. Multipurpose cadastral systems support the four functions of land tenure, value, use, and development to deliver sustainable development.

By around 2000, cadastral systems were seen as a multipurpose engine of government operating best when they served and integrated administrative functions in land tenure, value, use, and development and focused on delivering sustainable land management. A mature multipurpose cadastral system could even be considered a land administration system in itself.

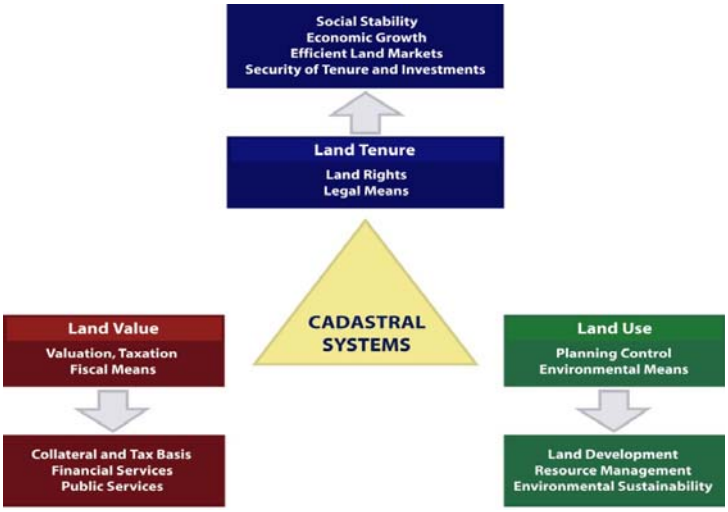



**Figure 4:** Cadastral systems provide a basic land information infrastructure for running the interrelated systems within the areas of Land Tenure, Land Value, and Land Use (Enemark, 2004).

## 2.4 Digital Cadastral Systems

The 1990s saw the move towards building Digital Cadastral Data Bases (DCDB) using the enabling digital technologies. Converting existing analogue registers to a digital format was relatively easy while converting or building the graphical component (the digital cadastral map) turned out to be a much more complex process.

This again relates to the diversity of cadastral systems throughout the world. In the French/Latin/US style approach the conversion to a digital format aimed at making the land taxation process more efficient and in the more advanced systems, such as in the Netherlands, making the cadastral graphics a key component in the process of land management.

In the German style cadastral systems the conversion to a digital format was more controversial depending on whether the old analogue cadastral maps were linked to the national grid or produced as island maps using plain table measurement. Cadastral maps linked to the national grid are relatively easy to digitize while systems based on “island maps” produced by plain table surveys and with no general connection to the national grid, are more difficult to convert into a digital format.

In Denmark, for example, the cadastre was established in 1844 for collecting land taxes from the agriculture holdings based on the quality of the soil. The resulting property framework from the enclosure movement formed the basis for the new cadastral maps established in the early 1800s. These maps were surveyed by plane table at a scale of 1:4,000. Each map normally includes a village area and the surrounding cultivated areas. As a result, the maps were "island maps" and not based on any local or national grid (Figure 5). These old analog maps have been maintained over time with subdivisions and cadastral alterations.

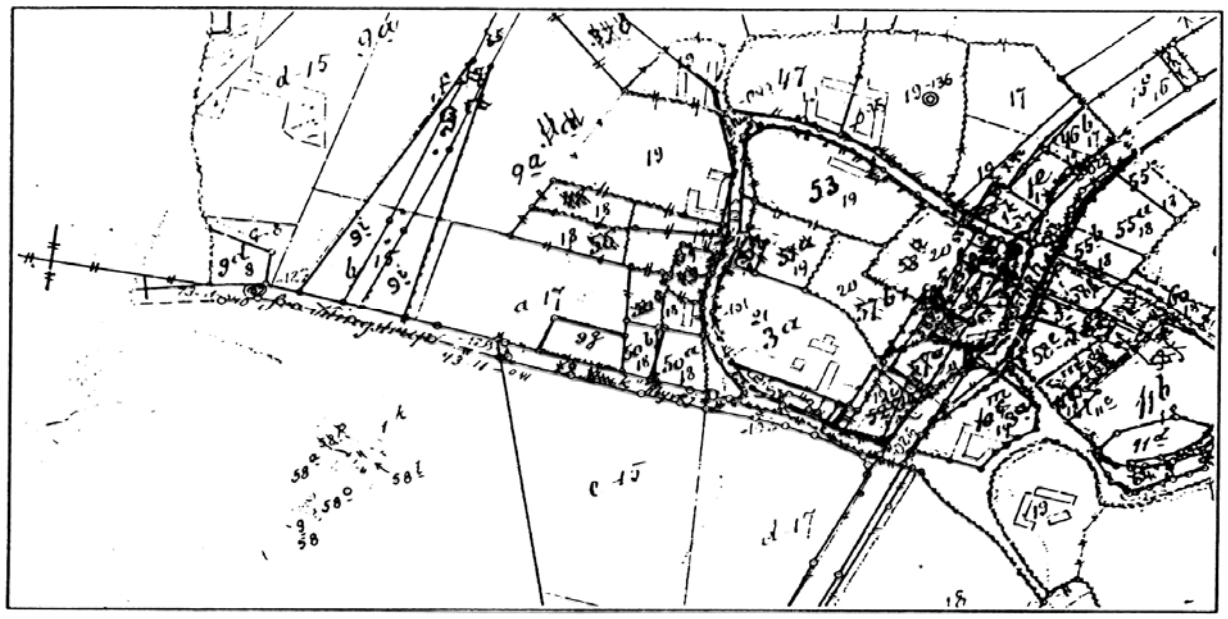


**Figure 5.** Part of an analogue cadastral map from 1983 as used, rectified, and updated over a period of about 100 years. The map is an "island map" and is not linked to a national grid. The display is difficult to interpret, and even though the map was redrawn in 1984, it is not efficient for daily land management. (Courtesy of the National Survey and Cadastre, Denmark).

The process of digitizing analogue maps was undertaken in two stages. First, state control points and cadastral surveys connected to the national grid were entered into the map to form a "skeleton" cadastral map. In urban areas, about 40 percent of the boundary points were entered this way and in rural areas about 20 percent. Second, the remaining parcels were inserted by digitizing the analog map and fitting these into the skeleton map by transformation. Identified elements in the digital topographic map were also used to support the transformation. Using this process, the accuracy of the boundary points in the resulting digital cadastral vary considerably, ranging from a few centimeters in some urban areas to several meters in rural areas. Therefore, the digital cadastral map will not be totally consistent with a digital topographic map.

The accuracy of the boundary points relates to the way they are established in the map. This information is therefore attached to the boundary point in the database. Other metadata includes information about the type of boundary and the file number from the cadastral archive of the National Survey and Cadastre of Denmark.

In the analogue cadastral maps, new boundaries were adjusted graphically to the position of existing boundaries. This process is reversed in the digital map, where new cadastral measurements are used for adjusting the position of existing boundaries. This dynamic process will ensure an ongoing improvement of the accuracy of the Digital Cadastre Data Base (DCDB).

The DCDB may also be improved by upgrading certain areas — e.g., in relation to major land development projects. This process includes a new transformation of the existing boundary points based on identification and positioning of a range of boundary points within the area. The DCDB includes a number of problems deriving from the history of the old analog map and the process of computerization. Successful use of the DCDB depends on the degree of educated use of the map. But, in summary, Denmark's establishment of a DCDB has provided the opportunity to combine the cadastral identification of land parcels with the topographic information of natural features to support efficient management of land RRRs in a sustainable way.

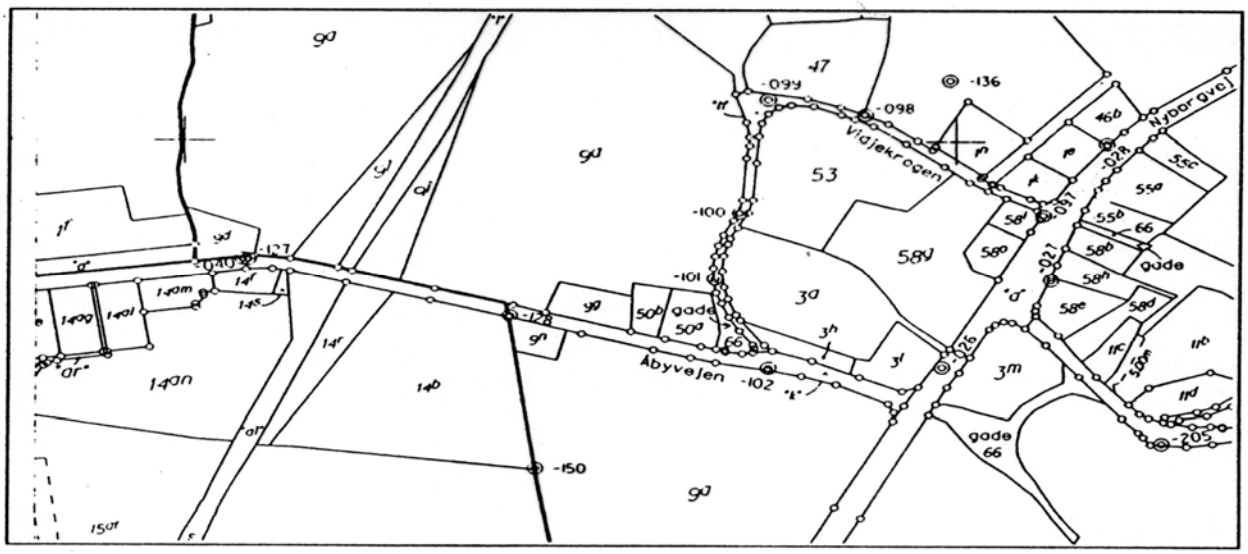



**Figure 6.** The digital cadastral map from 1993 shows the same area as figure 5, but the map is now linked to the national grid as a "frame map" showing only the current cadastral situation. The boundary points, shown by circles, are established in the map using control points and cadastral measurements. The digital cadastral map is thus tailored for integrated land management (Courtesy of the National Survey and Cadastre, Denmark).

On the other hand, the Torrens/English style cadastral systems were based on boundary surveys or topographic boundary identification (UK) and were not constraint by a cadastral map carrying some legal significance. Analogue cadastral maps mainly served as index maps for identifying land ownership. The development of digital cadastral maps was then based on the boundary surveys for the individual land parcels and put together to form a best possible seamless cadastral map linked to the national grid. DCDB is then improved over time. In conclusion, it looks that no matter to origin of the analogue cadastral maps the end result of the digitizing process seems to serve to same purpose. This does not relate to the cadastral process but to the ability of combining the cadastral boundary graphics with other relevant topographic or property information to form an integrated source of land information – a spatial information infrastructure – serving as a basis for holistic and sustainable land management.

## 2.4 Comparing and Improving Cadastral Systems

A website has been established http://www.cadastraltemplate.org to compare cadastral systems on a worldwide basis. About 42 countries are currently included (August 2010) and the number is still increasing. The web site is established by Working Group 3 (Cadastre) of the PCGI-AP (Permanent Committee on GIS Infrastructure for Asia and the Pacific). The cadastral template is basically a standard form to be completed by cadastral organizations presenting their national cadastral system. The aim is to understand the role that a cadastre plays in a state or a National Spatial Data Infrastructure (NSDI), and to compare best practice as a basis for improving cadastres as a key component of NSDIs. The project is carried out in collaboration with FIG Commission 7 (Cadastre and Land Management), which has extensive experience in comparative cadastral studies. (Steudler, et.al. 2004).

It is generally accepted, however, that a good property system is a system where people in general can participate in the land market having a widespread ownership where everybody can make transactions and have access to registration. The infrastructure supporting transactions must be simple, fast, cheap, reliable, and free of corruption.. It is estimated that only 25-30 countries in the world apply to these criteria.

## 2.5 Limitations of formal cadastral systems

It is recognized that these legal or formal systems do not serve the millions of people whose tenures are predominantly social rather than legal. “Rights such as freehold and registered leasehold, and the conventional cadastral and land registration systems, and the way they are presently structured, cannot supply security of tenure to the vast majority of the low income groups and/or deal quickly enough with the scale of urban problems. Innovative approaches need to be developed” (UN- HABITAT 2003). This should include a “scaling up approach” that include a range of steps from informal to more formalised land rights. This process does not mean that the all societies will necessarily develop into freehold tenure systems. Figure 7 shows a continuum of land rights where each step in the process can be formalised, with registered freeholds offering a stronger protection, than at earlier stages.

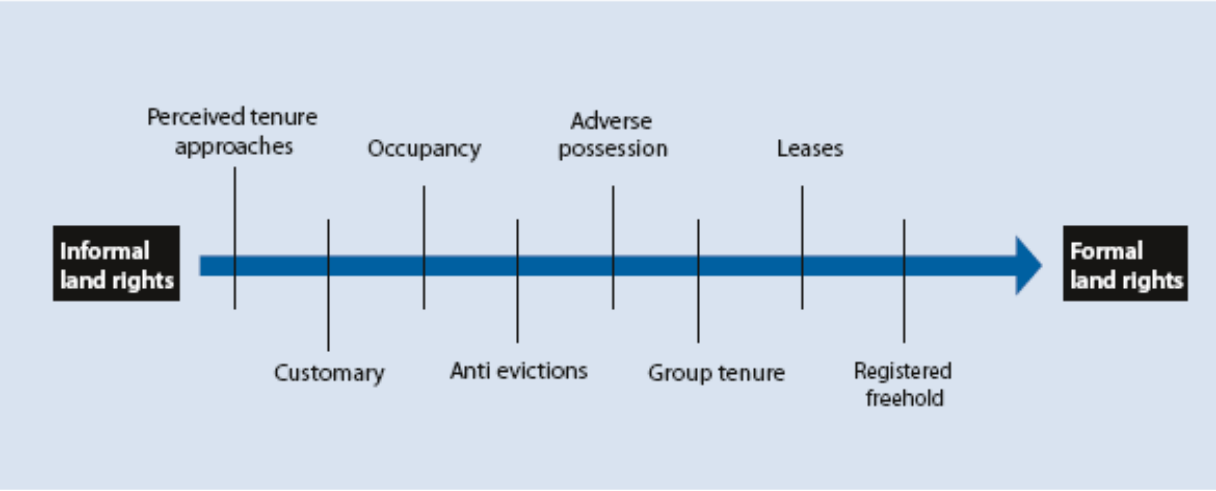


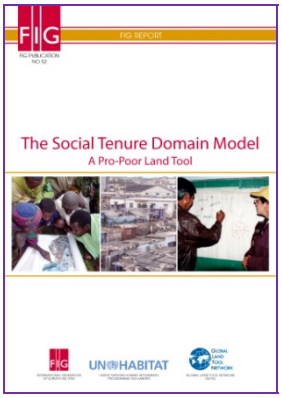

Figure 7. Continuum of land rights (UN-Habitat, 2008).

Most developing countries have less than 30 percent cadastral coverage. This means that over 70 percent of the land in many countries is generally outside the land register. This has caused enormous problems for example in cities, where over one billion people live in slums without proper water, sanitation, community facilities, security of tenure or quality of life. This has also caused problems for countries with regard to food security and rural land management issues.

The security of tenure of people in these areas relies on forms of tenure different from individual freehold. Most off register rights and claims are based on social tenures. The Global Land Tool Network (GLTN), facilitated by UN-HABITAT is a coalition of international partners (such as FIG) who has taken up this challenge and is supporting the development of pro-poor land management tools, to address the technical gaps associated with unregistered land, the upgrading of slums, and urban and rural land management. GLTN partners support a continuum of land rights (Figure 7), which include rights that are documented as well as undocumented, from individuals and groups, from pastoralist, and in slums which are legal as well as illegal and informal.

This range of rights generally cannot be described relative to a parcel, and therefore new forms of spatial units are needed. A model has been developed to accommodate these social tenures, termed the Social Tenure Domain Model (STDM). A first prototype of STDM is available. This is a pro-poor land information management system that can be used to support the land administration of the poor in urban and rural areas, which can also be linked to the cadastral system in order that all information can be integrated.

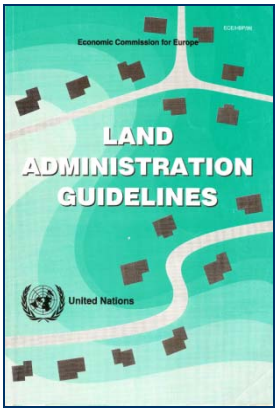
The need for a complete coverage of all land by Land Administration Systems is urgent. Not only for the registration of formal rights and for the recordation of informal and customary rights. Also for managing the value, the use of land and land development plans. This relates to the global land administration perspective presented in Figure 8 below. Complete coverage of all land in a Land Administration System is only possible with an extendable and flexible model such as STDM that enables inclusion of all land and all people within the four land administration functions. So STDM will close part of the technical gap in developing countries in terms of making Land Administration cover the total territory.




The FIG Working Group 7.1 of Commission 7 on Cadastre and Land Management, took the lead from 2002 onwards, in the development of the STDM in close co-operation with UN-HABITAT. ITC, financially supported by the GLTN, developed a first prototype of STDM, that is supported by the World Bank. The FIG Publication 52 presents the need for STDM, the properties of STDM as a tool, and the benefit and use of STDM as a key means of meeting the Millennium Development Goals (MDGs). Land tenure types, which are not based on formal cadastral parcels and which are not registered, require new forms of land administration systems. STDM is a pro-poor land tool aiming to include informal land rights into flexible, unconventional systems of land administration that eventually can be incorporated into more formal systems.

## 3. LAND ADMINISTRATION SYSTEMS

When countries in Eastern and Central Europe changed from command economies to market economies in the early 1990s, the UN Economic Commission for Europe (UNECE) saw the need to establish the Meeting of Officials on Land Administration (MOLA). In 1996, MOLA produced Land Administration Guidelines (UN-ECE 1996) as one of its many initiatives. In 1999, MOLA became the UN-ECE Working Party on Land Administration (WPLA).




The UN-ECE Guidelines on Land Administration was sensitive to there being too many strongly hold views in Europe of what constituted a cadastre. Another term was needed to describe these land-related activities. It was recognized that any initiatives that primarily focused on improving the operation of land markets had to take a broader perspective to include planning or land use as well as land tax and valuation issues. As a result, the publication replaced "cadastre" with the term "land administration". Widening the concept of a cadastre to include land administration reflected its variety of uses throughout the world and established a globally inclusive framework for the discipline. An updated version of the guidelines was published in 2005: "Land administration in the UNECE region: Development trends and main principles".

For the first time, efforts to reform developing countries, to assist countries in economic transition from a command to a market-driven economy, and to help developed countries improve LAS could all be approached from a single disciplinary standpoint, at least in theory. That is, to manage land and resources "from a broad perspective rather than to deal with the tenure, value, and use of land in isolation" (Dale and McLaughlin 1999, preface).

Consolidation of land administration as a discipline in the 1990s reflected the introduction of computers and their capacity to reorganize land information. UN-ECE viewed land administration as referring to "*the processes of determining, recording, and disseminating information about the ownership, value, and use of land, when implementing land management policies*" (UN-ECE 1996) The emphasis on information management served to focus land administration systems on information for policy makers, reflecting the computerization of land administration agencies after the 1970s.

### 3.1 A global land management perspective

The focus on information remains but the need to address land management issues systematically pushes the design of land administration systems (LAS) toward an enabling infrastructure for implementing land policies and land management strategies in support of sustainable development. In simple terms, the information approach needs to be replaced by a model capable of assisting design of new or reorganized land administration systems to perform the broader and integrated functions now required. Such a global perspective is presented in figure 7 below.

Land management covers all activities associated with the management of land and natural resources that are required to fulfill political and social objectives and achieve sustainable development. The operational component of the concept is the range of land administration

functions that include the areas of land tenure (securing and transferring rights in land and natural resources); land value (valuation and taxation of land and properties); land use (planning and control of the use of land and natural resources); and land development (implementing utilities, infrastructure, construction planning, and schemes for renewal and change of existing land use).

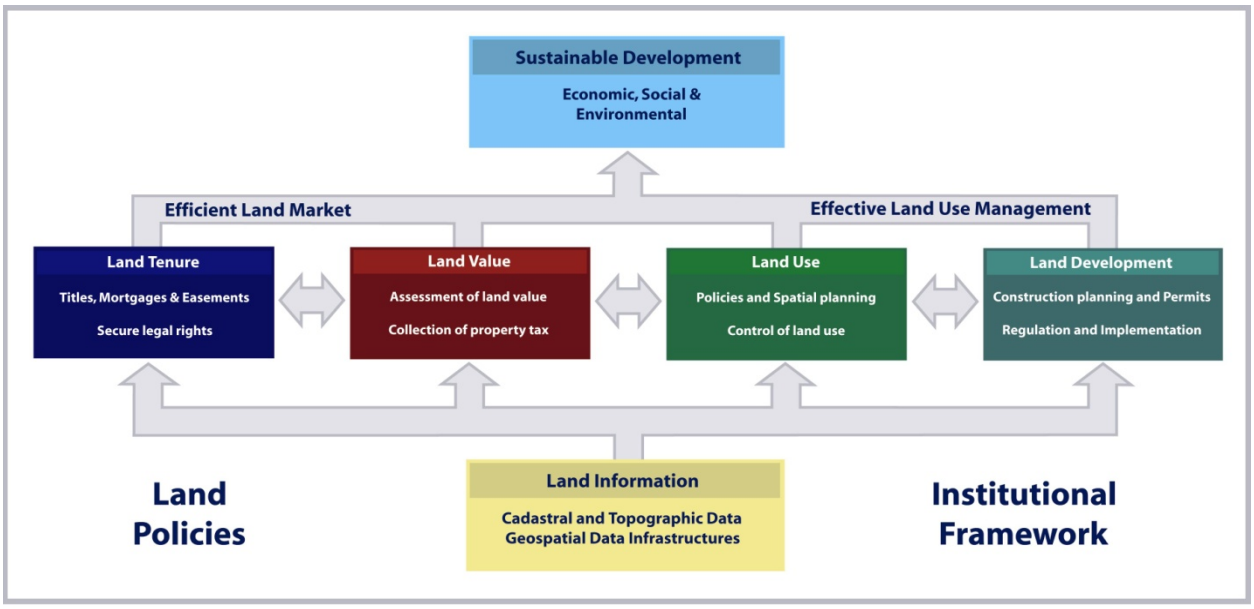
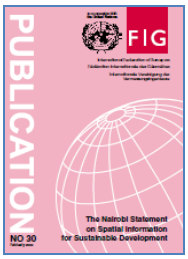


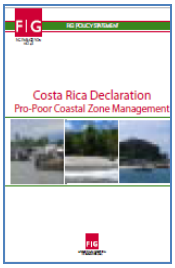

**Figure 8**. A Global land management perspective (Enemark, 2004)

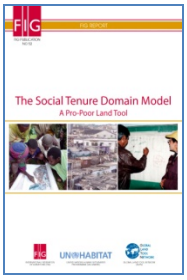
From this global perspective, land administration systems act within adopted land policies that define the legal regulatory pattern for dealing with land issues. They also act within an institutional framework that imposes mandates and responsibilities on the various agencies and organisations. LAS designed this way forms a backbone for society and is essential for good governance because it delivers detailed information and reliable administration of land from the basic foundational level of individual land parcels to the national level of policy implementation.

### 3.2 The FIG Agenda

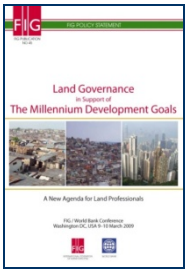
FIG is strongly committed to the Millennium Development Goals and the UN-Habitat agenda on the Global Land Tool Network. FIG should identify their role in this process and spell out the areas where the global surveying profession can make a significant contribution. Issues such as tenure security, pro-poor land management, and good governance in land administration are all key issues to be advocated in the process of reaching the goals. Measures such as capacity assessment, institutional development and human resource development are all key tools in this regard. In pursuing this agenda FIG is working closely with the UN agencies and the World Bank in merging our efforts of contributing to the implementation of the MDGs. This provides a platform for focusing on specific issues of mutual interest such as taking the land administration agenda forward.. At the same time it will contribute further to the well founded cooperation between FIG and our UN partners.In recent years FIG has established a number of relevant initiatives. A rage of publications is presented below showing the impact of the FIG agenda.






Following the Bathurst Declaration in 1999 a number of FIG initiatives looked at addressing the goal of the global agenda namely sustainable development. FIG published a policy statement in 2001 on FIG Agenda 21 (FUG publ. 23) and a report with guidelines on Women´s access to land with some key principles for equitable gender inclusion in land administration (FIG publ. 24).

Sustainable development was also in focus in the Nairobi Statement on Spatial Information (FUG publ. 30) and the following best practice guidelines on city-wide land information management (FIG publ. 31) both published as an outcome of 1st FIG regional conference in Nairobi 2002.

The concept of organising regional conferences has proven to be strong by bringing FIG to various regions in the world especially developing countries and providing a unique opportunity to address issues at the top of the regional and local agenda. The resulting FIG publications include: The Marrakech Declaration on Urban-Rural Development for Sustainable Development (FIG publ. 33, 2004); The Costa Rica Declaration on pro-Poor Coastal Zone Management (FIG publ. 43, 2008); and the Hanoi Declaration on Land Acquisition in Emerging Economies (FIG publ. 51, 2010).

A pro-poor approach to land administration and management has been addressing through the report on Informal Settlements – The Road towards more Sustainable Places (FIG publ. 42, 2008) and the comprehensive report on Improving Slum Conditions through Innovative Financing (FIG publ. 44, 2008) produced as an outcome of the joint FIG/UN-Habitat seminar during the FIG Working Week in Stockholm, June 2008. The pro-poor approach has been further addressed through development of the Social Tenure Domain Model (FIG publ. 52, 2010) in cooperation with GLTN, UN-Habitat,

The big challenges on the global agenda such as climate change, natural disasters, and rapid urban growth have been addressed in The Contribution of the Surveying Profession to Disaster Risk Management (FIG publ. 38, 2006) and the research study on Rapid urbanisation and Mega Cities: The Need for Spatial Information management (FIG publ. 48, 2010).

The overall challenge of Good Land Governance in support of the global agenda has been analysed in cooperation with the UN-agencies and the World Bank. Key outcomes have been the Aguascalientes Statement on Development of Land Information Policies in the Americas (FIG publ. 34, 2005) and the very recent key publication on Land Governance in Support of the Millennium Development Goals (FIG publ. 45, 2010) resulting from the joint FIG/World Bank conference held in Washington, March 2009. Based on this conference the World Bank has also published a joint WB/FIG/GLTN/FAO publication "Innovations in Land Rights Recognition, Administration and Governance".

## 4. LAND GOVERNANCE

All countries have to deal with the management of land. They have to deal with the four functions of land tenure, land value, land use, and land development in some way or another. A country's capacity may be advanced and combine all the activities in one conceptual framework supported by sophisticated ICT models. More likely, however, capacity will involve very fragmented and basically analogue approaches. Different countries will also put varying emphasis on each of the four functions, depending on their cultural basis and level of economic development.

Arguably sound land governance is the key to achieve sustainable development and to support the global agenda set by adoption of the Millennium Development Goals (MDGs). Land governance is about the policies, processes and institutions by which land, property and natural resources are managed. Land governance covers all activities associated with the management of land and natural resources that are required to fulfill political and social objectives and achieve sustainable development. This includes decisions on access to land, land rights, land use, and land development.

### 4.1 The Land management Paradigm

The cornerstone of modern land administration theory is the land management paradigm in which land tenure, value, use and development are considered holistically as essential and omnipresent functions performed by organised societies. Within this paradigm, each country delivers its land policy goals by using a variety of techniques and tools to manage its land and resources. What is defined as land administration within these management techniques and tools is specific to each jurisdiction, but the core ingredients, cadastres or parcel maps and registration systems, remain foundational. These ingredients are the focus of modern land administration, but they are recognised as only part of a society's land management arrangements. The land management paradigm is illustrated in figure 9 below.

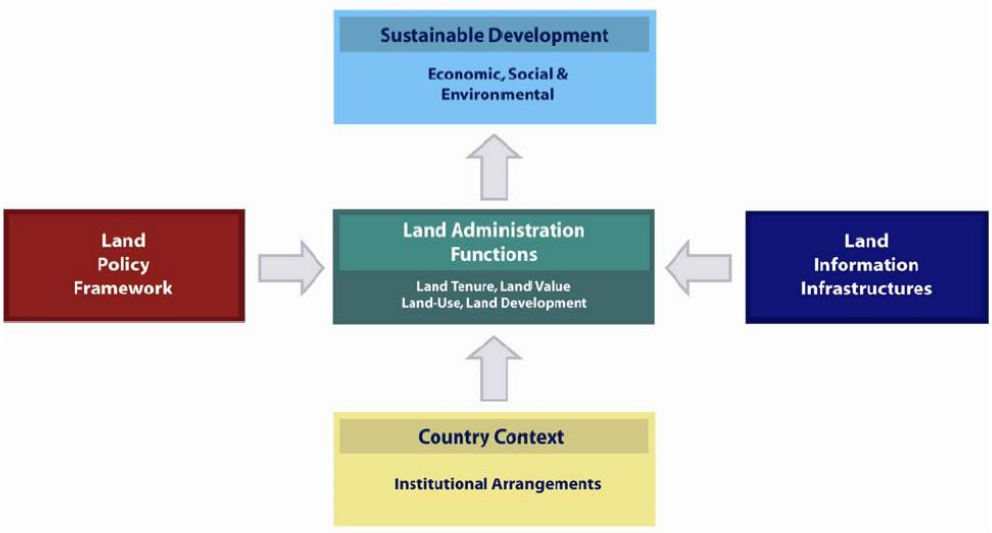



**Figure 9.** The land management paradigm (Enemark, 2004)

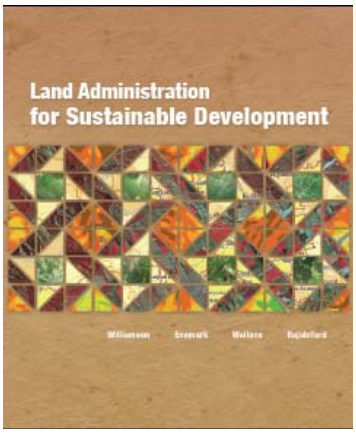
The Land management paradigm allows everyone to understand the role of the land administration functions (land tenure, land value, land use, and land development) and how land administration institutions relate to the historical circumstances of a country and its policy decisions. Importantly, the paradigm provides a framework to facilitate the processes of integrating new needs into traditionally organised systems without disturbing the fundamental security these systems provide. While sustainability goals are fairly loose, the paradigm insists that all the core land administration functions are considered holistically, and not as separate, stand-alone, exercises.

Land policy is simply the set of aims and objectives set by governments for dealing with land issues. Land policy is part of the national policy on promoting objectives such as economic development, social justice and equity, and political stability. Land policies vary, but in most countries they include poverty reduction, sustainable agriculture, sustainable settlement, economic development, and equity among various groups within the society.

Land management activities reflect drivers of globalization and technology. These stimulate the establishment of multifunctional information systems, incorporating diverse land rights, land use regulations, and other useful data. A third driver, sustainable development, stimulates demands for comprehensive information about environmental, social, economic, and governance conditions in combination with other land related data.

The operational component of the land management paradigm is the range of land administration functions (land tenure, value, use and development) that ensure proper management of rights, restrictions, responsibilities and risks in relation to property, land and natural resources.

Sound land management requires operational processes to implement land policies in comprehensive and sustainable ways. Many countries, however, tend to separate land tenure rights from land use opportunities, undermining their capacity to link planning and land use controls with land values and the operation of the land market. These problems are often compounded by poor administrative and management procedures that fail to deliver required services. Investment in new technology will only go a small way towards solving a much deeper problem: the failure to treat land and its resources as a coherent whole.




The recent book Land Administration for Sustainable Development (Williamson, Enemark, Wallace, Rajabifard, 2010) explores the capacity of the systems that administer the way people relate to land. A land administration system provides a country with the infrastructure to implement land policies and land management strategies. From the origin of the cadastre in organising land rights to the increasing importance of spatially enabled government in an ever changing world, the book emphasises the need for strong geographic and land information systems to better serve our world.

## 5. THE CADASTRE AS AN ENGINE OF LAS

The land management paradigm makes a national cadastre the engine of the entire LAS, underpinning the country's capacity to deliver sustainable development. This is shown diagrammatically in figure 10. The diagram highlights the usefulness of the large scale cadastral map as a tool by exposing its power as the representation of the human scale of land use and how people are connected to their land.

Wherever the cadastre sits in a national land administration system, ideally it should assist the functions of land tenure, value, use, and development. This way the cadastral system becomes the core technical engine delivering the capacity to control and manage land through the four land administration functions. They support business processes of tenure and value, depending on how the cadastre is locally built. They identify legal rights, where they are, the units that form the commodities, and the economy related to property. These cadastres are much more than a layer of information in national SDI.

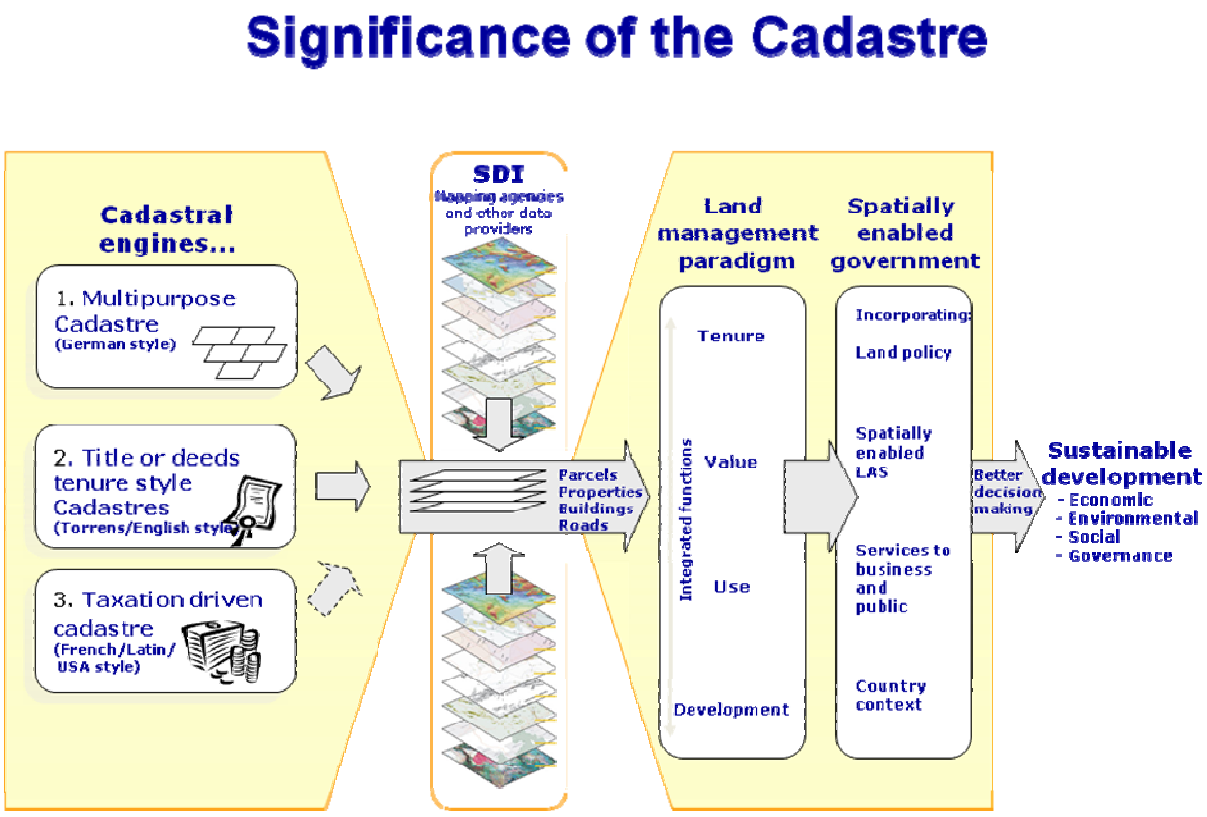



**Figure 10.** The cadastre as an engine of LAS - the "butterfly" diagram (Williamson, Enemark, Wallace, Rajabifard, 2010)

The diagram is a virtual butterfly: one wing represents the cadastral processes, and the other the outcome of using the processes to implement the land management paradigm. Once the cadastral data (cadastral or legal parcels, properties, parcel identifiers, buildings, legal roads, etc) are integrated within the SDI, the full multipurpose benefit of the LAS, so essential for sustainability, can be achieved.

The body of the butterfly is the SDI, with the core cadastral information sets acting as the connecting mechanism. This additional feature of cadastral information is an additional role, adding to the traditional multipurpose of servicing the four functions. This new purpose takes the importance of cadastral information beyond the land administration framework by enlarging its capacity to service other essential functions of government, including emergency management, economic management, effective administration, community services, and many more functions.

The diagram demonstrates that the cadastral information layer cannot be replaced by a different spatial information layer derived from geographic information systems (GIS). The unique cadastral capacity is to identify a parcel of land both on the ground and in the system in terms that all stakeholders can relate to, typically an address plus a systematically generated identifier (given addresses are often duplicated or are otherwise imprecise). The core cadastral information of parcels, properties and buildings, and in many cases legal roads, thus becomes the core of SDI information, feeding into utility infrastructure, hydrological, vegetation, topographical, images, and dozens of other datasets.

## 6. FINAL REMARKS

Arguably sound land governance is the key to achieve sustainable development and to support the global agenda set by adoption of the Millennium Development Goals (MDGs). Land governance is about the policies, processes and institutions by which land, property and natural resources are managed. Land governance covers all activities associated with the management of land and natural resources that are required to fulfill political and social objectives and achieve sustainable development. This includes decisions on access to land, land rights, land use, and land development.

Digital Cadastral Systems underpin efficient management of the four key functions within the land management paradigm. And the large scale digital cadastral map is a key tool in providing the representation of the human scale of land use and how people are connected to their land. The role of cadastral systems has evolved over time from primarily serving as a basis for land taxation and/or security of land tenure towards being the key driver for achieving good governance of land and natural resources in support of national policies and the global agenda.

The key challenges of the new millennium are clearly listed already. They relate to climate change; food shortage; urban growth; environmental degradation; and natural disasters. These issues all relate to governance and management of land. The challenges of food shortage, environmental degradation and natural disasters are to a large extent caused by the overarching challenge of climate change, while the rapid urbanisation is a general trend that in itself has a significant impact on climate change.

Measures for adaptation to climate change must be integrated into strategies for poverty reduction to ensure sustainable development and for meeting the MDGs. Adaptation to and mitigation of climate change, by their very nature, challenge governments and professionals in the fields of land use, land management, land reform, land tenure and land administration to incorporate climate change issues into their land policies, land policy instruments and facilitating land tools. It is argued that adaptation to climate change can be achieved to a large extent through building sustainable and spatially enabled land administration systems.

Over the last decades the role of FIG and the global surveying community has taking a leading role in driving this evolution. FIG is an UN recognised NGO representing the surveying profession in about 100 countries throughout the world. FIG has adopted an overall theme for the current period of office (2007-2010) entitled "Building the Capacity". This theme applies to the need for capacity building in developing countries to meet the challenges of fighting poverty and developing a basis for a sustainable future, and, at the same time, capacity is needed in developed countries to meet the challenges of the future in terms of institutional and organisational development in the areas of surveying and land administration.

In general FIG strives to enhance the global standing of the profession through both education and practice, increase political relations both at national and international level, help eradicating poverty, promote democratisation, and facilitate economic, social and environmental sustainability. FIG, this way, intends to play a strong role in improving the capacity to design, build and manage surveying and land management systems that incorporate sustainable land policies and efficient spatial data infrastructures. These systems should also respond to the global agenda in terms of the Millennium Development Goals and the new key challenges in terms of climate change, natural disasters, and urban growth. FIG is building the capacity for taking the land policy agenda forward in a partnership with the UN agencies and the World Bank; see e.g WB/GLTN/FIG/FAO (2010): Innovations in Land Rights Recognition, Administration and Governance".

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