

From Cadastre to 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

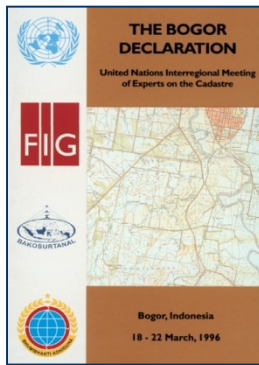
The international development in the area of Cadastre and Land Administration has been remarkable with FIG taking a leading role. Throughout the last 10-15 years a number of initiatives have been taken with a focus to explain the importance of sound land administration systems as a basis for achieving “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 actors 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”.

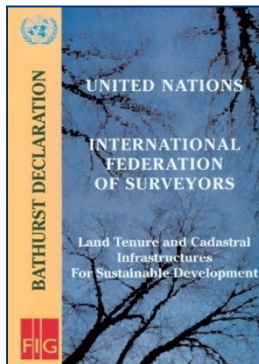
A range of publications is presented below showing the impact of the FIG agenda.



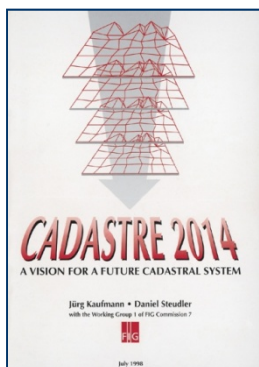
In 1995 FIG published an important and very timely publication entitled “The FIG statement on the Cadastre”. In many countries throughout the world the cadastral systems were revised, mainly due to technology development. Cadastral reform was on the agenda in most developing countries. At the same time, 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 how 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 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 2). 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.

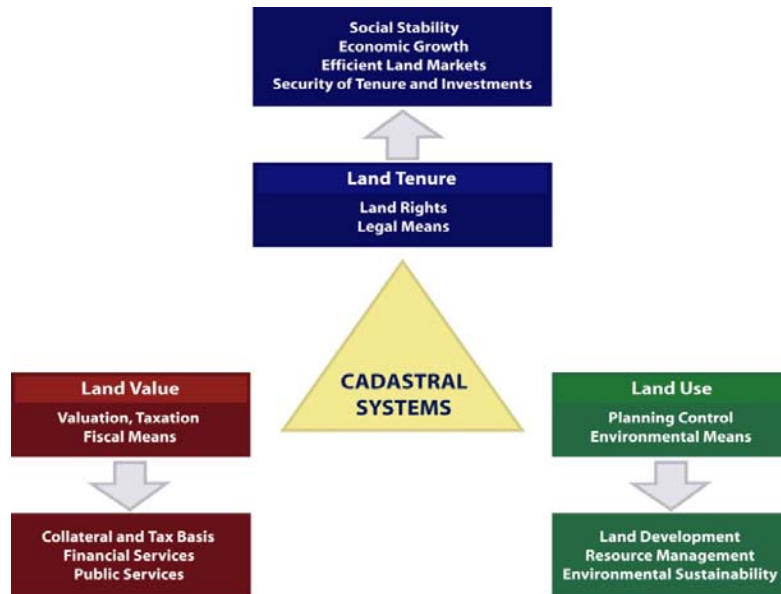
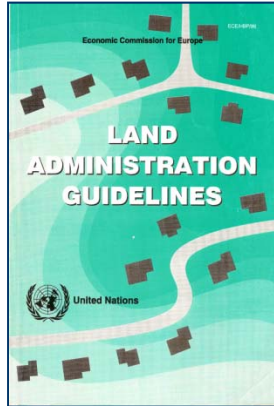


Figure 2: Cadastral systems provide a basic land information infrastructure for running the interrelated systems within the areas of Land Tenure, Land Value, and Land Use (Enemark, 2004).

The identification of land parcels in the cadastral system provides the basic infrastructure for running the interrelated systems within the areas of land tenure, value, use, and development. As a result, the traditional surveying, mapping and land registration focus has moved away from being primarily provider-driven to now being clearly user-driven. However, each of those systems includes tasks and processes that impose quite different demands on the cadastral system. The success of a cadastral system is a function of how well it internalizes these influences and achieves these broad social, economic and environmental objectives.

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. Another term was needed to describe these land-related activities. 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 held 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 administration perspective

The focus on information remains but the need to address land management issues systematically pushes the design of 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 land administration perspective is presented in figure 3 below.

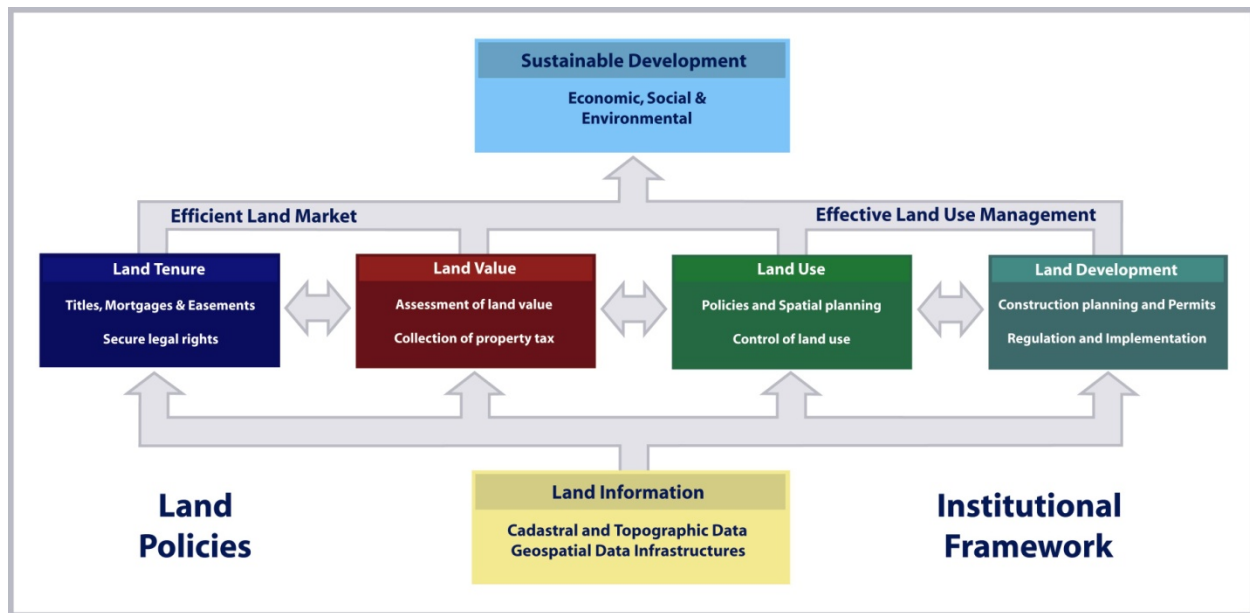


Figure 3. A Global land administration perspective (Enemark, 2004)

The four land administration functions (land tenure, land value, land use, and land development) are different in their professional focus, and are normally undertaken by a mix of professionals, including surveyors, engineers, lawyers, valuers, land economists, planners, and developers. Furthermore, the actual processes of land valuation and taxation, as well as the actual land-use planning processes, are often not considered part of land administration activities. However, even if land administration is traditionally centered on cadastral activities in relation to land tenure and land information management, modern land administration systems designed as described in figure 3 deliver an essential infrastructure and encourage integration of the four functions:

- **Land Tenure:** the allocation and security of rights in lands; the legal surveys of boundaries; the transfer of property through sale or lease; and the management; adjudication of disputes regarding rights and boundaries.
- **Land Value:** the assessment of the value of land and properties; the gathering of revenues through taxation; and the management and adjudication of land valuation and taxation disputes.
- **Land-Use:** the control of land-use through adoption of planning policies and land-use regulations at various levels; the enforcement of land-use regulations; and the management and adjudication of land-use conflicts.
- **Land Development:** the building of new infrastructure; the implementation of construction planning; and the change of land-use through planning permission and granting of permits.

Inevitably, all four functions are interrelated. The interrelations appear because the conceptual, economic, and physical uses of land and properties serve as an influence on land values. Land values are also influenced by the possible future use of land determined through zoning, land-use

planning regulations, and permit-granting processes. And land-use planning and policies will, of course, determine and regulate future land development.

Land information should be organized to combine cadastral and topographic data and to link the built environment (including legal and social land rights) with the natural environment (including topographical, environmental, and natural resource issues). Land information should, in this way, be organized through an SDI at the national, regional, federal, and local level, based on relevant policies for data sharing, cost recovery, access to data, data models, and standards (see chapter 9, “SDIs and technology”).

Ultimately, the design of adequate systems of land tenure and land value should support efficient land markets capable of supporting trading in simple and complex commodities (see chapter 6, “Building land markets”). The design of adequate systems to deliver land-use control and land development should lead to effective land-use management (see chapter 7, “Managing the use of land”). The combination of efficient land markets and effective land-use management should support economic, social, and environmental sustainable development.

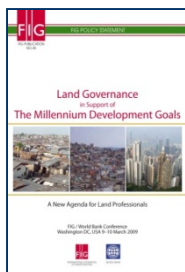
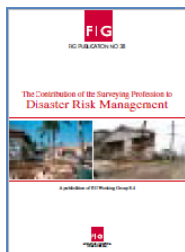
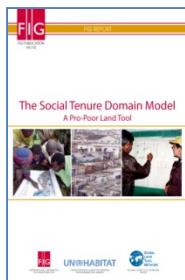
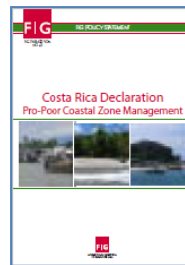
From this global perspective, land administration systems act within adopted land policies that define the legal regulatory pattern for dealing with land issues. They also act within an institutional framework that imposes mandates and responsibilities on the various agencies and organisations. They should service the needs of individuals, businesses, and the community at large. Benefits arise through the land administration systems guarantee of ownership, security of tenure and credit; facilitating efficient land transfers and land markets; supporting management of assets; and providing basic information and efficient administrative processes in valuation, land use planning, land development and environmental protection. LAS designed in 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 range 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 (FIG 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 (FIG 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 4 below.

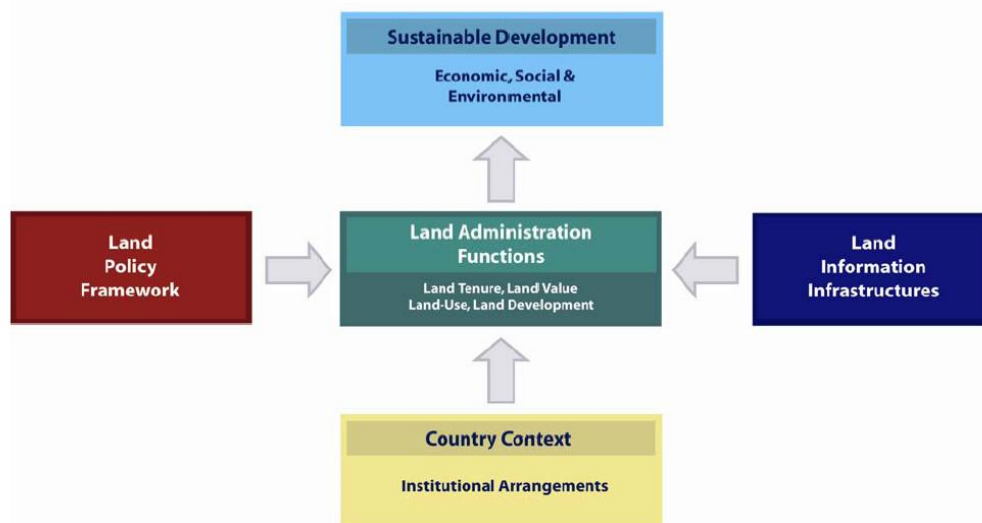


Figure 4. The land management paradigm (Enemark, 2004)

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.

4.2 Good Governance

Governance refers to the manner in which power is exercised by governments in managing a country's social, economic, and spatial resources. It simply means: the process of decision-making and the process by which decisions are implemented. This indicates that government is just one of the actors in governance. The concept of governance includes formal as well as informal actors involved in decision-making and implementation of decisions made, and the formal and informal structures that have been set in place to arrive at and implement the decision. Good governance is a qualitative term or an ideal which may be difficult to achieve. The term includes a number of characteristics: (adapted from FAO, 2007):

- **Sustainable and locally responsive:** It balances the economic, social, and environmental needs of present and future generations, and locates its service provision at the closest level to citizens.
- **Legitimate and equitable:** It has been endorsed by society through democratic processes and deals fairly and impartially with individuals and groups providing non-discriminatory access to services.
- **Efficient, effective and competent:** It formulates policy and implements it efficiently by delivering services of high quality
- **Transparent, accountable and predictable:** It is open and demonstrates stewardship by responding to questioning and providing decisions in accordance with rules and regulations.
- **Participatory and providing security and stability:** It enables citizens to participate in government and provides security of livelihoods, freedom from crime and intolerance.
- **Dedicated to integrity:** Officials perform their duties without bribe and give independent advice and judgements, and respects confidentiality. There is a clear separation between private interests of officials and politicians and the affairs of government.

Once the adjective “good” is added, a normative debate begins. In short: sustainable development is not attainable without sound land administration or, more broadly, sound land governance.

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 5. 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. In this way, within 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.

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.

Figure 5. The cadastre as an engine of LAS - the “butterfly” diagram
(Williamson, Enemark, Wallace, Rajabifard, 2010)

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. FACING THE NEW CHALLENGES

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 (Enemark, 2009).

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.

More generally, sustainable land administration systems should serve as a basis for climate change adaptation and mitigation as well prevention and management natural disasters. The management of natural disasters resulting from climate change can also be enhanced through building and maintenance of appropriate land administration systems. Climate change increases the risks of climate-related disasters, which cause the loss of lives and livelihoods, and weaken the resilience of vulnerable ecosystems and societies.

Adaptation to climate change can be achieved to a large extent through building sustainable and spatially enabled land administration systems. This should enable control of access to land as well as control of the use of land. Such integrated land administration systems should include the perspective of possible future climate change and any consequent natural disasters. The systems should identify all prone areas subject to sea-level rise, drought, flooding, fires, etc. as well as measures and regulations to prevent the impact of predicted climate change.

Key policy issues to be addressed should relate to protecting the citizens by avoiding concentration of population in vulnerable areas and improving resilience of existing ecosystems to cope with the impact of future climate change. Building codes may be essential in some areas to avoid damage e.g. in relation to flooding and earthquakes. Issues may also relate to plans for replacement existing settlements as an answer to climate change impacts.

The measures of building integrated and spatially enabled land information systems does not necessarily relate to the inequity between the developed and less developed countries. Implementation of such systems will benefit all countries throughout the globe. Therefore, the integrated land administration systems should, in addition to appropriate registration of land tenure and cadastral geometry, include additional information that is required about environmental rating of buildings, energy use, and current and potential land use related to carbon stock potential and greenhouse gases emissions.

This also relates to the fact that climate change is not a geographical local problem that can be solved by local or regional efforts alone. To address climate change, international efforts must integrate with local, national, and regional abilities.

Urbanisation is another major change that is taking place globally. The urban global tipping point was reached in 2007 when over half of the world's population was living in urban areas; around 3.3 billion people.

This incredibly rapid growth of megacities (more than 10 million inhabitants) causes severe ecological, economical and social problems. It is increasingly difficult to manage this growth in a sustainable way. It is recognised that over 70% of the growth currently happens outside of the formal planning process and that 30% of urban populations in developing countries living in slums or informal settlements, i.e. where vacant state-owned or private land is occupied illegally and used for illegal slum housing. In sub-Saharan Africa, 90% of all new urban settlements are taking the form of slums. These are especially vulnerable to climate change impacts as they are usually built on hazardous sites in high-risk locations. Even in developed countries unplanned or informal urban development is a major issue (FIG/WB 2010).

Urbanisation is also having a very significant impact on climate change. The 20 largest cities consume 80% of the world's energy use and urban areas generate 80% of greenhouse gas emissions world-wide. Cities are where climate change measures will either succeed or fail.

Rapid urbanisation is setting the greatest test for Land Professionals in the application of land governance to support and achieve the MDGs. The challenge is to deal with the social, economic and environment consequences of this development through more effective and comprehensive spatial and urban planning, resolving issues such as the resulting climate change, insecurity, energy scarcity, environmental pollution, infrastructure chaos and extreme poverty.

In conclusion, the linkage between urban growth, climate change adaptation, and sustainable development should be self evident. Measures to manage urban growth and for adaptation to climate change will need to be integrated into strategies for poverty reduction to ensure sustainable development. The land management perspective and the role of the operational component of land administration systems therefore need high-level political support and recognition.

7. THE ROLE OF LAND PROFESSIONALS AND FIG

The role surveyors are changing. In a global perspective there is a big swing that could be entitled "From Measurement to Management". This does not imply that measurement is no longer a relevant discipline to surveying. The change is mainly in response to technology development. Collection of data is now easier, while assessment, interpretation and management of data still require highly skilled professionals. The role is changing into managing the measurements. There is wisdom in the saying that "All good coordination begins with good coordinates" and the surveyors are the key providers.

The concept of a modern Positioning Infrastructure (combining satellites and reference stations on the ground) still supports the activities traditionally associated with a geodetic datum but extends toward much broader roles on the global scale. It can be argued that GNSS could be considered one of the only true global infrastructures in that the base level of quality and accessibility is constant across the globe (Higgins, 2009). Such a Positioning Infrastructure moves the focus from measurement of framework points to management of the data received from the positioning system.

The change from measurement to management also means that surveyors increasingly contribute to building sustainable societies as experts in managing land and properties. The surveyors play a key role in supporting an efficient land market and also effective land-use management. These functions underpin development and innovation for social justice, economic growth, and environmental sustainability. The big swing is implies a change from land surveyors to land professionals.

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 will strive 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 can facilitate support of capacity development in three ways:

- **Professional development:** FIG provides a global forum for discussion and exchange of experiences and new developments between member countries and between individual professionals in the broad areas of surveying and mapping, spatial information management, and land management. This relates to the FIG annual conferences, the FIG regional conferences, and the work of the ten technical commissions within their working groups and commission seminars. This global forum offers opportunities to take part in the development of many aspects of surveying practice and the various disciplines including ethics, standards, education and training, and a whole range of professional areas.
- **Institutional development:** FIG supports building the capacity of national mapping and cadastral agencies, national surveying associations and survey companies to meet the challenges of the future. FIG also provides institutional support to individual member countries or regions with regard to developing the basic capacity in terms of educational programs and professional organisations. The professional organisations must include the basic mechanisms for professional development including standards, ethics and professional code of conduct for serving the clients.
- **Global development:** FIG also provides a global forum for institutional development through cooperation with international NGO’s such as the United Nations Agencies (UNDP, UNEP, FAO, HABITAT), the World Bank, and sister organisations (GSDI, IAG, ICA, IHO, and ISPRS). The cooperation includes a whole range of activities such as joint projects (e.g. The Bathurst Declaration, The Aguascalientes Statement), and joint policy making e.g. through round tables. This should lead to joint efforts of addressing topical issues on the international political agenda, such as reduction of poverty and enforcement of sustainable development.

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

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BIOGRAPHICAL NOTES

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