

## A CADASTRAL TALE

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**Keywords:** Cadastre, Land Administration, Land Management, FIG

### SUMMARY

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.

This paper presents the role of the cadastral system in support of the land administration functions within: land tenure, land value, land-use, and land development. The paper facilitates an understanding of how the cadastral concept has developed over time into the broader concept of Land Administration Systems in support of sound Land Management. The objective is to build a general understanding of the concept, purpose and benefits of establishing sustainable land administration systems.

Cadastral systems are embedded in the historical, cultural and judicial setting of the individual country. However, in spite of the different origins, the systems seem to merge into a global Land Administration model serving some basic societal needs. The role of FIG is underlined in this regard.

The paper finally explains about the need for capacity development with regard to implementing the necessary interdisciplinary educational programs at university level, and also building a profession and a professional association in area of land administration. Furthermore, there is a need for building sound institutions to provide good governance of land related issues. Capacity building for developing adequate standards in these areas is a key challenge to be met at the threshold of the third millennium.

Land administration systems therefore need high-level political support and recognition.

## 1. INTRODUCTION

The title of this paper “A Cadastral Tale” indicates something imaginary. In this case, the point is that the impact of the cadastre, or more precisely the cadastral system, in society is in fact almost imaginary. 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.

The last decade has seen moves towards establishment of fully digitized cadastral systems throughout the world. It is recognized that cadastral systems are not ends in themselves. Cadastral systems must serve a multi-purpose use and thereby meet the challenge of modern Geographic Information Systems (GIS) and the modern Information Technology (IT) environment.

Cadastral systems should be seen as a core component of more comprehensive land administration systems or infrastructures concerned with the processes of determining, recording and disseminating information about tenure value and use of land when implementing land policies. Appropriate land administration systems then provide the basis for sound land management towards economic, social and environmental sustainability.

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.

In this regard, organisations such FIG, UN, World Bank, EU, and also the whole surveying/land administration community should recognize that the increasing demand for sustainable land administration infrastructures includes some basic aspects of capacity building, especially with regard to developing the adequate educational, professional and institutional standards. This is a key challenge to be met at the threshold of the third millennium. Land administration systems therefore need high-level political support and recognition.

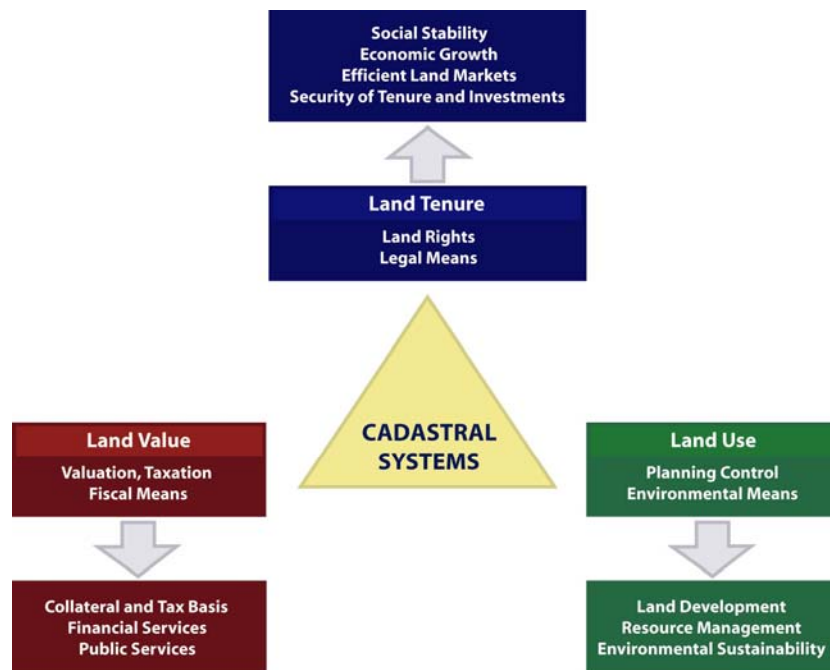
These issues were addressed at a recent Special Forum held in Aguascalientes, Mexico. The outcome of the meeting is published in The Aguascalientes Statement, (UN-FIG-PCIDEA, 2004). Proceedings in English and Spanish are available at the FIG website <http://www.fig.net/pub/mexico/index.htm>

## 2. CADASTRAL SYSTEMS

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”.

However, the concept of Cadastre is difficult to identify. It may be designed in many different ways, depending on the origin, history and cultural development of the region or country. Basically, a cadastre as such is just a record that identifies the individual land parcels/properties. The purpose of this identification may be taxation (as was the reason for establishing the European cadastres) or it may be security of land rights (as was the case when establishing the Torrens systems in the new world such as Australia). Today, most cadastral registers around the world are linked to both the land value/taxation area and the area of securing legal rights in land.

Therefore, it makes sense to talk about Cadastral Systems or Cadastral Infrastructures rather than just Cadastre. These systems or infrastructures include the interaction between the identification of land parcels, the registration of land rights, the valuation and taxation of land and property, and the control of present and possible future use of land. This is shown in figure 1 below (developed from Enemark, 2003).



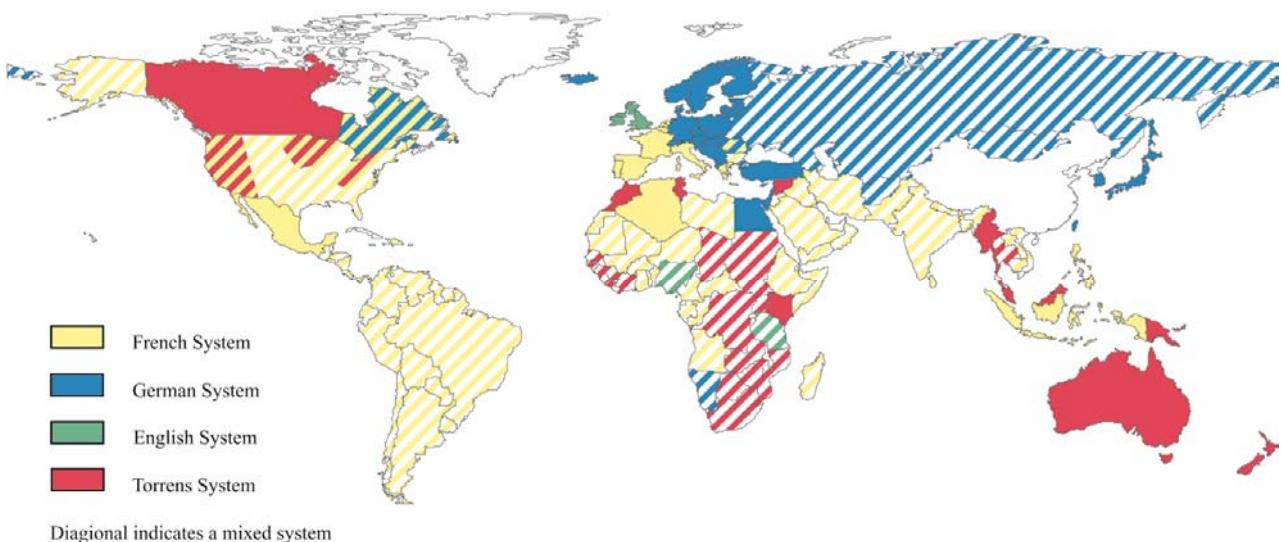
**Fig. 1:** Cadastral systems provide a basic land information infrastructure for running the interrelated systems within the areas of Land Tenure, Land Value, and Land Use.

Even though cadastral systems around the world are clearly different in terms of structure, processes, and actors, they are increasingly merging into a unified global model: the multi-purpose cadastre. This is due to some global drivers: globalisation and technology development. These trends supports establishment of multifunctional information systems with regard to land rights and land-use regulations. A third global driver is sustainable development with its demand for comprehensive information on the environmental conditions in combination with other land and property related data.

The identification of land parcels in the cadastral system provides the basic infrastructure for running the interrelated systems within the areas of Land Tenure, Land Value, and Land-Use. 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.

## 2.1 Land Registration Systems

Cadastral Systems are organized in different ways throughout the world, especially with regard to the Land Registration component. 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.** *An overview of Land Registration Systems around the world.*

Deeds registration is rooted in the Roman culture and is, therefore, common in Latin cultures in Europe (France, Spain, Italy, Benelux), in Latin America, and in parts of Asia and Africa who have been influenced by these cultures. The concept is also used in most of the United States. The Deeds Systems is found in different forms, where the role of the cadastral identification as well as the role of the surveyors varies significantly.

Title registration has its origin in the German culture and is found in the central European countries (Germany, Austria, Switzerland). Different versions of the German system are found in the Eastern European and the Nordic countries. The versions relate to the use of the property concept and the organization of the cadastral process including the use and the role of private licensed surveyors. A special version of the Title System is found in UK, where the concept of general boundaries is used to identify the land parcels on the large-scale topographic map series. Title registration is found in a third variant: the Torrens system (developed by Sir Robert Torrens) and introduced in Australia by mid 1800's to serve the need of securing land rights in the "new world". The Torrens Systems is implemented in Australia, New Zealand, Western states of Canada, and some countries in Asia and Africa.

The systems in Latin America, Africa and Asia are often mixed and rather incomplete in terms of content as well as coverage. Furthermore, some land rights cannot be recorded in Western judicial systems due to the nature of the rights. This relates to the traditional land rights on the African continent known as "customary rights", and also the "indigenous land rights" related to the indigenous people in the American and Australian parts of the world. However, it is a misunderstanding that location of rights can only be done by defining a cadastral parcel and by a precise boundary survey (Molen, 2001).

In many parts of the world, there is a problem of providing shelter for people migrating to settle in the major urban areas to find a living. These "informal settlements" or "squatting" are often basically illegal and not based on any kind of formal rights. Western land tenure approaches are not suitable to deal with these problems of providing secure access to land. Instead, the approach should aim to provide basic de facto security rather than sophisticated de jure security ( Molen, 2001).

The formalized western land registration systems are basically concerned with identification of legal rights in support of an efficient the land market, while the systems do not adequately address the more informal and indigenous rights.

## **2.2 Comparing Cadastral Systems**

The basic grouping into deeds and title systems may still provide the best picture. The grouping may, however, be supplemented with a number of other elements. The processes around property formation and property transfer vary quite significantly with regard to the actors and institutions involved, and with regard to the outcome of the process in terms of accessibility, identification and security of land rights. The role of the surveyors also varies a lot from being a private consultant, a public servant, or being non-existent.

To compare different cadastral systems at least four issues must be taken into account:

- *Property definition* –the legal/economic/physical concept;
- *Property determination* – process of determination; general/fixed boundaries;
- *Property formation* – process, institutions and actors; the role of the surveyors;
- *Property transfer* – process, institutions and actors; legal consequences.

By focusing on processes, institutions, and actors, the systems reflect the cultural and judicial setting of which they are an integrated part.

A website has been established <http://www.cadastraltemplate.org> to compare cadastral systems on a worldwide basis. About 35 countries are currently included (June 2004) and the number is still increasing. The web site is established as a result of one of the objectives of Working Group 3 “Cadastré” of the PCGIAP (Permanent Committee on GIS Infrastructure for Asia and the Pacific). The cadastral template is basically a standard form to be filled out by cadastral organizations presenting their national cadastral system. The aims are 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 Cadastral template project is carried out in collaboration with Commission 7 “Cadastré and Land Management” of the International Federation of Surveyors (FIG), which has extensive experience in comparative cadastral studies. (Stuedler, et.al. 2004).

**Cadastral Template**  
*A Worldwide Comparison of Cadastral Systems*  
Cadastral country reports based on a jointly developed PCGIAP/FIG template.  
Established under UN mandate by Resolution 4 of the 16th UNRCC-AP in Okinawa, Japan in July 2003.  
UN endorsement for cooperation with UN-ECE WPLA, UN-ECA CODI, and PCIDEA.

**Data per Country**  
(last update: 7 Jun. 2004, 35 countries)  
as .htm Select a Country  
as .pdf Select a Country

**I. Data per Data Fields**  
(last update: 7 Nov. 2003, 30 countries)  
D3 - Role of Cadastral Layer in SDI

**II. Principles and Statistics**  
(last update: 18 Apr. 2004, 33 countries)  
1.1 Cadastral Principles  
2.1 Population  
2.3 Parcels  
2.7 Professionals

**Documents**  
• Questionnaires for Download (English, Español, Portuguese).  
• Publications  
• Administrative Documents

**Latest Updates**  
• Country report of Namibia as 35th country (7 Jun. 2004)  
• Country report of Venezuela (in Spanish) as 34th country (28 May 2004)  
• Country report of Mexico (also in English) (26 Apr. 2004)  
• Country report of Mexico (in Spanish) as 33rd country (18 Apr. 2004)  
• Publication in the Hong Kong Journal of Geospatial Engineering (3 Mar. 2004)  
• Questionnaires available also in Spanish and Portuguese (5 Feb. 2004)

The "Cadastral Template" has been developed by a research group at the Department of Geomatics of the University of Melbourne. It consisted of Prof. Ian Williamson, Dr. Abbas Rajabifard, and Daniel Steudler, supported by Prof. Stig Enemark from Aalborg University, Denmark.

PCGIAP-Working Group 3 "Cadastré" cooperates with FIG-Commission 7 to place the country information jointly on this website and to maintain the information during its 2003-2006 Work Plan.

**Fig 3.** The Cadastral Template provides a worldwide Comparison of Cadastral Systems

## 2.3 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 4 below.

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

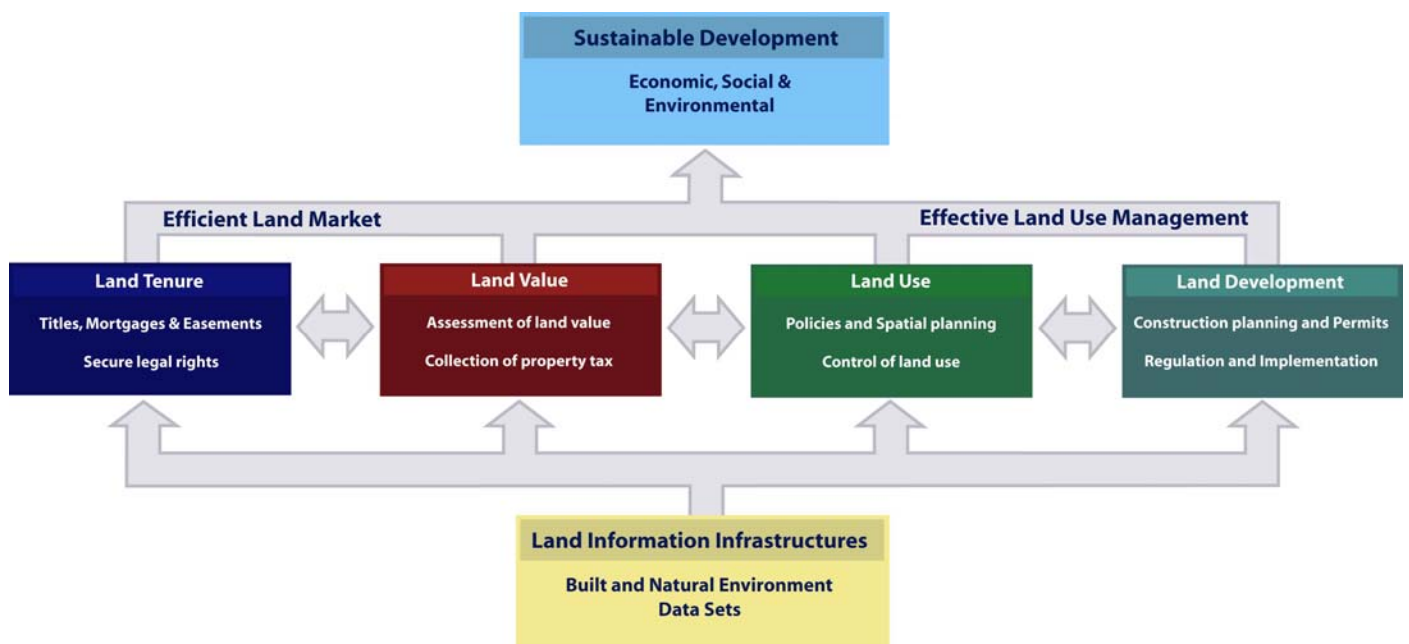
**Fig. 4:** *Evolution of Western Cadastral System (Developed from Williamson and Ting, 1999)*

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.

## 3. LAND ADMINISTRATION SYSTEMS

Land administration systems are concerned with the social, legal, economic and technical framework within which land managers and administrators must operate (UN-ECE, 1996). These systems support efficient land markets and are, at the same time, concerned with the administration of land as a natural resource to ensure its sustainable development. This global approach to land administration is shown in figure 5 below (developed from Enemark, 2003).





**Fig.5.** A Global Land Administration Model

Land administration comprises an extensive range of systems and processes to administer:

- *Land Tenure:* the allocation and security of rights in lands; the legal surveys to determine the parcel boundaries; the transfer of property or use from one party to another through sale or lease; and the management and adjudication of doubts and disputes regarding rights and parcel 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 national, regional/federal, and local 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.

These four systems are interrelated. The actual economic and physical use of land and properties influences the land value. The land value is also influenced by the possible future use of land as determined through zoning and land-use planning regulations and permit granting processes. And the land-use planning and policies will, of course, determine and regulate the future land development.

The information on land and properties permeates through the overall system and provides the basic infrastructure for running the systems within the four interrelated



areas. The Land Information area should be organized to combine the cadastral and topographic data and thereby linking the built environment (including the legal land rights) with the natural environment (including environmental and natural resource issues). Land Information should be organized as a spatial data infrastructure at national, regional/federal and local levels based on relevant policies for data sharing, cost recovery, access to data, standards, etc.

The design of adequate systems in the areas of Land Tenure and Land Value should lead to the establishment of an efficient land market. The design of adequate systems in the areas of Land-Use Control and Land Development should lead to an effective land-use administration. The combination of an efficient land market and an effective land-use administration should then form the basis for a sustainable approach to economic, social and environmental sustainability.

A modern land administration system acts within the environment of adopted land policies that fulfil political objectives with regard to land issues. It also acts within an institutional framework that imposes mandates and responsibilities on the various agencies and organisations. The foundation of any system of social order is the framework of laws, which reflect the Constitution of the country, governs the administrative processes, and expresses the rights and obligations to the citizen. In the case of land laws relating to land administration, the following indicates what should be included when drafting and enacting appropriate land laws (developed from UN-ECE, 1998):

- Define legal forms of land tenure (ownership, leasehold, use of land);
- Distinguish between real and personal property (immovable and movable property);
- Distinguish between different forms of land tenure (ownership, leasehold, use);
- Define how rights can be established and transferred;
- Establish an independent public land registration institution with clear powers;
- Ensure that registered rights are guaranteed by the State;
- Establish simple administrative systems for land transfer and property formation;
- Establish quick and simple procedures for mortgage and forced sales;
- Co-ordinate legislation related to planning, land-use, land value, land registration;
- Ensure clarity of responsibilities and powers of the authorities involved;
- Specify the administrative role of the agencies and actors involved.

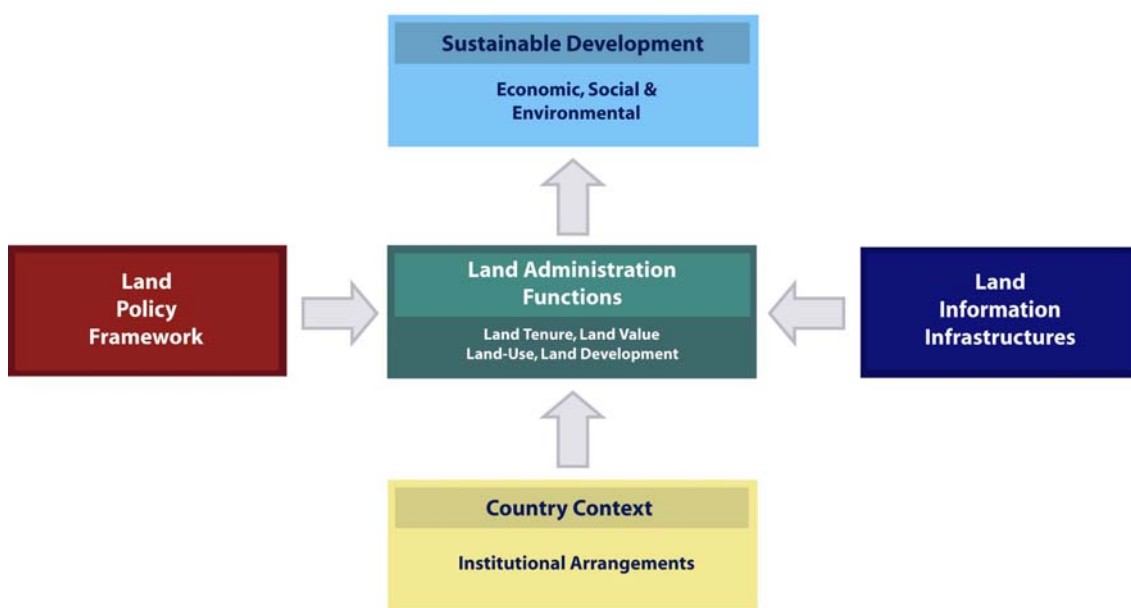
An example of a national approach to Land Administration Systems can be found in “The Danish Way” (ten thematic articles) on the address: [www.ddl.org/thedanishway](http://www.ddl.org/thedanishway) (Enemark and Schoeler, 2002).

#### **4. LAND MANAGEMENT**

An efficient system of land administration is necessary but not sufficient to ensure the best use of land as a resource. Land management can be described as the process by which the resources of land are put into good effect (UN-ECE 1996). Land management is about land policies, land rights, property economics, land-use control, regulation, implementation, and development. Land management, this way, encompasses all those

activities associated with the management of land as an asset and a resource to achieve sustainable development.

The organisational structures for land management differ widely between countries and regions throughout the world, and reflect the cultural and judicial setting of the country or jurisdiction. The institutional arrangements may change over time to better support the implementation of land policies and good governance. Within this country context, the land management activities may be described by the three components: Land Policies, Land Information Infrastructures, and Land Administration Functions in support of Sustainable Development. This Land Management Paradigm is presented in Figure 6 below.



**Fig. 6.** *The land Management Paradigm (Enemark et al., 2005)*

Land policy is a part of the national policy on promoting objectives such as economic development, social justice and equity, and political stability. Land policies may be associated with: security of tenure; land transactions and access to credit; sustainable management and control of natural resources and the environment; the provision of land for the poor; ethical minorities and women; land use and physical planning; real property taxation; measures to prevent land speculation and to manage land disputes.

The operational component of the land management paradigm is the range of land administration functions that ensure proper management of rights, restrictions and responsibilities in relation to property, land and natural resources. These functions include the areas of land tenure (securing and transferring rights in land); 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, and construction planning).

The land administration functions are based on and facilitated by appropriate land information infrastructures that include cadastral and topographic datasets and provide access to complete and up-to-date information on the built and natural environment.

Sound land management is the operational processes of implementing land policies in a comprehensive and sustainable way. In many countries, however, there is a tendency to separate land tenure rights from land-use rights. There is no effective institutional mechanism for linking planning and land-use controls with land values and the operation of the land market. The problems are often compounded by poor administrative and management procedures that fail to deliver the services that are needed. Investment in new technology will only go a small way towards solving a much deeper problem, which is the failure to treat land and its resources as a coherent whole.

## **6. CAPACITY DEVELOPMENT**

Good land management will help promote economic and social development in both urban and rural areas. For developing and transition countries, land reform policies are key components in achieving these goals. The challenges in this regard relates to developing the necessary capacity in terms educational, professional, and institutional standards. Capacity building is increasingly seen as a key component of land administration projects such as World Bank projects in developing and transition countries. However, the capacity building concept is often used in a very narrow meaning such as focusing on staff development through formal education and training programmes to meet the deficit of qualified personnel in the actual project in the short term.

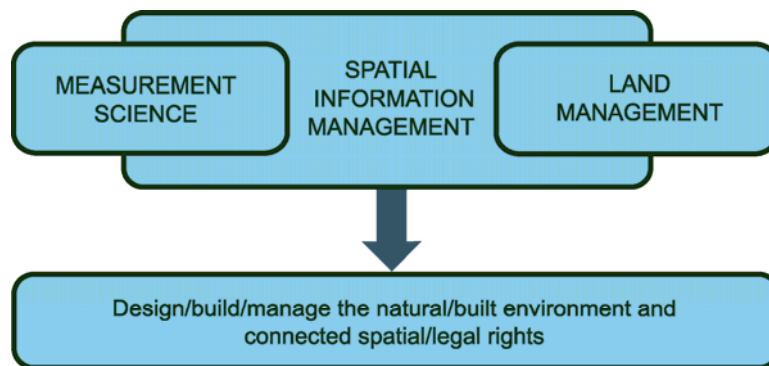
This conventional understanding has changed over recent year towards a broader and more holistic view covering social, organisational and educational aspects. Capacity Building therefore is a broader concept than just Human Resource Development (HRD) since it includes an emphasis on the overall system, environment, and context in which individuals, organisations, and societies operate and interact. Where a donor project is established to create land administration infrastructures in developing or transition countries, it is critical that capacity building is a main steam component that is addressed up front, not as an add-on. In fact, such projects should be dealt with as capacity building projects in themselves. While attention should still be given to doing the project, the key focus should be on building capacity to meet the medium and long term needs (Enemark and Williamson, 2004).

The relationship of humankind to land varies in and between countries and regions, and adequate responses in terms of capacity building must reflect these fundamental conditions. For example, if a country such as Indonesia wished to have a land administration system supported by a land title and cadastral surveying system similar to Denmark or Australia, this could possibly require 40,000 professional land surveyors and 30 or more university programs educating professional surveyors (based on Steudler et. al., 1997). Clearly this is not realistic even in a medium term perspective. As a result, there is a need to develop appropriate solutions matching the stage of development and specific characteristics and requirements of the individual country (Enemark and Williamson, 2004).

## 6.1 Educational Standards

Traditional education of surveyors has focused on geometry and technology more than on land use and land administration. Taking a land administration approach to surveying education, there is a need to change the focus from being seen very much as an engineering discipline. There is a need for a more managerial and interdisciplinary focus as a basis for developing and running adequate systems of land administration.

A future educational profile for land administrators should be composed by the areas of Measurement Science and Land Management and supported by and embedding in a broad interdisciplinary paradigm of Spatial Information Management. Such a profile is illustrated below (Enemark and Prendergast, 2001).



*THE EDUCATIONAL PROFILE OF THE FUTURE*

## 6.2 Professional Standards

The spatial information revolution and the evolving land management paradigm in support of sustainable development have had many influences on professional structures over the last two decades. Professions such as surveying are being re-engineered and re-invented to accommodate the spatial information revolution, while endeavouring to maintain traditional services.

The international surveying profession and the national associations will have to adapt to these challenges and develop structures that accommodate a modern interdisciplinary profile. This includes adoption of ethical principles and model codes of professional conduct suitable for performing this modern role (FIG 1998).

The profile of the surveying profession in the third millennium will include a mix of technical surveying and mapping professionals, business practitioners, spatial data managers, land and environmental resource managers (in the public as well as the private sector), and legal and financial consultants on land management matters.

### 6.3 Institutional Standards

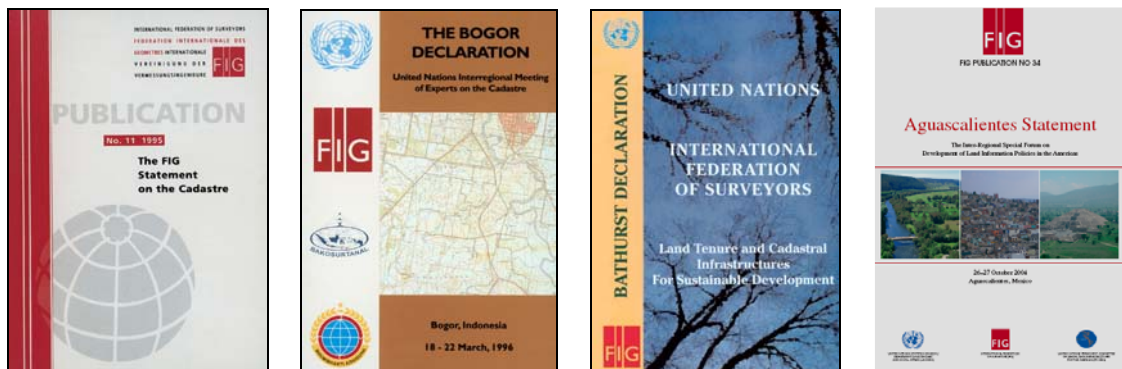
Establishing appropriate institutional and organisational infrastructures is seen as a crucial key for achieving sustainability in any society. In a theoretical sense, the concept of property rights is such an institution. Appropriate cadastral systems play a most important role in terms of facilitating the real property transactions such as land transfers, land taxation and control of land-use and land development.

Another institutional challenge is about establishing a suitable balance between national policy-making and local decision-making. This challenge relates to good governance and to the issue of decentralization with regard to the delegation being made between governmental levels. Decentralization of land-use planning and decision-making immediately raise the question of suitable local institutions and organisations for managing these tasks. Such local institutions and organisations must be able to handle conflicts in a very concrete and direct sense. In the context of sustainability, the conflict between immediate gains and needs on one hand, and the concern of future generations on the other, is of course crucial.

A fundamental institutional challenge in this regard is related to understanding the value of developing appropriate institutional, legal and technical processes to integrate land administration and topographic mapping programs within the context of a wider national land policy.

### 6.4 The Role of FIG

FIG plays a strong role in improving the capacity to design, build, and manage land administration systems which incorporate spatial data infrastructures. Throughout the last 10-15 years FIG has taken a lead role in explaining 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. A number of these key publications are shown below. The latest achievement entitled the Aguascalientes Statement on Development of Land Information Policies in the Americas is developed as a joint initiative of UN/FIG/PCIDEA with FIG taking the lead role. This publication is available in both English and Spanish.



Furthermore, the FIG publication Series also includes a number of publications dressing educational, professional, and institutional issues of global relevance, such as Continuing Professional Development, Ethical Principles, and Business Matters for Professionals, Standardisation, and Mutual Recognition of Professional Qualifications. The publications are available on-line at the FIG Home Page

<http://www.fig.net/pub/figpub/pubindex.htm>

## **7. FINAL REMARKS**

The objective of this paper is to build a general understanding of the concept, purpose and benefits of establishing sustainable land administration systems. Especially in developing countries the debate should move from “whether this is desirable” to “what is the most appropriate land administration system to serve the needs of an individual country or jurisdiction”. This debate should be aware of the global trends in this area while still recognising that the design of such systems will always be unique due to the different geographic and cultural preconditions and needs of each respective country.

Land administration systems, in principle, reflect the social relationship between people and land recognized by any particular jurisdiction or state. Such a system is not just a GIS. On the other hand, Land Administration Systems are not an end in itself but facilitate the implementation of the land policies within the context of a wider national land management framework.

Land administration systems and the core cadastral component provide information about geographical objects and their attributes. In this regard the principle of data sharing should be applied when creating a national geo-spatial data infrastructure that include cadastral and topographic datasets and provide access to complete and up-to-date information on the built and natural environment.

Land administration activities are, however, not just about technical or administrative processes. The activities are basically political and reflect the accepted social concepts concerning people, rights, and land objects with regard to land tenure, land markets, land taxation, land-use control, land development, and environmental management.

Land administration systems therefore need high-level political support and recognition.

## **CONTACTS**

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