

FIG Statement on the Cadastre

Introduction

This statement of the International Federation of Surveyors highlights, from an international perspective, the importance of the Cadastre as a land information system for social and economic development. It gives examples of legal, organisational, and technical issues that need to be addressed in order to establish and maintain a Cadastre. The statement also describes some of the different roles that surveyors play in the management and operation of a Cadastre. This statement does not recommend a uniform cadastre for every country or jurisdiction.

A Cadastre is normally 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, the ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (e.g. valuation and equitable taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental protection.

1. Land Management and Land Information

Land management is the process of managing the use and development of land resources. Some of the critical, and sometimes conflicting, objectives that must be addressed by land management policies today include:

- improving the efficiency of land resource use to support the rapidly growing population of many countries;
- providing incentives for development, including the provision of residential housing and basic infrastructure such as sewer and water facilities;
- protecting the natural environment from degradation; providing equitable and efficient access to the economic benefits of land and real estate markets;
- supporting government services through taxation and fees related to land and improvements.

A prerequisite for achieving these and other objectives is having effective access to information about land, e.g. information about land resource capacity, land tenure and land use. This information is essential in:

- identifying problems and priority concerns;
- formulating and implementing appropriate land policies and strategic plans to address the problems;
- supporting land use planning and land development activities;
- providing cost-effective land transaction processes to support economic development;
- implementing equitable and efficient property taxation systems;

- monitoring land use to ensure the identification of new problems and to evaluate the effect of land policies.

While land management can have many social and environmental objectives, most developing nations must give priority to immediate economic objectives. Formalising and providing security for property rights in land, through public recognition and recording, is today considered to be a primary component of a free market economy and an essential step in moving towards improved standards of living.

The Cadastre is the primary means of providing information about property rights. More specifically, the Cadastre provides the private and public sector with:

- information identifying those people who have interests in parcels of land;
- information about those interests (e.g. nature and duration of rights, restrictions, and responsibilities);
- information about the parcels (e.g. their location, size, improvements, value).

2. The Cadastre and Land Information

The Cadastre is a land information system, usually managed by one or more government agencies. Traditionally the Cadastre was designed to assist in land taxation, real estate conveyancing, and land redistribution. The Cadastre helps to provide those involved in land transactions with relevant information and helps to improve the efficiency of those transactions and security of tenure in general. It provides governments at all levels with complete inventories of land holdings for taxation and regulation. But today, the information is also increasingly used by both private and public sectors in land development, urban and rural planning, land management, and environmental monitoring.

A Cadastre is normally a parcel-based system, ie. information is geographically referenced to unique, well-defined units of land. These units are defined by the formal or informal boundaries marking the extent of lands held for exclusive use by individuals and specific groups of individuals (e.g. families, corporations, and communal groups). Each parcel is given a unique code or parcel identifier. Examples of these codes include addresses, co-ordinates, or lot numbers shown on a survey plan or map.

Graphical indices of these parcels, known as cadastral maps, show the relative location of all parcels in a given region. Cadastral maps commonly range from scales of 1:10,000 to 1:500. Large scale diagrams or maps showing more precise parcel dimensions and features (e.g. buildings, irrigation units, etc.) can be compiled for each parcel based on ground surveys or remote sensing and aerial photography. Information in the textual or attribute files of the Cadastre, such as land value, ownership, or use, can be accessed by the unique parcel codes shown on the cadastral map, thus creating a complete Cadastre.

The Cadastre forms part of the base data required in any public land information system. Since information about land parcels and land holdings is often needed by many different users, having a unified, standard Cadastre for each jurisdiction helps to avoid duplication and assists in the efficient exchange of information. The Cadastre is usually created and managed through a government

organisation. In some countries, Cadastres may be the responsibility of local governments; in others it is a state or national responsibility.

Examples of the data of general interest to a wide user community, that is usually considered part of the Cadastre, include:

- land parcels (e.g. location, boundaries, co-ordinates)
- land tenure (e.g. property rights, ownership, leases)
- land value (e.g. quality, economic value, tax value, value of improvements)

Other information can also be connected to land parcels through the unique parcel identifiers and through cadastral index maps. Such information may be of importance to specific user groups and includes:

- buildings and other improvements
- agricultural data (land capability classifications, land use)
- forestry data
- utilities (e.g. water, electricity, communications)
- fisheries (noting individuals holding rights in inland and coastal waters)
- environmental quality (particularly for site-specific analysis and monitoring)
- demography (population statistics, consumer marketing data, etc.)

The Cadastre plays an important role in the regulation of land use. Land use regulations stipulate conditions for the initial establishment of a parcel (e.g. subdivision or amalgamation); the use to which the land will be put; parcel size; and the necessary access to water and sewerage, roads, etc. In land development, the Cadastre forms an essential part of the information required by the private developer, land owners, and the public authorities to ensure that benefits are maximised and costs (economic, social, and environmental) are minimised.

3. Different Cadastres

Most early societies developed rudimentary types of Cadastres to support taxation and other land administration activities. As societies evolved and property transactions became important, Cadastral records began to take on a greater legal role. Today, Cadastres often serve many functions and multiple users.

Through the centuries, many types of Cadastral systems evolved and their differences often depend upon local cultural heritage, physical geography, land use, technology, etc. Cadastres may be classified in many ways, e.g. by:

- primary function (e.g. supporting taxation, conveyancing, land distribution, or multipurpose land management activities);
- the types of rights recorded (e.g. private ownership, use rights, mineral leases);
- the degree of state responsibility in ensuring the accuracy and reliability of the data (e.g. complete state mandate, shared public and private responsibility);
- location and jurisdiction (e.g. urban and rural Cadastres; centralised and decentralised Cadastres);

- the many ways in which information about the parcels is collected (e.g. ground surveys tied to geodetic control, uncoordinated ground surveys and measurements, aerial photography, digitising existing historical records, etc.)

All of these factors help to determine the required resolution and scale of geographical data (such as cadastral maps), the type and characteristics of data recorded in both the geometric and attribute files, and the organisational and professional responsibility for managing the data.

Other factors that will influence the format and management of the Cadastre include:

- history, culture, and traditional land tenure arrangements;
- area;
- physical and economic geography;
- population distribution;
- level of technology;
- traditional public administration arrangements;
- land and property law arrangements;
- land policy priorities for the jurisdiction.

In continental Europe, as in most countries worldwide, the responsibility for managing cadastral information has historically been divided among several government organisations and professions. Land registration has generally been the mandate for the courts and the legal profession. Mapping, parcel boundary delimitation, and maintenance of parcel data for fiscal, land use control, and land redistribution purposes have been the responsibility of the surveying profession. In regions such as North America, other professions have historically been responsible for land use planning and for land valuation and taxation.

One major consequence of the development of modern land information systems using computer technology has been the creation of closer coordination among organisations responsible for parts of the Cadastral data. In some countries, the functions of legal and fiscal land recording, surveying, and mapping have been merged into one organisation. In other countries, the information needed for the different purposes has been coordinated into one information system or arranged in such a way that different systems can easily exchange information.

4. The Role of the Surveyor

The role of the surveyor differs with the purpose of the Cadastre and with different types of organisations. Although there are other activities involved in managing the Cadastre, such as title recording that is usually the responsibility of legal experts, the surveyor may be responsible for:

a) Cadastral surveying: This is the definition, identification, demarcation, measuring and mapping of new or changed legal parcel boundaries. It usually includes the process of re-establishing lost boundaries and sometimes resolving disputes over boundaries or other interests in real property.

There are always specific regulations regarding training and experience for surveyors wishing to carry out cadastral surveys because they have a professional responsibility to society. Cadastral

surveys are carried out by governmental officials and private surveyors or by a combination of both. Special certification is required and this can be administered either by the state or by a professional society.

b) Survey recording: This process includes the checking or examination of the results of the cadastral survey and the entry of the information in registration books and on cadastral index maps. A unique parcel identifier is allocated to each parcel. The examination can check on land policy matters (for instance, does the subdivision contribute to a suitable land use?); legal matters (such as the right of the applicant to conduct certain land activities); and technical matters (for instance, have the survey regulations been obeyed?). To lower examination costs, government authorities are putting more emphasis on quality assurance and more responsibility on practising surveyors for the accuracy of their field data and survey plans.

c) Land valuation: Where the Cadastre is used as a tool for ensuring implementation of a certain land policy, valuation of land and buildings is often an integral part of the role of the surveyor. The most common example is valuation for taxation. But valuation is also important in processes such as expropriation of land and land consolidation where a systematic survey of all properties may be carried out to establish relative values for compensating affected property owners. Subdivision and consolidation surveys may also include establishing the construction and maintenance costs of roads and other joint facilities in order to distribute the costs among the new land holders.

d) Land-use planning: When the Cadastre includes initial land allocation, subdivision or consolidation, the land use planning aspect becomes an important part of the cadastral surveyor's role. As a professional, the surveyor is responsible for protecting the interests of the community and this may involve public consultation and mediation processes. The result may be a new land use plan, where economical, environmental and traditional points of view, reach conciliation.

e) Database management: Information technology has created a demand for specialists in database design and management. As this is an important component in a modern Cadastre, experts are needed to manage and operate large databases, for geometric (spatial) information as well as attribute information. Surveyors play an important role in this field of activity and education in computer systems is an integral component of today's education and training programs for surveyors.

f) Dispute resolution: In some countries, but mainly in Northern Europe, cadastral surveying has special legal significance, where the surveyor makes decisions concerning land matters which are legally binding. These can be questions such as: should a land division be permitted, taking into account the interests of both private developers and the general public?; should a transfer of land between owners be permitted?; who should be compensated for expropriated lands?; and what is the correct legal interpretation of old documents? Consequently, the role of the surveyor has developed from being an independent expert on a committee or in a court, to being the actual first court instead.

5. The Cadastre and Land Tenure

What types of land tenure are represented in the Cadastre? Land tenure is concerned with the rights, restrictions, and responsibilities people have with respect to the land. From a legal perspective, land may be defined as any portion of the earth to which rights of ownership, stewardship, or use may be

exercised. Thus the land may include, for example, the surface area of the earth, buildings and permanently fixed improvements, surface and subsurface resources including water, and in some instances even well-defined units of air space (e.g. for power easements). Often the land and the buildings on the land are referred to as real estate and the various rights associated with land are called real property.

Any type of real property can be recorded in a Cadastre if the right or restriction can be associated with a definite unit of land. Different types of rights may be shown on different cadastral maps or layers of map data. Thus, for example, mineral rights may be shown on a separate map, even perhaps at a smaller scale than the surface rights.

The most important types of land tenure or real property identified in most Cadastral systems can be characterised as follows:

a) Ownership usually means the exclusive right to use the parcel and enjoy the yield from the land and improvements. It also includes the right to transfer the parcel to another person, to mortgage the property and to lease it. All of these rights may be more or less restricted by legislation.

It is common today that the legal rights of the land owner are restricted to using the parcel of land in a manner that is beneficial and appropriate from a community perspective. Restrictions may also include measures to protect the environment. Ownership of the land usually includes ownership of any buildings on the land, but in some jurisdictions land and buildings may be owned separately.

b) A lease gives the lessee or grantee the right to use the parcel (or part of a larger parcel) for a limited time, in accordance with the regulations stipulated not only in legislation but also in the contract with the lessor. The lessor may be a private landowner or a government authority. The time span of a lease varies from very short periods (e.g. several months) to periods of up to 99 years or longer.

Leasehold tenure is usually not transferable to a third party without the consent of the owner. It is not usually possible to use leaseholds as collateral for loans, unless the lease is for a considerable period. A lessee of land may own a building erected on that land and the building may be used as collateral. Leaseholds for buildings and land can also differ in time span.

c) An easement is a limited right for an owner of one parcel to use or prevent use of some kind on a neighbouring parcel. The right is usually connected to the parcel and exists in principle as long as the parcel exists. Special easements or rights-of-way may also exist for such uses as construction and access to utility lines. There may also be traditional public rights-of-way over certain parcels to provide access to rivers, the coast, roads, etc.

d) A mortgage is a limited right in which real property is pledged to secure money. If the property owner does not live up to the terms of the contract (e.g. does not meet monthly payments on the loan), then the lender has the right to recover any losses incurred by taking possession of the property. There may be more than one mortgage affecting a property and the right of recovery for losses will depend on the priority given to each mortgage.

In some jurisdictions, the lender actually acquires the title or ownership of the property at the time the mortgage contract is signed. In this case the property owner has the right of possession and use but the full ownership only transfers back when all the terms of the contract have been met (e.g. all

payments have been met). In other jurisdictions, the lender only receives the right to repossess the property if the property owner defaults on the mortgage (e.g. does not make the payments required).

e) Communal or group rights are important in many countries, especially where land resources have been abundant and the land use of a group covers an extensive area. In such cases, the right to use the land and resources belongs to a group such as a family, a community, a clan, or a band, rather than individuals in the group. Such rights are often found in customary tenure systems, but not exclusively.

Different types of communal rights exist, with varying degrees of restrictions and control on the rights of individual members. When there is no traditional or legislative control on the individual, the common resources may become exhausted.

f) Other rights: It is common that land tenure is based on the fact that the land is used by someone for a certain purpose. Most customary or traditional land tenure systems are in some way based on this principle, although the content of the user right may vary considerably within different jurisdictions

6. Cadastral Issues

In creating, maintaining, and improving a Cadastre, there are a number of legal, technical, and operational issues that must be resolved according to the needs and constraints of each jurisdiction. Some of the priority issues are discussed below.

6.1 Documentation of informal or customary rights to land

Cadastral systems play an important role in land reform where there are changes in the tenure system. These changes can include, for example:

- formalisation of undocumented traditional or customary tenure;
- formalisation of spontaneous settlement based on occupancy;
- changes from one form of legislated tenure to another (e.g. leasehold or communal rights to full ownership).

In all cases, the existing rights and claims must be adjudicated and the new rights should be recorded officially. This may involve developing a new Cadastre or radically modifying an existing record. It is important that a link is kept to historical records even though this may not be part of the active cadastral system.

When a formal land registration system is introduced in a jurisdiction, it is necessary to investigate the existing informal, traditional or customary rights to land in order to transfer them with a certain degree of accuracy to the formal system. Criteria for determining what constitutes a legal claim to land have to be developed to support the adjudication process. But comprehensive adjudication of each claim can be very time consuming; it can delay and even threaten the implementation of the reform. Therefore it is often necessary to design effective but fast juridical and technical procedures to document the rights and to resolve any subsequent conflicts.

Land reform in areas where land is held by custom or communally is sometimes introduced to allow for the development of land markets. It is essential that such reforms are only started after careful investigations of the need for and the consequences of the reform. The establishment of a cost-effective Cadastre for customary rights, with or without changing the legal and administrative responsibilities is a significant challenge for cadastral organisations in many developing countries.

6.2 Designing land registration systems

Land registration is the official recording of legally recognised interests in land. As well as supporting conveyancing and property taxation, registration systems are often a source of government revenue through the collection of fees and transfer taxes. Most jurisdictions have some form of registration of legal documents, ownership, or use rights, but worldwide there have been major efforts to improve land registration systems to meet new demands for information, land transactions, and cost reduction. In some cases, a new system of land registration may be introduced to replace existing systems or informal arrangements.

There are many types of systems based on legal, organisational, procedural, and information management distinctions. From a legal perspective, the major types are divided between deed registration, where the documents filed in the registry are the evidence of title, and registration of title, in which the register itself serves as the primary evidence. Title registration systems are often further classified (e.g. European, Torrens, English) by the way boundaries are delimited and recorded, as well as other differences. Cadastral maps are, for example, an important basis of most European systems.

Although these distinctions can be useful, in reality there are as many variations as there are jurisdictions. For example, some deed registration systems today include important elements of title registration, such as cadastral mapping, parcel-based indices, and examination of documents to ensure compliance with laws and regulations. With computerisation and the development of modern land information systems, the distinctions among specific systems have become even less important.

Deed registration systems can generally be implemented more quickly and with less expense than title registration systems. Deed registration can also be linked to a system of title insurance as in the USA where the private sector provides the security found in a title registration system, however such a system does not usually provide land related information for broader economic, social and community purposes. The laws and procedures of title registration systems (including examination of documents and cadastral plans) are more complex, but in principle, title registration systems have benefits in terms of greater security of tenure and more reliable information. Furthermore, users do not have to search through old documents to find information on ownership; they can rely on the information on the title register. This usually results in lower transaction costs.

Therefore, in implementing a new land registration system or in reforming an existing system, it is perhaps most important to consider the needs and conditions within a particular jurisdiction. Registration systems can then be designed to reflect specific cost constraints, land law, organisational support, optimal procedures and information requirements. Both short and long term needs should be considered, as well as ways in which the system can be improved over time.

6.3 Sporadic or systematic approaches to land registration and surveying

When introducing new systems of land registration (land titling) and surveying in a jurisdiction, the work can be undertaken area by area in a systematic manner or sporadically, for instance, whenever there is a new land transaction. The methods can also be used simultaneously.

A major disadvantage of the sporadic approach is that it will generally take a much longer time to obtain complete coverage within the jurisdiction. A major advantage is that it requires fewer new resources and is therefore less expensive in the short term.

If the objective is to extend the Cadastre to a more comprehensive land information system within a reasonable time frame, the systematic approach is generally more effective. The time factor can be influenced markedly by the choice of technical methods used and by the standards for accuracy and data quality. In general, the systematic approach will reduce the time required to begin reaping direct benefits from the new systems.

6.4 Definition, demarcation and delineation of boundaries and parcels

Most parcel boundaries are defined by stable marks or visible features on the ground, which can be natural or artificial. They can be represented by lines on maps, often described by bearings or azimuths and distances, or by coordinates. If the representation on the map has legal priority over the marks on the ground in cases of dispute, the demands for survey accuracy are usually higher than if the case is the opposite. Physical demarcation on the ground is important because it provides actual notice of the boundaries to the landowners.

The demarcation and delineation of the boundaries are a part of a cadastral survey aimed at defining the parcel on the ground and securing evidence for the re-establishment of the boundary if it disappears. As the costs of cadastral surveys are relatively high, the technical requirements of demarcation and delineation (e.g. accuracy and survey methodology) should reflect such factors as the value of the land, the risk of land disputes and information needs of the users of the Cadastre.

The basic spatial unit in a Cadastre is known as a parcel. A parcel can be defined in many ways depending on the purpose of the Cadastre. For instance, an area with a particular type of land use may be considered a parcel in some systems; in others it is defined as an area exclusively controlled or owned by an individual or group of individuals (e.g. family or corporation). In some systems a property may consist of several parcels of land which may be distributed over a small region such as a village. The flexibility in the definition makes it possible to adapt the cadastral system to particular needs and thus also adapt the cost of the registration. If, for instance, the purpose is mainly to protect the ongoing traditional land use, larger parcels representing common interests can be defined as the basis for the system.

6.5 Technical methods for cadastral surveying and mapping

Cadastral surveying is usually undertaken using ground survey methods. A cheap and simple method is to use plane tables or tapes and optical squares. More sophisticated methods include the use of electronic distance measuring equipment or "Total Stations", which usually give higher

accuracies. Satellite positioning fixing using the Global Positioning System (GPS) gives high accuracy at a relatively low cost.

Cadastral surveying can also be undertaken by using aerial photography. Today high accuracies can be obtained using analytical photogrammetric methods. GPS can also be used to reduce the costs of establishing ground control. Other types of maps or images such as orthophotos or enlarged photo prints can be used to reduce costs in special areas, especially if a systematic approach is used. Satellite images can today only be used effectively in areas with very large estates and open terrain and in scales smaller than 1:25,000, whereas most cadastral maps need to have larger scales (1:500 to 1:10,000) depending on the size of the parcels.

Computerised mapping systems and geographic information systems reduce the importance of the physical map in favour of geographical data bases. The latter are much more flexible for a multi-user, multi-purpose environment.

6.6 Computer technology

Computer technology today offers excellent opportunities for the automation of Cadastres and the creation of land information systems. Every attempt to modernise or introduce such systems should consider using computers. Computer systems can be designed to provide better access to information, better quality, and better legal and physical security than other systems and in the long-run are usually more cost-effective. They will greatly facilitate data exchange and coordination between different agencies.

However computer systems are dependent on an infrastructure for maintenance and communication as well as access to well-trained operators. Graphical computer systems are more complicated and demanding on expertise than alphanumeric systems and require more complicated data management schemes.

6.7 Organisation, coordination and management of a Cadastre

Since the Cadastre is a public land information system with the aim of providing information for public land administration, supporting the land market and protecting legal interests in land, the management of the Cadastre should preferably be supervised by the government, either through regulation or through actual operation of the Cadastre.

With deregulation of professions in some developed countries, together with anti-monopoly legislation and efforts to downsize public administration, new organisational arrangements are being considered. These range from partnerships and strategic alliances between government and the private sector for managing and improving cadastral systems to contracting out some services to the private sector. It is increasingly common, for example, for the private sector to be responsible for data capture and update, for surveying and mapping, and even for the running of the computer system, and for distributing information in some cases. Such arrangements require standards, guidelines, and at least sporadic checks by authorities to ensure that the standards are met.

The greatest benefits of a cadastral system or system reform can only be realised if this basic information system is used and coordinated with other types of land information. This nearly always involves coordination with other public and private organisations which are responsible for this data. To be successful, such coordination needs leadership, effective communication, commitment, and

compromise. Coordination can be facilitated through legislation, establishment of standards, establishment of advisory groups, exchange of information etc.

The management of a cadastral organisation includes the establishment and maintenance of good contacts with, not only the primary users of the Cadastre, but also with the growing group of secondary users and clients. An important goal of a cadastral organisation must always be to provide good service to clients, ie., to give fast, easy and relatively cheap access to reliable data. This is necessary not only to avoid the development of expensive duplicate systems, but also to be able to realise the full benefits of a cadastral reform.

Another important aspect of management is the creation of good conditions in which staff can develop their skills in line with rapid technological development. A final major aspect is the creation of financing arrangements (e.g. pricing strategies, private sector involvement, new market opportunities) that will allow the organisation to invest in and develop new technology and new applications as the number of customers increases.

6.8 Financing and pricing strategies

Cadastral systems are usually financed through government funding. However, the general trend in developed countries is to seek financing more directly from the users. If this is the case and cadastral organisations are to be more dependent on income from selling their information, it is essential to clearly define in legislation the ownership of the information, associated copyright rules and the responsibility for maintaining quality.

A distinction however can be made between the cost of establishing a Cadastre or undertaking a land titling project and the subsequent cost of maintaining the system. The establishment of a system is a "one off" cost which may be borne by government but is increasingly part of a cost recovery program. Maintenance of the system or the provision of information from the system is more often based on cost recovery or even designed to generate government revenue.

In other words, more direct financing from customers cannot replace fundamental public investments in spatial infrastructure, such as the establishment and maintenance of a national coordinate system. Direct pricing will be more successful for products of direct interest for specific customers, for instance information on selling prices of real property. If the price of cadastral information is too high, this will be reflected in the willingness of the users to rely on other, less reliable sources. Since the Cadastre is one of the most important institutions underpinning effective land markets (e.g. through secure land tenure and efficient land transactions), governments generally provide basic funding.

Appropriate investments in establishing a Cadastre and/or improving one (e.g. through computerisation) provide both short and long term benefits. Such cadastral reforms should be based on a good understanding of user requirements and system constraints and on an achievable system design. Investigations show that cadastral reforms often have a higher cost-benefit ratio than is usual for governmental investments in general. Some of the benefits include:

- more security of land tenure
- better access to long-term credit
- increased productivity of land
- lower transaction costs on the real property market

- cheaper information for land administration
- more equitable and cost-effective collection of land taxes
- improved opportunities to implement land policies
- improved opportunities to plan for sustainable development of land and other natural resources

6.9 The role of cadastral systems in formulating, implementing and monitoring land policy

A cadastral system is an information system of land holdings and land use. Therefore it provides excellent opportunities for identifying problems associated with the development and implementation of land policies. The Cadastre can assist in monitoring and controlling matters regarding:

- the size of parcels, both maximum and minimum, for instance to prevent excessive fragmentation;
- the shape of parcels, to avoid uneconomical subdivision design or inefficient road and water systems etc.;
- reallocation of land rights to improve social and economic policies through subdivision, land consolidation, land reallocation etc.;
- land use, for instance agriculture or to ensure that low-cost public buildings are allocated to the right group of people;
- control and measures taken to implement social programs to improve access to land ownership by women and minority groups;
- valuation of land for the collection of government taxes and rates;
- collection of contributions to improve common facilities, such as water systems etc.;
- the value of land as a result of development;
- acquisition of land for public or common purposes.

6.10 Access to reliable data

Cadastral systems are used to provide information for various uses in society. The data often has great legal, social, and economic importance. Therefore the information should be accessible and the Cadastre should be open to the general public. Cadastral managers also have a responsibility to ensure that the information can be relied upon with confidence.

On the other hand, the information can be misused and the system must protect the interests of individuals from misuse. Misuse can include, for instance, provision of incorrect information about a person. It also includes the combining of harmless information with other information in such a way that a threat is created. Therefore, a balance must be established between open access to information and the protection of individual interests. This may be achieved through legislation, management policies, security access codes, etc. However, it should be emphasised that unless information is readily available to users and the general public, the real benefits of a Cadastre cannot be realised.

6.11 Measuring Success

While success may be a relative term, there are a number of well recognised criteria for measuring the actual or potential success of a Cadastre. These criteria include:

a) Security: The system should be secure such that a land market can operate effectively and efficiently. Financial institutions should be willing to mortgage land quickly and there should be certainty of ownership and parcel identification. The system should also be physically secure with arrangements in place for duplicate storage of records in case of disaster and controls to ensure that unauthorised persons cannot damage or change information.

b) Clarity and Simplicity: To be effective the system should be clear and simple to understand and to use. Complex forms, procedures, and regulations will slow the system down and may discourage use of the system. Simplicity is also important in ensuring that costs are minimised, access is fair, and the system is maintained.

c) Timeliness: The system should provide up-to-date information in a timely fashion. The system should also be complete; that is all parcels should be included in the system.

d) Fairness: In development and in operation, the Cadastre should be both fair and be perceived as being fair. As much as possible, the Cadastre should be seen as an objective system separated from political processes, such as land reforms, even though it may be part of a land reform program. Fairness also includes providing equitable access to the system through, for example, decentralised offices, simple procedures, and reasonable fees.

e) Accessibility: Within the constraints of cultural sensitivities, legal and privacy issues, the system should be capable of providing efficient and effective access to all users.

f) Cost: The system should be low cost or operated in such a way that costs can be recovered fairly and without unduly burdening users. Development costs, such as the cost of the adjudication and initial survey, should not have to be absorbed entirely by initial users. Low cost does not preclude the use of new information technologies, as long as the technology and its use is appropriate.

g) Sustainability: There must be mechanisms in place to ensure that the system is maintained over time. This includes procedures for completing the Cadastre in a reasonable time frame and for keeping information up-to-date. Sustainability implies that the organisational and management arrangements, the procedures and technologies, and the required educational and professional levels are appropriate for the particular jurisdiction.

7. Conclusion

Cadastre is a field of activity, important in early societies, but even more important today from a global perspective due to its role in economic development and environmental management.