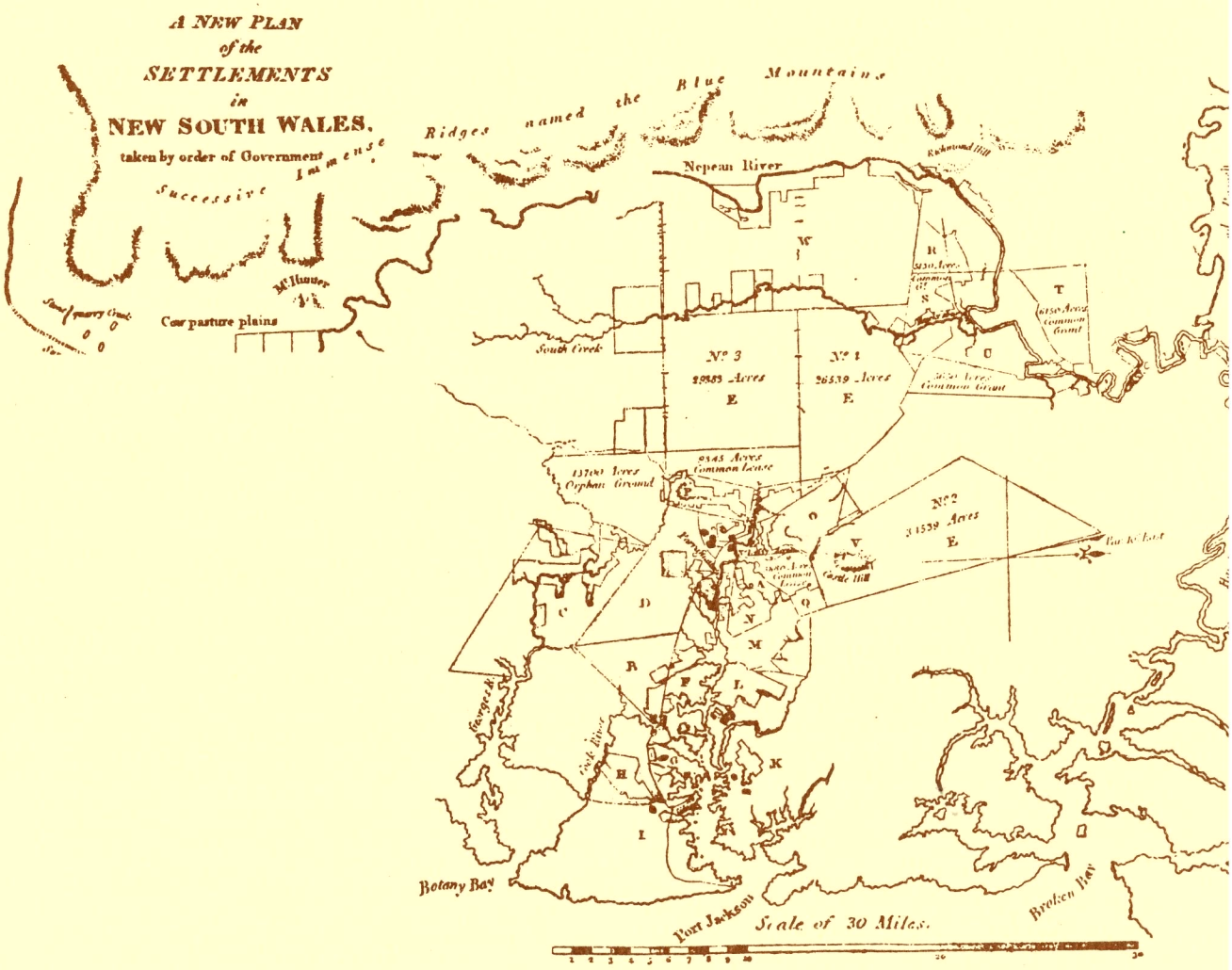
A MODEL FOR A CADASTRAL LAND INFORMATION SYSTEM FOR INDONESIA

BY
JAHJA SOETANDI



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ABSTRACT

The main objective of the research is to examine the overall land administrative system for the introduction of a parcel-based land information system (LIS) in Indonesia. The research is comprised of four parts. First is the study of the concept of a modern cadastre, that has been evolved from a wide range of cadastral system concepts within many developed countries around the world leading to the introduction of a computerised LIS. The second part concentrates on the fiscal and legal cadastral systems in Indonesia and on other uncoordinated land related activities, with the emphasise on surveying and mapping. The third part is to examine the theoretical principles for LIS and to investigate some alternatives and strategies for approaching the fundamental concept of LIS. The fourth part establishes a rational LIS model for Indonesia and outlines the LIS design and implementation followed by some recommendations for solving some political, social and administrative problems. This research required an extensive literature study, a period of field study in Indonesia as well as visiting a number of operational land data systems in various Commonwealth, state and local government organizations in New South Wales, The Australian Capital Territory, South Australia and Western Australia.

The LIS model is proposed for a long term development centred around two major organizations: Land Registry and IPEDA (land taxation office) that can form a cadastral database as a basis for LIS. Some recommendations on the overall land administrative functions in the government include improvement of the land registration system and integration with the land taxation system within the essential cadastral survey and mapping elements. Other supporting components for the overall development include legislation, organization, education and training aspects in order to obtain general acceptance, to generate cooperation and to rectify the role of surveying professional in Indonesia.

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GLOSSARY, ABBREVIATION AND ACRONYMS

GLOSSARY :

Akte	-	Deed
Book "A"	-	A list of persil's tax calculation in one desa
Book "B"	-	A list of tax payers in alphabetical order for each persil in one desa
Book "C"	-	A list of parcel(s) of each land holder within one district
Book "CC"	-	A list of parcel(s) of each land holder and its total annual tax within one district
Bupati	-	Head of Kabupaten
Camat	-	Head of Kecamatan
Carakan	-	A list of land holder's names in alphabetical order
Daerah lengkap	-	Prepared area (land titling with cadastral map)
Daerah persiapan	-	Un-prepared area (land titling without cadastral map)
Darat (d)	-	Dry land including farm, agriculture land, ponds, atc. (Non-sawah)
Desa	-	Village
Desa Register	-	A list of persils in one desa
Girik or Petuk DD	-	IPEDA statement of land tax assessment of one land holder
Kabupaten	-	Region
Kampung	-	Typical Indonesian settlement
Kantor	-	Office
Kecamatan	-	District
Kelurahan	-	Locality
Kotamadya	-	Municipality
Land Rente	-	Land Rent
Lurah	-	Head of Kelurahan
Notaris	-	Notary
Persil	-	A class of area (in rural area); it consist of a number of land parcels
Propinsi	-	Province
Rincikan	-	Detail of parcels in one persil including other land (descriptive) data
Sawah (s)	-	Rice or paddy field
P1 section	-	Renewal section I dealing with rural land
P2 section	-	Renewal section II dealing with urban land
P3 section	-	Renewal section III dealing with forest, plantation and mining land
Tata Kota	-	City and regional planning
TUPI 8	-	A list of land tax payers and the assessment for one desa
Walikota	-	Head of Kotamadya
Wilayah	-	Territory

ABBREVIATIONS AND ACRONYMS :

AKAMIGAS	:	AKAdemi MInyak dan GAS (Academy for Oil and Gaz)
APSPI	:	Assosiasi Perusahaan Survai dan Pemetaan Indonesia (Indonesian Association of Surveying and Mapping Companies)
ATPU	:	Akademi Teknik Pekerjaan Umum (Public Works Academy)
BAKOSURTANAL	:	BAdan KOordinasi SURvey dan pemeTAan NAsional (National Coordination Agencies for Survey and Mapping)
BAPPENAS	:	Badan Perencana Pembangunan Nasional (National Development and Planning Board)
CT	:	Certificate of Title
CIDA	:	Canadian International Development Aid
CLIPP	:	Conference on Compatible Land Identifier - The Problems, Prospects and Payoffs.
EDM	:	Electronic Distance Measurement
GIS	:	Geographic Information System
GPS	:	Global Positioning System
IBRD	:	World Bank, International Bank for Reconstruction and Development
IPDA	:	InsPeksi DAerah (Regional Inspection)
IPEDA	:	Iuran PEmbangunan DAerah (Regional Development Contribution; the term for Land Tax)
IREDA	:	Iuran REhabilitasi DAerah (Regional Rehabilitation Contribution)
ISGI	:	Ikatan Sarjana Geodesi Indonesia (Indonesian Geodetic Engineer Indonesia Association)
ISI	:	Ikatan Surveyor Indonesia (Indonesian Surveyor Association)
ITB	:	Institut Teknologi Bandung (Bandung Institute of Technology)
ITENAS	:	Institut TEknologi NASional (National Institut of Technology)
JANTOP	:	JAwataN TOPografi (Army Topographic Service)
KANWIL	:	KANtor WILayah (Territory Office)
KDL	:	Kantor Dinas Luar (Operational Office)
Kodya	:	KOtamaDYA (Municipality)
LIS	:	Land Information System
PBB	:	Pajak Bumi dan Bangunan (Land and Building Tax)
PENAS	:	Perusahaan Umum Survei Udara (Aerial Survey Company)
PP	:	Peraturan Pemerintah (Government Regulation)
PPAT	:	Pejabat Pembuat Akte Tanah (Land Deed Official)
PRONA	:	PROyek Nasional Agraria (Agrarian National Project)
PTSP	:	Pendidikan Teknisi Survai dan Pemetaan (Training for Survey and Mapping Technicians)
PUSDATA	:	PUSat DATA (Data Centre in Dept. of Public Works)
PUSSURTA-ABRI	:	PUSat SURvey dan pemeTAan-Angkatan Bersenjata Republik Indonesia (Army Survey and Mapping Centre Republic of Indonesia)
REPELITA	:	Rencana Pembangunan Lima Tahun (Five Year Development Plan)

SLIC	:	State Land Information Council (in NSW)
UMP	:	Urban Mapping Project
UTM	:	Universal Tranfers Mercator projection
UUPA	:	Undang-Undang Pokok Agrarian (Basic Agrarian Act)
UUPH	:	Undang-Undang Pokok KeHutanan (Basic Forestry Act)
UUPP	:	Undang-Undang Pokok Pertambangan (Basic Mining Act)

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CHAPTER 1

1. INTRODUCTION

The term "cadastre" has been introduced and widely used in many developed and less developed countries, but "in many cases the misuse of the term 'cadastre' (mostly in common law countries) has led to a misconception of the basic cadastral principles" (Williamson, 1985). The term has often been adopted without the users really understanding the principles underlying the original concept of a (modern) cadastre.

To clarify the concepts of a cadastre, it is necessary to define the term cadastre and its major components (land registration, cadastral survey and cadastral mapping) used in this thesis. It is not the intention of the thesis to describe the terms in detail, since a detail studies in this matter has been well documented by Williamson (1981A, 1983A, 1985), Dale (1976, 1981), McLaughlin (1975), Blachut (1974), Bullock (1984), Binns (1953), Larsson (1971, 1975, 1978), Henssen (1975b, 1978), and Hampel (1978). Therefore, the definition of terms given in brief form is based on the above studies. The term "land information system" is also discussed with regard to a developing country's perception of its present needs and the design strategy for setting up a land information system.

A short historical development of land record systems, cadastre and cadastral systems in developed countries and Indonesia is reviewed. The growth of the early land record system from a taxable record system, to the current era of computerized land information systems shows that the uniqueness of the existing land record systems is based on their local conditions. One system that is appropriate to the situation in one country is not necessarily transferable to another country where conditions are usually very different. It is difficult for a system to be transplanted from a developed country to less developed countries. Therefore, it is important to review briefly the various combinations of social, political, environmental circumstances and their historical background that exists in a country.

Finally this chapter concludes with a summary of the objectives and methods of study carried in the research.

1.1 CADASTRE CONCEPT AND DEFINITIONS

1.1.1 CONCEPT OF MODERN CADASTRE

Within cadastral and land information disciplines, there have been numerous attempts to describe the term cadastre. However, it is difficult, if not impossible to define it precisely. Neither will there be an universally acceptable definition because the form of cadastre in each country is always different being based on its historical differences, laws, customs and the establishment of conveyancing and land registration system. One definition which may have general acceptance is summarised and defined by Williamson (1983A), as :

> **"A cadastre is a complete and up-to-date official register or inventory of land parcels in any state or jurisdiction containing information about the parcels regarding ownership, valuation, location, area, land use and any buildings or structures thereon."**

The form or nature of the records shows two very distinctive components of cadastre, which are as follows: (Dowson and Sheppard, 1956)

1. **A parcellation record of land units, shown on diagrams or maps on a suitable scale, giving its division in units, the locations and boundaries as a spatial component of cadastral record.**

2. **An authorative documentary record, shown in a related descriptive register in respect of each land unit or parcel.**

The land parcel itself is the basic building block of the cadastre which is in general the smallest unit of ownership. The parcel covers a continuous area of land and a continuous interest in the land.

Many government-instituted systems or machineries of land administration in many Commonwealth or common law countries that deal with conveyancing, land registration, cadastral surveying and cadastral mapping are based on the English system - intrinsically English Land Law. Very often, these administrative systems cannot be simply regarded as cadastres. The term used for these systems in this thesis is largely based on the study by Williamson (1983A). It adopts the term "cadastral system", because implicit in the definition of a cadastral system and cadastre is that "a cadastre can be a cadastral system, but a cadastral system may not necessarily incorporate a cadastre". To distinguish the incomprehensive systems which mainly existed before the 19th century from cadastre, the term "land record systems" will be used as a very broad meaning of land recording systems.

The European and English cadastral systems are the two basic types of cadastral systems in use in the world. Even though their concepts are considerably different, the term "cadastre" in general is still being used to described them loosely because of a general lack of understanding and consensus on the concept of a cadastre. The differences between them are discussed in some detail by Williamson (1983A), who summarises the modern cadastral concept in relation to the European cadastre:

1. A series of large-scale maps showing property boundaries, all buildings and structures on the land and the major natural features.

2. A register or number of registers containing information on ownership, valuation, land use and any other matters dealt with by the cadastre, for every land parcel.

3. The cadastre must be complete, that is every parcel of land in the state or jurisdiction must be displayed on the maps and included in the respective registers.

4. Each parcel in the cadastre must have a unique common identifier.

5. The cadastre must be dynamic.

6. The information in the registers must be correct and preferably have legal status and be guaranteed by the state.

7. The contents of the registers should be public, within reasonable limits.

8. The large-scale mapping system must be supported by a permanently marked and well maintained, coordinated survey system.

9. The cadastre must include an unambiguous definition of parcel boundaries both in map form and on the ground. This is usually as a result of cadastral surveys.

1.1.2 CADASTRAL COMPONENTS

The major components of a cadastre are land registration, cadastral survey and cadastral mapping. All of them are part of land management in which information about land are processed, either quantitatively in a form of measurements and descriptive records, or qualitatively as often expressed on maps. The most important aspect concerning the maintenance and the effective use of this information is to integrate all the information of the major components of the cadastre into an unified land record system.

Land registration itself broadly means a system of documenting complete and valid records of information concerning land, whether for legal, fiscal or other purposes. The establishment of a land registration system serves to benefit the government and local authorities and individuals as well.

The term land registration is used synonymously with the land registry or the land registry system. Within this term, there are two broad categories of land registration systems, namely: registration of deeds and registration of titles. A deeds registration system is based on record of transaction or deeds on land. A deed is an evidence or a written document of a particular transaction without proving the legal right of the party(ies) in that transaction. Therefore legal right can only be proved by tracing back the ownership to a good root of title. Title registration contains details of rights vested in an (some) owner (s) and the limitations, based on land parcel. The necessary change, based on a transaction, is entered in the register only by an authorized official. So it is not necessary to prove the legality of the title by tracing back the ownership to a good root of title. The title register is much more conclusive and definite than the deeds register. The major difference is that

the proprietary land parcel is the unit of registration in a register of title, whereas deeds are the unit of registration in a register of deeds.

The deeds registration system was operational in many countries and jurisdictions before the land title system was introduced for the first time in the mid 19th century. Conceptually these two systems are different, but in practice the differences often cannot be seen. Many countries or jurisdictions may not have a purely title or deeds registration system. They may have a system that incorporates some functions of both systems, varying somewhat between the extremes of the title and the deeds registration system (Williamson & McLaughlin, 1985).

For the purpose of this thesis, the term "land registration" will be used to cover the spectrum of such systems and if necessary the terms deeds registration and title registration can also be used to distinguish one from the other.

The term land registration has been centered mainly on a written or descriptive part of the cadastral record. The other part of the cadastre is a graphical or technical part, involving cadastral surveys and mapping. It contains an index which refers to the first part and a detailed description of the parcel, which is usually in the form of maps or survey data. The objective of the cadastral survey and mapping is very often solely to determine the location of each parcel, the extent of its boundaries and surface area and to indicate its separate identity both graphically on a map or record, and physically on the ground.

In the context of the modern cadastre, the function and the arrangement of cadastral surveys and cadastral mapping cannot be simply separated. The cadastral survey's role is to update the cadastral map, not only to prepare a single isolated boundaries survey just to support the conveyancing system. In many countries (mainly in Commonwealth countries), including Indonesia, a cadastral survey is carried out on a single parcel of land as an isolated boundary survey. It has the single role of providing a very high standard of survey for the purpose of supporting the registration system.

Many cadastral maps show the location of land parcels in an area. They may contain parcel boundaries, parcel identifiers, street names, public place names, and the ownership status (public and private lands) as well as other parcel information. It is commonly desirable that a cadastral map is separated from topographic maps that show the physical features. But in practice, for the purpose of efficiency, a cadastral map may also show the physical features and sometimes the map is in a form of rectified aerial photographs.

Based on their function or purpose, it is possible to distinguish two broad types of cadastral maps. First, there is the cadastral (index) map that provides the index to all parcels. It enables rapid access to the land registers or land records. The second is the cadastral (legal) map which has exactly the same functions as an index in addition to having a legal status regarding boundary or ownership details.

From technical view point, there are graphical and numerical forms of cadastral systems which are distinguished by the sophistication of the presentation of spatial information and the form of spatial data stored in the database. A graphical system is relatively simple and unsophisticated, based on graphical presentation of photomaps or from stereo restitution for cadastral mapping. In boundary surveys, it is based on instruments such as planetable. The main objective is a graphical representation and the record stored in map form. The numerical cadastral system on the other hand is based on a numerical survey record system which generally describes coordinate of each point and the map is plotted from those coordinates.

1.1.3 LAND INFORMATION SYSTEM (LIS) PERSPECTIVE FOR DEVELOPING COUNTRIES

In developed countries, the introduction of better land administration is accompanied by the implementation of advanced techniques and more efficient systems, namely (computerized) Land Information System (LIS). The term of LIS has been defined by the Federation Internationale des Geometres (FIG) - Commission 3 (1981). To clarify the definition, modifications were recommended by Hamilton and Williamson (1984), as follows:

> "A Land Information System is a resource [tool] for legal, administrative and economic decision-making and an aid for planning and development which consists on the one hand of a data base containing spatially referenced land-related data for a specific jurisdiction [defined area], and on the other hand, of procedures and techniques for the systematic collection, up-dating, processing and distribution of the data. The base of a land information system is a uniform spatial referencing system for the data in the system, which also facilitates the linking of data within the system with other land-related data."

The term LIS has become commonly used in the less developed countries. Some people have come to believe that a LIS is a tool that can resolve the land administration problems. However, as described by Williamson (1986A):

> "the term (LIS) can cause considerable confusion in developing countries. Unfortunately 'land information systems' have been promoted in the broadest sense in some developing countries as a general solution to land administration problems. Such advice is often misleading and in some cases simply may not be true."

In the broader information system environment as shown in figure 1.1, there is no fixed division of definition used between land and geographic information systems, thus the following categorisation is not rigid. Nevertheless there are two different types of Land (Geographic) Information Systems which are based on different types of land related data. Figure 1.1 is a general breakdown which may place a LIS in the broader information environment. A LIS is firstly a collection of parcel-based land related data which are usually recorded on large scale cadastral maps. Secondly a (generally called) Geographic Information System

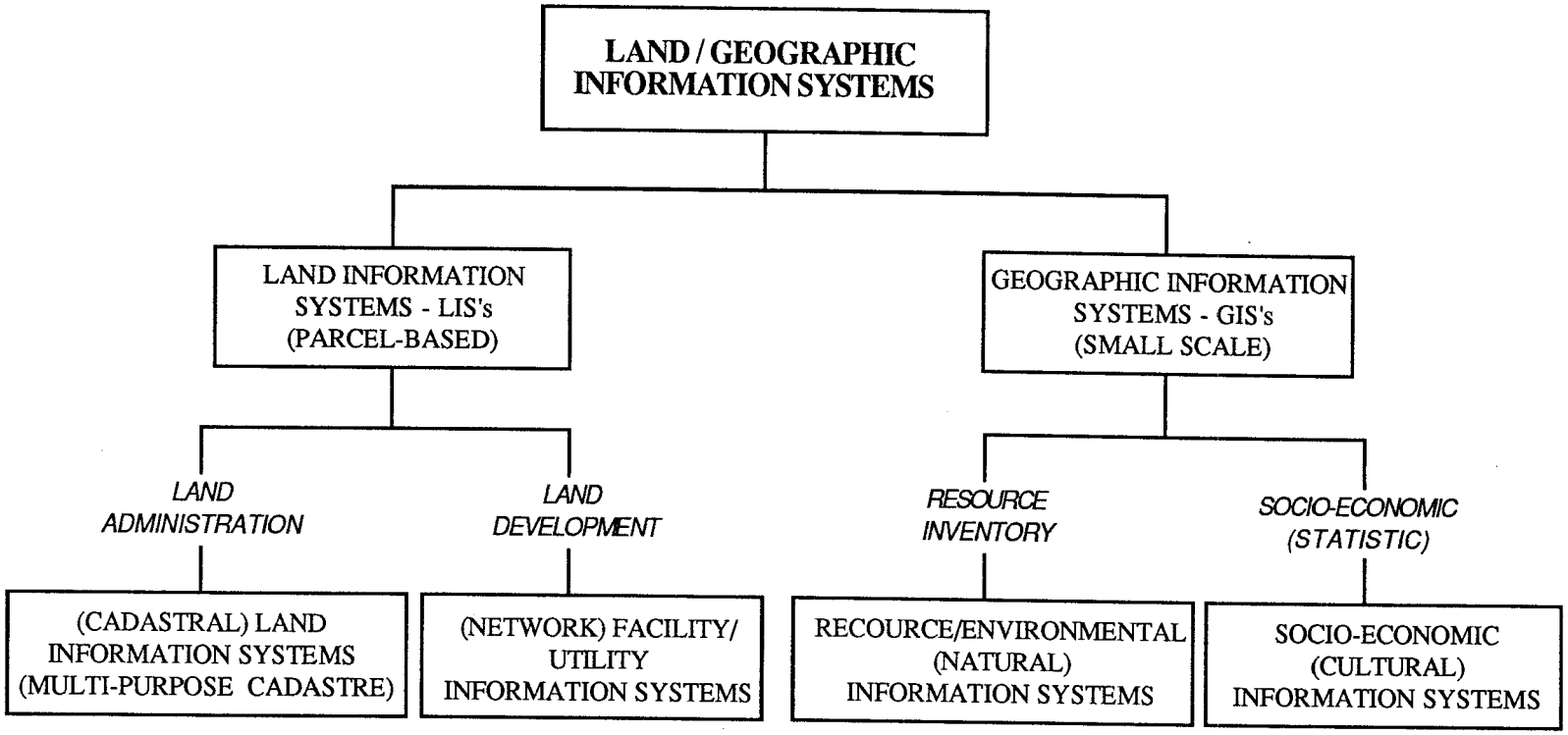


Figure 1.1. General Breakdown of LIS in the Broader Environment.

(GIS) is concerned with demographic, environment and natural resource related data typified by smaller scale topographic maps which are not necessarily parcel-based. However in the overall strategy of a government both components (LIS and GIS) have to be compatible and to some extent integrated (Williamson, 1986A). More views on differences and similarities on LIS and GIS are discussed by Marble (1984). In this thesis, only the parcel-based LIS is discussed. LIS has been understood around the world as equivalent to a computerized LIS. This is not necessarily true. To avoid this misconception, the term "computerized" is used in the thesis to describe the use of computer in a LIS.

The Ad Hoc Group of Experts on Cadastral Surveying and Land Information Systems of the United Nations has stated in the report (1983), that:

> **"In all versions of the cadastre, there are land records and therefore the cadastre is one kind of land information system. The reverse, however, is not true. Land Information Systems need neither be concerned with the cadastre nor with land parcels."**

Nittinger (1978) claimed that many officials responsible for land are aware of the political and economic importance of a modern cadastre or a multipurpose cadastre or a LIS. However financial and organizational limitations may not permit the introduction of a multipurpose cadastre or a LIS. Where funds are available, it would be advisable to undertake a thorough investigation into the viability of such a project.

It is necessary to understand the whole concept of LIS. The role of LIS, factors to be considered before its establishment, method of establishing a LIS, principles or selection of methods of acquisition of data, institutional aspects, training, and continuing maintenance of LIS are the subjects that have to be investigated carefully. In every country's (or often jurisdiction's) LIS, the administration of its land registration system is unique and it is heavily dependent on local conditions. Therefore, an extensive investigation has to be undertaken concerning the existing land administration system.

Developing countries may erroneously think that organizations in land administration in developed countries have successfully completed their systems and that these systems could be transported into their environment. Many such systems may indeed demonstrate a wide range of capabilities for handling land data. However, there are usually still problems that have not been resolved. There is no turn-key computerized or non-computerized system that can be implemented for any country. Problems in setting up a land information system are very complex, ranging from technological considerations to also political and administrative concerns.

To develop a multipurpose cadastre or a computerized LIS in developing countries, it is essential that the cadastral base should be improved in the first instance. Emphasis in this thesis is on the aspects of the cadastral system in Indonesia that are critical for the establishment of a land information system.

1.2 THE HISTORY OF CADASTRE AND CADASTRAL SYSTEM

1.2.1 ORIGIN OF CADASTRE

Land measurement and the creation of land records have been traced back to 3000 B.C. to the ancient Egyptians, whose methods were adopted by the Romans in about A.D. 300 to establish land reform. The Roman system is recognized as being the first European fiscal registration system that had the main purpose of tax collection for the Roman Emperor.

The word cadastre itself is generally accepted as being derived from the Latin word "capitastrum", - a register of "capita" or "capitum registrum". The word capita was described by Dowson & Sheppard (1956) as follows:

> **"the unit of the new tax (jugum) was a parcel of land of variable extent, but which an able-bodied peasant (caput) was declared capable of cultivating and living on. Thus a property of 100 juga meant a property of 100 labourers or capita"**

However Nittinger (1974) claimed that "cadastre" was derived from the medieval Greek word "katastikhon", denoting a note book or a business record. The word "katastikhon" is also derived by several modern dictionaries to mean literally "line by line" or a tax register (Simpson, 1976).

From ancient times, land recording systems have been used primarily to support land taxation policies. In around 1000 A.D. the Indians under Raja Raja the Great surveyed for revenue purposes (Larsson, 1971); and the famous Domesday Book in England systematically compiled a comprehensive survey record of all land holding in a very short period (1085-1086).

There were several other compilations of land records later in the European Continent such as in France in 1115 (NRC, 1980), Pisa in 1162, Siena in 1202, Vericelli in 1207, Milan in 1208, and Florence in 1285 (Hampel, 1978). However the origins of the modern concept of cadastre were found in continental Europe during the eighteenth and nineteenth centuries. The earliest effort was the Milanese cadastre mapping program (1720-1723) followed by the Austro-Hungarian monarchy (1785-1789) under Emperor Joseph II (NRC, 1980).

Even though those systems were mostly compiled for taxation purposes, several were also compiled for legal purposes. However the need for (large-scale) cadastral maps had not largely been recognized and used as a basis for their registers until the beginning of 19th century, when the French developed a highly comprehensive land record system for a proper cadastre under Napoleon I. It was here the term "cadastre" was introduced for the first time and hence it became a French word.

From the 19th century, the growth of European cadastres had been strongly influenced by the Napoleonic cadastre, because of the French occupation over very large areas of Europe between 1794 to 1814. Henssen (1975A) indicated that the cadastre concept at that time was clearly born from the Physiocrat principle. This

principle means that the only proper object of taxation as the major source of revenue for a state or government was from collecting taxes on land (McLaughlin, 1975; Henssen 1975, 1978).

The important realization of the French at that time (1808) was that a proper survey of all parcels of land and the representation of all land holdings on a large scale map were absolutely necessary. In addition, Napoleon I soon realized that such surveys and maps could also be utilized for other purposes including a register of legal parcels. But he failed to implement it because he did not realized that it required more sophisticated administrative arrangement. However, in order to realize the importance of proper mapping, Napoleon I had experienced a tremendous and expensive waste of 18 years (1790-1808) in time and nearly 100 millions francs in cash (Hampel, 1978).

Outside the European Continent, England had developed their famous systematic land survey and land record system, known as the Domesday survey. England was able to maintain the system without significant changes or much influenced from the Europeans for nearly 1000 years. It was argued by Dowson & Sheppard (1956) that there had been no French occupation ever in England, so there were no dramatic social changes, revolution or any substantial instability, which could influence their comprehensive land administration system, even though some evolutionary and slow incremental changes occurred during that time. Other significant reasons were the economic and administrative condition of this country. In general, land holdings in England were relatively large and recorded in less detail than in Europe where there were an extensive number of small land holdings due in part to the system of inheritance.

In South Australia, a title registration which is known as the Torrens System (1858) was introduced by Sir Robert Torrens. About the same time, in Great Britain (1862) another title registration system was also introduced through the Land Registry Act. However, the latter was a failure. It was followed by several other failures in two Acts (in 1875 and 1897). Finally in 1925, through the Land Registration Act, the title registration system was successfully implemented.

1.2.2 THE EVOLUTION OF LAND RECORD SYSTEMS TOWARDS LAND INFORMATION SYSTEMS

Following the Early land record systems described earlier, the primary purpose of the European cadastre, born in the beginning of 19th century was solely for land taxation. The intention to protect ownership and to facilitate conveyancing involving adjudication, demarcation and the recording of rights had been growing since the mid 19th century in Germany and France, and later in several European countries. The attempts were to introduce a land registration system based on title registration. The first title register system was introduced in Germany, followed by other European countries in the beginning of the 20th century such as Austria (1900), Denmark (1926), Norway (1935), Sweden (1932), Switzerland (1912) and Yugoslavia (1930) (Williamson, 1983A). The legal base of the European cadastre had

gradually evolved from a fiscal base. It is obvious that the European cadastre is the origin of all present day cadastres. In the beginning of the 20th century, the European cadastre was being up-dated for a multipurpose uses hence it has been called a multipurpose cadastre. A simple diagram of the evolution of land data systems is shown in figure 1.2.

Cadastral systems outside the European continent or in common law countries had also been undergoing changes during this period. These systems have been slightly influenced by the European systems. In general, the primary goal was to improve and establish a more efficient conveyancing system by introducing a title registration system or converting a deeds registration to a

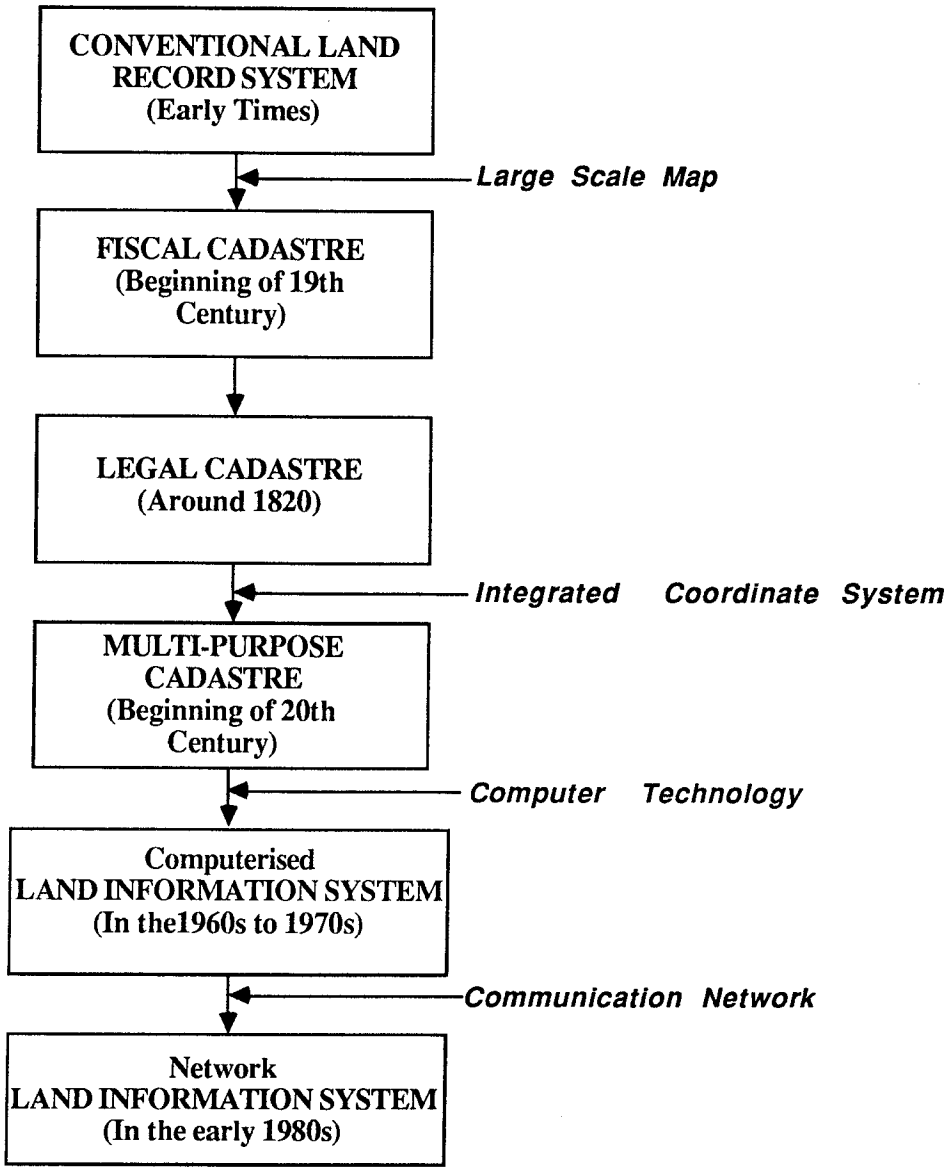


Figure 1.2. The Evolution of Land Data Systems.

title registration system. The establishment of land registration systems outside Europe appeared to be very distinct and concentrated on the aspects of land registration without much regard to other related components in the cadastral system. It can be rightly claimed that cadastral systems in most European countries are slightly ahead of systems in most common law countries. Most European countries have operated a modern cadastre which has a better foundation to accommodate many users for many purposes (including fiscal and legal).

As discussed above the establishment of the modern European cadastres and the common law legal cadastral systems occurred at about the same time. There were similar trends in developments in these countries in that they are used mainly for conveyancing purposes and provide a legal status of ownership. However there are several basic differences between them as summarized in detail studies of the existing cadastral systems in developed countries (Williamson, 1985).

1. The most distinctive feature is the use of large scale cadastral maps as a central component in the European cadastres. In most common law countries except Great Britain, there is no large scale cadastral map base on which to build a modern cadastre.

2. The land registration system including cadastral surveys in European cadastres is a central component not only for conveyancing processes but also as an integral part of up-dating cadastral maps. In many common law countries, cadastral surveys are usually of high standards but are not integrated into a controlled mapping framework. Lack of integration between cadastral surveys and topographic (cadastral) mapping in common law countries is very common. Cadastral surveys are usually controlled by the land registry office and topographic (cadastral) mapping by the survey department.

The development of the Swedish Land Data Bank System (Andersson, 1985) is one of many examples in European countries. The creation of this system in the early 1970's was a very important advance to connect the Land Register Agencies and Real Property Agencies. As a result, both are also responsible for up-dating the central data bank for each change or transaction in their agencies. The development of this system had effectively supported a wide range of land information applications in this country.

Integration of inter-related land administration institutions is the main emphasis in the system development especially within the European countries. As an example, Switzerland has effectively operated the cadastre under one organization at a state level, administering land registration, cadastral surveying, large-scale mapping, conveyancing and valuation. One common national grid system is used for all boundary surveys. Moreover a numerical approach has been adopted, whereby coordinates of all traverse points, boundary points and all corners of houses and structures are kept in a list in local cadastral offices in one data base. This data is an important foundation for a multipurpose cadastre. Further developments towards a computerized land information system appear to be the main goal of the overall plan, although

they are still underway.

Great Britain is similarly geared towards a multi-purpose cadastre, although the form of the cadastral system in this country is unique, even within Commonwealth countries. Land registration is called compulsory in all urban areas i.e. seventy percent of estimated titles. Moreover, it is being expanded steadily across the country. However, the large-scale topographic map series have been virtually completed and are now being produced by digital mapping techniques. The large-scale cadastral maps are prepared by the Ordnance Survey. Nearly 200,000 Ordnance Survey maps are used by many authorities as a base for multipurpose functions (Dale, 1981 and Smith, 1984). To some extent, the title register is closed to the public and it has a limited flow of information with other authorities (Dale, 1981 and Williamson, 1985). Parcel boundaries determined by title registry offices are not fixed and they are called "general boundaries".

Within the Commonwealth countries, Australia has a very well establish Torrens Title registration system. This system has been adopted in many developed and less developed countries. Large scale cadastral maps have not been the centre of cadastral system. This component has been separated from the land registry which is based on isolated cadastral surveys. The cadastral system has not changed much and was still based on the early common law conveyancing until the 1960's, when the concept of survey integration was introduced. However over the last two decades, all states have become aware of the concept of a parcel-based land information system. The current development of this system is in parallel with the development of cadastral systems (Williamson, 1983A). Today, a network of Land Information Systems (LIS), which consist of a number of decentralized sub-systems and led by Western Australia, are being developed.

As described above, the evolution of the cadastre in the last century was from fiscal-oriented to a legal or judicial-oriented cadastre. At the beginning of this century, some of the European cadastres were developed further into multipurpose type cadastres containing a wide variety of land information, from details of human and physical resources to details of services and utilities (Dale, 1978). Today the emphasis has changed. The term Land Information System (LIS) is gaining popularity, accelerated by rapid computer developments since the 1960s. A multipurpose cadastre can provide the basis for a distributed network of LIS's maintained by various agencies.

1.3 CADASTRAL SYSTEMS DEVELOPMENT IN INDONESIA

1.3.1 BRIEF HISTORY OF CADASTRAL SYSTEMS

In Indonesia prior to 1960, a parcel-based land record system was operated under the Dutch style of law, as most of the country had been ruled by the Dutch since the beginning of 17th century. This was a European (Dutch) Agrarian system applied entirely with the aims of protecting the Dutch population, and some other minor ethnic groups in urban and plantation areas.

Although the land record system had been introduced nearly two centuries before the French cadastre, the arrangement of land administration had not been properly established. Some administrative changes had occurred before the 19th century but they were relatively insignificant compared with the other comprehensive developments in Europe at that time.

For the rest of the local communities, a land recording system followed the system introduced by Sir Thomas Stamford Raffles during the short period of the British occupation (1811-1816). The land rent system was originally conducted by an agency called "Land Rente" (taxation office) for the purpose of land tax collection on mainly agricultural land under customary (unwritten) laws. The customary laws of each major ethnic area in Indonesia are varied and they apply just to their communities. The only written record of ownership for such land was a receipt for tax paid. Up to the 1960s, the owner may also have had a document (called girik) which was in fact a statement of the land area registered in the taxation office without any description or a plan of the land parcel. The purpose of this document was to provide more security of tenure because when a new land registration system was introduced in 1960, the institution that administered the system was not ready to undertake the land registration task. The land records have only been collected for a limited number of villages.

On the 24th of September 1960, a New National Agrarian Law, Act No. 5, concerning the Basic Regulation on Agrarian Principles was introduced to abolish the dualism of the Dutch laws and customary laws. The effective date of the land registration component came later, on 23th of March 1961. The new National land law is based on customary law principles and a Constitution produced during the Independence in Article No. 33, that is:

> **"Land, water and all natural resources are Government's responsibility and authority to regulate and to use for the maximum prosperity of the people".**

In Article No. 19 of the Act on the registration of land, it states that the intention of the government is to have all ownership rights in land registered, primarily for the benefit of the land owners and to provide some degree of security and to facilitate land transfer. However, in practice there had been tremendous problems in implementing such a huge task. Because of the new regulation, and also some changes in the administrative structure of the whole government due to political instabilities and chaos from the "Old Order" before 1965, very slow progress was made.

The Act also states that the land registration system is a "user pay" system, but for the very low income people, it is free. To operate such a huge task needs considerable financial backing, because most of the population is poor. This is a very difficult problem in developing countries. In addition, the system is not easily understood and accepted in its social and political environment. After more than two and a half decades, progress is still very slow.

Discussions about the land regulations as well as the existing conditions of the land record system will be reviewed later in more detail in chapter 2.

1.3.2 GENERAL BACKGROUND

1.3.2.1 GEOGRAPHICAL CONDITIONS

Indonesia is the largest archipelago, comprising five large islands (larger than 130,000 sq.kms): Kalimantan, Irian Jaya (West Irian), Sumatra, Sulawesi and Jawa respectively in descending order of size, and about 13,600 small islands. The total land area of Indonesia is approximately one fourth that of the Australian continent (about 2 million sq.kms), but the population is about ten times that of Australia. With rapid population growth, there is very strong pressure on land, especially those concentrated in Jawa (the fifth largest island). This is the most populated island in Indonesia, although their total area is only about 132,187 sq. kms. or about 6.5 % of the Indonesian total land area.

From the last census (1980), the population of the country was nearly 147.5 million. With 2.3% annual growth, now there are approximately 170 million people in this country. About 62% are in Jawa, which contains only 5 provinces. In this particular island, land has become a very valuable commodity. In rural areas, forest is extensively cleared for illegal cultivation. In urban and rural areas, land is frequently overcrowded with squatter settlements and "kampung" settlements. Land usage is often inappropriate. The average size of a land parcel for cultivation is 0.6 hectares, usually owned by one family (Soeroso, 1974). In contrast, the average size of a land parcel on the other islands such as Sumatra, Kalimantan, Sulawesi and Irian-Jaya is more than 1.5 hectares per family. This figure appears to exclude the large area of forest. Henssen (1974) has described this common urban problem:

> **"the rapid growth of population has created increasing pressure on rural land, while simultaneously a massive migration of people to cities and towns has led to the uncontrolled growth of urban centres."**

The combination of exploding population on a very limited area coverage (in Jawa) and less populated area on the other islands, necessitates better land management and control. Land surveys and adequate records and inventories of resources (land and human) will be required to make this possible.

Unfortunately this need for a good infrastructure to support the bureaucratic processes of land administration is sometimes overlooked or neglected. Moreover, the situation is very complex, in view of the number of separated islands spread over the very large areas that have to be controlled. Substantial land data and information have to be managed by a labour force comprising largely of unskilled workers instead of highly skilled personnel. The following comment expressed by Dale (1976) exemplifies this problem:

"much inefficiency exists, much is done that need not to be done and much that should be done remains undone."

Unfortunately, statistical data about land parcels are not available. To estimate the average number of parcels in one province in Jawa, the follow information are assumed: consider 132,187 sq.kms, in 5 provinces having an average parcel area of 0.6 hectares, of which 70% are public land (which may be less), there would be more than 1.3 million parcels. In major urban areas, this figure appears to be reasonable. In a city like Jakarta (approximate area of 656 sq.kms. and with an average land parcel of 150 sq. metres), this figure could be higher.

1.3.2.2 ADMINISTRATIVE STRUCTURE OF THE GOVERNMENT

Since Independence (1945) Indonesia has been divided for administrative purposes into provinces. Today, as a result of the new provincial division during that period, there are 27 such provinces including two special regions and one special capital city which is equivalent to the provincial level. Each province is subdivided into regencies (Kabupaten) and/or municipalities (Kotamadya). Regencies are further subdivided into districts (Kecamatan), and districts further subdivided into villages (Desa). Municipalities are subdivided into districts (Kecamatan) which in turn are divided into localities (Kelurahan). Localities and villages are the smallest jurisdictional areas for local governments. The structure of administration is shown in figure 1.3. The administrators for each level of government are also indicated.

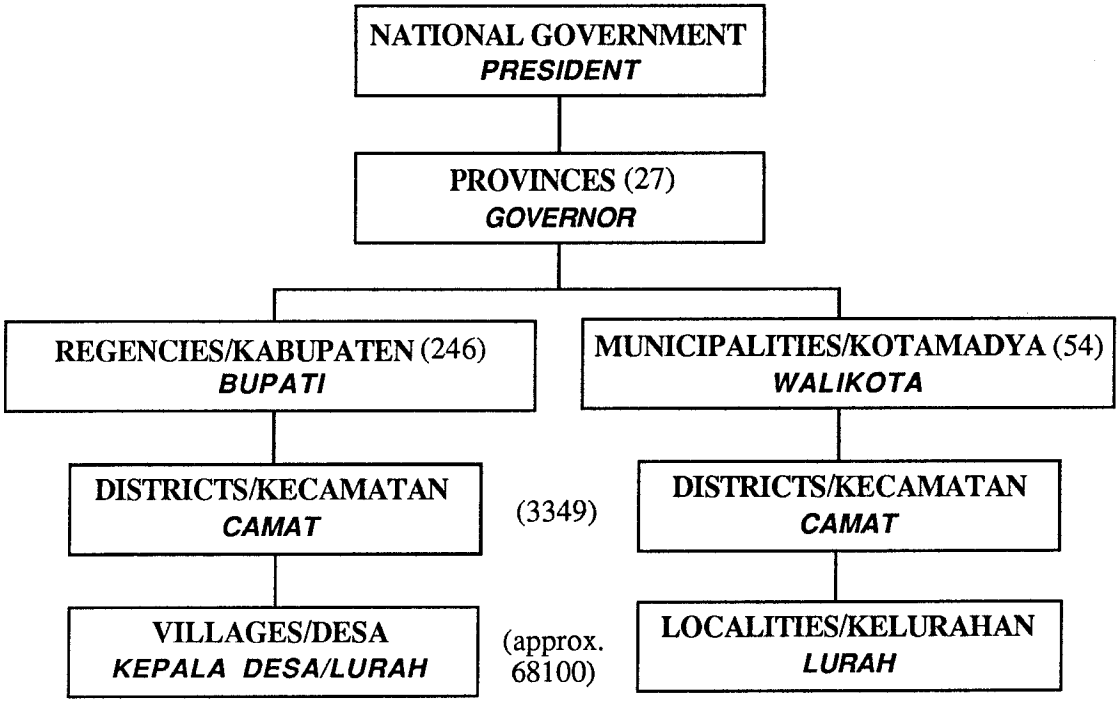


Figure 1.3. The Statewide Structure of the Indonesian Government.

The hierarchy of the Government (see figure 1.4) in general, is divided into as many as 21 Departments, each with a minister overseeing a number of Directorate Generals administered by director generals. Directorate Generals are subdivided into Directorates administered by directors. There are two Directorates in the Government which are directly concern with land parcel records, namely Directorate of Land Registry (Direktorat Pendaftaran Tanah) under the Directorate General of Agrarian Affair (Direktorat Jendral Agraria) - Department of Interior (Departemen Dalam Negeri), and the Directorate of IPEDA (Land Taxation) under the Directorate General of Taxation (Direktorat Jendral Pajak) - Department of Finance (Departemen Keuangan). In addition to those two directorates, there are several other agencies resulting in duplication in mapping; namely the Department of Public Works, which has 4 directorates and one mapping centre unit; the local government of the City of Jakarta that has its own mapping section; and the National Coordination Agency for Surveys and Mapping (BAKOSURTANAL - under the State Minister) which is equipped with very high standard of mapping equipment. Details about their functions, activities, and drawbacks are discussed in chapter 2, chapter 3 and chapter 4.

Each province has a high degree of autonomy in the administration, but the statutes and regulations are under the direction of the central government through each department concerned. Major development is coordinated by the central government. The Indonesian provincies have autonomy similar to the local councils in Australia. The Local Agrarian Offices as well as the Local Taxation Offices are administered under the direction of their minister.

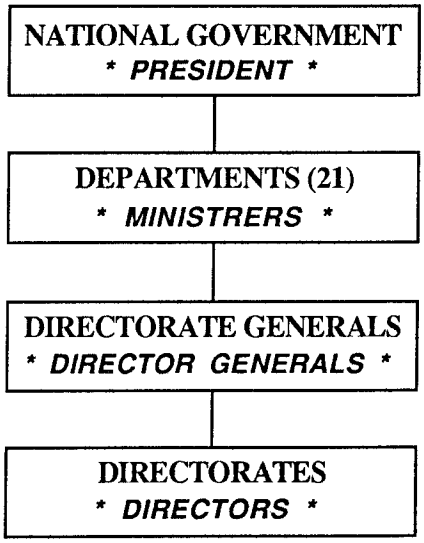


Figure 1.4. The Overall Indonesian Government Structure.

1.4 OBJECTIVES OF STUDY

The main objectives of this study are to examine the cadastral system in Indonesia, to investigate and to recommend the creation of a land data base and to conceptualise the strategies for the development and implementation of a multipurpose cadastre and land information system. The problems and solutions are approached as diagrammatically shown on figure 1.5.

The prevailing condition in Indonesia is examined. There are inexistence, two land record systems, namely those for fiscal and legal purposes. Due to political, social, economic and administrative problems, neither of them is effective nor appropriate as a central component of land administration, for internal or external purposes.

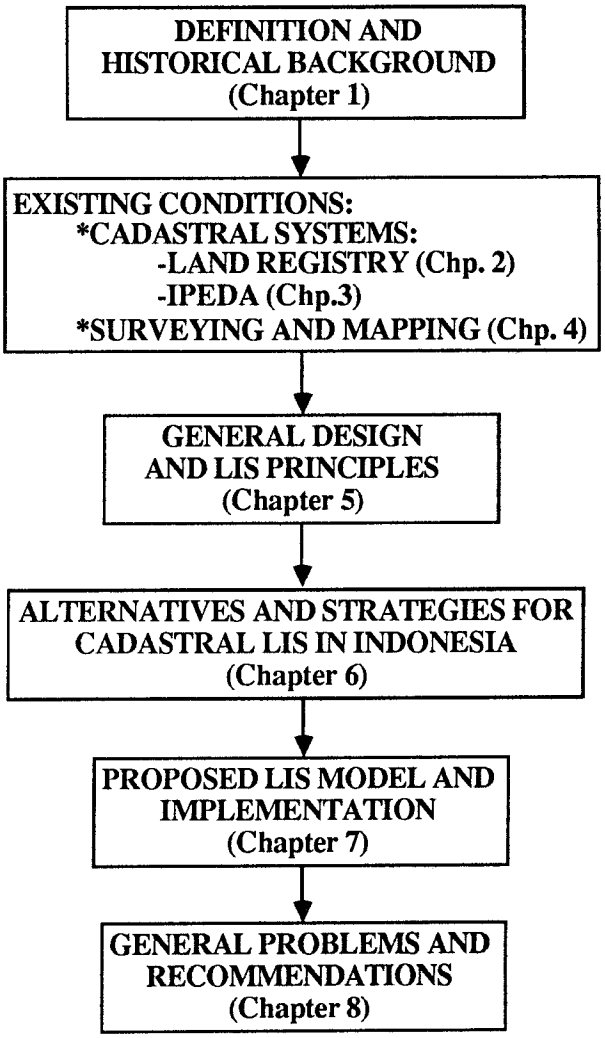


Figure 1.5. The Approach of Cadastral LIS Study for Indonesia.

This study is not intended to introduce a new procedure or to improve the existing system drastically, but to stimulate land administrators to challenge the problems, to review the concept of Indonesian cadastral system and to draw a strategy for the planning and implementation stages for a more extensive use of the system. A LIS concept for Indonesia is introduced which emphasises improvement of the cadastral system in the first stage.

The functions of both Land Registry (legal) and Land Taxation (fiscal) offices are discussed, including some drawbacks and deficiencies of the existing legislation and environment. The integration of both institutions is of primary importance. Of secondary importance is the integration with other interrelated land administration institutions as users as well as land data collectors.

Instead of a conceptual base of a system, this thesis will include some brief review of some appropriate survey techniques, possible electronic data processing, an appropriate map production technique, and some education and training to fulfil the complex operations of land management which are commonly adopted in developing countries. Institutional problems will be highlighted as one of the most important issue for the success of LIS development, but the most difficult problem to be resolved.

To achieve the above objectives, the research is strongly oriented to current developments in Australia and other developing countries derived through an extensive literature study and visiting a number of government bodies within Australia. In examining the existing condition of Indonesia, a period of six weeks was also spent in that country.

CHAPTER 2

2. LAND REGISTRATION (LEGAL CADASTRAL) SYSTEM IN INDONESIA

2.1 INTRODUCTION

Most cadastral systems have been formally developed either for legal or fiscal purposes. Nowadays, if a cadastral system is introduced for the first time, it is usually aimed at providing multipurpose information that will include fiscal and legal functions. An ownership register and an unified cadastral map are the foundation of such a system. The map should show property boundaries that can be used as a basis for other purposes. Most developed countries have the title/deed registry and the valuation office. Large scale (cadastral) mapping is usually left to another survey department. Although the registry and survey department are distinct and independent, the process of the land registration which involves both departments has to be effective and practical to ensure that the register held by the registry and the maps held by the survey department should be kept as an integral land registration procedure (Simpson, 1976).

Indonesian cadastral systems have a long historical background. The fiscal system is administered by the Land Taxation Office called "Direktorat IPEDA (Iuran PEmbangunan DAerah)" which literally means the Directorate of Regional Development Contribution. The legal system is administered by the Land Registry called "Direktorat Pendaftaran Tanah" which is also responsible for cadastral survey and mapping. To simplify the use of these names, the name IPEDA and Land Registry are used in this thesis. The place of the Land Registry and IPEDA in the Government structure is shown in figure 2.1.

In this chapter the latter agency is reviewed in some depth including its function and role in the Government, the process of land data acquisition, storage, dissemination and maintenance. The land tax system is discussed in the next chapter. However deficiencies and coordination problems which these two agencies experienced as a result of their autonomy are also discussed. Since the judicial aspects of the Land Registry are more complex than the operation of IPEDA, the land laws and the Land Registry's role in land administration will be discussed in some detail. Some recent initiatives mainly provided by the World Bank are discussed in a separate section.

2.2 THE ORGANIZATION OF LAND REGISTRATION

2.2.1 BRIEF ORGANIZATIONAL HISTORY

Since 1879, the "Kadastrale Dienst" (Cadastre Service) has had the responsibility of administering the cadastral system in Indonesia, while the deeds registration was the responsibility of the local court. After the Second World War (1947) the deeds registration became the responsibility of Kadastrale Dienst and became known as the "Jawatan Pendaftaran Tanah" (Land Registry) under the Department of Justice.

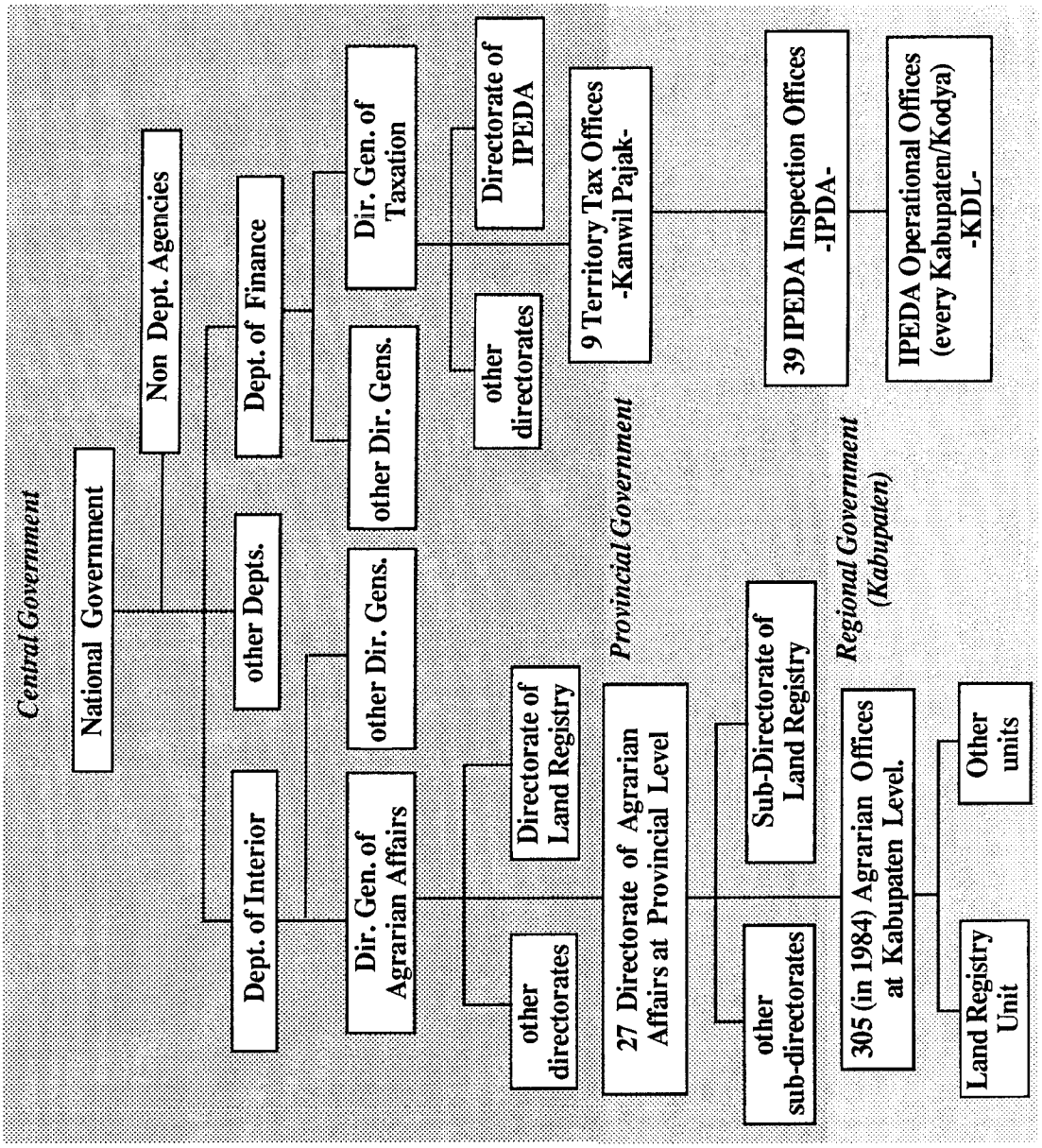


Figure 2.1. The Place of the Land Registry and IPEDA in the Government Structure.

In 1957 the Land Registry was transferred to the Department of Agraria and renamed "Direktorat Pendaftaran Tanah". There was one local Land Registry for each Kabupaten/Kotamadya which was directed by the Land Registry Inspection Office in the capital city of the province. In 1962, the Department of Agraria and the Department of Agriculture were merged into one department called the Department of Agriculture and Agraria.

After some political changes during 1965 to 1966, the new Parliament reduced the large number (more than 100) of departments in the Government. The Department of Agraria (together with Agriculture) was downgraded from a ministerial level to a directorate general level. It became known as the "Direktorat Jendral Agraria" (Directorate General of Agrarian Affair) under the Department of Interior.

This change did not strengthen the Land Registry's authority within the whole government infrastructure. The Land Registry is only recognised as a body that ascertains rights on land by issuing certificates of title. There is little awareness in the government of the importance of cadastral survey and mapping, and the multi-purpose nature of a cadastral system that could serve a number of institutions.

2.2.2 PRESENT DAY ORGANIZATION OF LAND REGISTRY

Since 1966, the structure of Directorate General of Agrarian Affairs has remained unchanged. There are four directorates, namely: the Directorate of Land Use, the Directorate of Land Reform, the Directorate of Land Right Matters and the Directorate of Land Registry. Cadastral mapping, cadastral surveys and land registration are the responsibility of Land Registry which has four sub-directorates, namely: the Sub-directorate of Terrestrial Surveying and Mapping, the Sub-directorate of Photogrammetry and Triangulation, the Sub-directorate of Evaluations and the Sub-directorate of Cadastral Administration. The activities of the first two sub-directorates are mainly technical. The other sub-directorates mainly deal with the administrative, personnel, equipment and project evaluation matters.

These sub-directorates are based only in the Head Office in Jakarta. Throughout the 27 provinces there are 27 Provincial Directorates of Agrarian, that have Sub-Directorates of Land Registry and other sub-directorates, supervising a total of about 305 (in 1984) Local Agrarian Offices located in kabupaten (regionals) and kodya (municipalities) offices. However not every kabupaten or kodya has an office. A small unit of Land Registry at this level has the responsibility on public service for (mainly sporadic) land registration, cadastral survey works and maintenance of cadastral records. This unit has a relatively small number of personnel who carry out the whole task. The map base (rectified or unrectified photomap) is produced mainly in the head office which has the technical facilities such as a photogrammetric laboratory. Cadastral survey is done generally by a limited number of local government official surveyors who are usually ill-equipped with limited survey instruments. Cadastral survey works are not carried out by private surveyors. Recently, under the Urban (cadastral) Mapping Project (see 2.8 and chapter

4), basemaps (photomaps) are contracted to the private sector.

The total number of personnel within the Land Registry in 1979 was: 520 surveyors mostly with surveying certificate (a three year survey course) who are technicians trained by the Agrarian training centres run by the Agrarian Office, 390 draftsmen, 25 photogrammetric operators and 1035 administrative personnel. Since large scale (cadastral) maps are very few, the biggest task is placed on the provincial offices to provide base (photo or line) maps to the local offices. But only few are able to do even simple methods of base mapping. According to the Government Regulation (No.10, 1961), cadastral mapping should be carried village by village; and photogrammetric methods could be applied. Therefore, the constraint to progress obviously has been concentrated in the head office, namely in the Sub-directorate of Photogrammetry and Triangulation which has only 35 surveyors, 20 draftsmen, 25 photogrammetric operators and 45 administrative personnel. The current exact number is not available, but in general the change has not been very significant.

In contrast with many other countries, Indonesia does not have a surveyor general distinct from the registrar general. The Director of Land Registry has a burdensome task of acting as both the registrar as well as the surveyor. There is no attempt to separate these two functions into two distinct sections (or directorates). The allocation of those two functions under one roof is justifiable in order to ensure a close contact between cadastral records and cadastral maps, but the status of the Land Registry as a directorate level in the Department of Interior seems to be too low to carry out such an enormous task. Therefore every attempt to extend and develop a larger administrative structure in order to carry out a more extensive project depends on being able to influence the top executive level in the government. It is likely to be very difficult to propose or legislate any procedure which could pass through into the upper levels of the higher bureaucracy.

The distinction between registration matters and the actual technique of cadastral survey, their extent and responsibility within the whole function of cadastral system has been emphasized by Simpson (1976):

> **"Since support of the land register (whether of deeds or title) is the main function of a cadastral survey system it can be argued that the Registrar himself is the best person to maintain administrative control. On the other hand, the administrative problems associated with a survey system are unlikely to be the same as those associated with the preparation and maintenance of a land register, except perhaps at the book-keeping stage, and it is obvious that technical survey matters and the maintenance of accuracy standards can be most efficiently controlled by an organization distinct from the registry. Where registration of title is concerned, however, the map which is actually used for illustrating the register, since it is an integral part of it, must be under the control of the Registrar to the extent that it cannot be altered in any way without his consent."**

2.3 INDONESIAN LAND LAW AND AGRARIAN PRINCIPLES

2.3.1 HISTORICAL VIEW OF INDONESIAN AGRARIAN LAW

The word "agraria" means "to cover earth, water, and natural resources, including the space above them". The meaning of "land" is narrower than the "earth", since land can only mean the surface of the earth. This is the reason why the term "Agraria" is applied very broadly in Indonesian Law, in order to regulate agricultural problems. Therefore, agrarian law is broader than land law. However for the purpose of the thesis, most of the discussions are concerned with land law.

Before 1960, Indonesian land laws were under two principal laws namely the (Western) Agrarian Act which is in the Indonesian Civil Code Act and the Customary Unwritten Law. Basically the Agrarian Act is the Dutch Agrarian Act ("Agrarische Wet") enacted in 1870, which was formed in fact from the Dutch Government Regulations ("Regering Reglement" - 1854) with a few additional articles. The Agrarische Wet was forced primarily by private foreign investors. By this Act, the foreigners were able to cultivate land on a very large area for a long period of time (Harsono, 1970). This Agrarian Act originated and is mainly inspired by the French Civil Code in 1789 which promoted liberal individualism principles. Not only were land laws separate for two classes of people, but all laws at that time distinguished between the two different classes of people. A Civil Code Book ("Kitab Undang Undang Hukum Perdata") which also covers land law was the written law that was developed and applied to the Dutch or generally called the European class people and the Eastern class people (non native people such as Chinese and Indian). In practice, the land used or cultivated by the European and the Eastern class people were secured under the written Dutch Acts supplemented by other (Queen) Acts and regulations such as Domeinverklaring in Agrarisch Besluit (1870) and Koninklijk Besluit (1872). Land transfer was regulated by the Overschrijvings Ordonnantie (Transfer Ordinance, 1834).

On the other hand, (the British) feudal principles introduced during the British occupation (1811-1816) had also influenced the administration system of the Dutch. The British introduced the "Domain" principle which was adopted from the British experience in England through the Doomsday Book. The principle of this system was that people could only cultivate the land, while the owner of all land was the government (the British Empire at that time). The people had to pay rent for their land which was collected by the head of each village. In Indonesia this system is called "Land Rente" (land rent) which was developed further into a land tax system (see chapter 3). However, the feudal principle only influenced the administration system in the villages where the head of the village had a strong authority to decide the fee, and if necessary even to change the land tenant, to reduce, or to cancel the tenancy. This authority had become supreme in rural villages that influenced oppression on the majority. In these areas, the local/native people were subjected to traditional customs, applicable to each tribe (called "customary law"). The head of a village also had authority in cases of transfer of land, where he would generally be asked to approve and permit the transfers; and in land disputes, where he

would be the key to finding a solution, usually with mutual agreement and deliberation, but he might be asked to arbitrate. The only land administration system in rural area at that time was the Land Rente.

After Independence, the two different land laws (Western Agrarian Act and Customary Law) and several other regulations that provided some degree of protection to non native people were seen to be unsuitable for the condition of the country. The attempt to abolish this dualism began in 1948, but there was no dramatic change until 1960. The most important changeover of land law in Indonesia was on the 23rd of September 1960 where a new Indonesian agrarian law was introduced. It is called "UUPA" or Undang Undang Pokok Agraria, which was an Act concerning Agrarian Principles formed by the Parliament. The Act has very strong socialistic philosophy, though it was not based on the Eastern Europe philosophy of socialism. The Act is based on the Indonesian philosophy (Panca Sila) that is : Belief in One and Supreme God, Humanity, Nationalism, Democracy and Social Justice. The objectives of the Act are to produce an Indonesian Social Society or a Society which is just and prosperous.

The condition and situation of the country in the beginning of 1960's was very unstable. "National Revolution" with a strong socialist ideology was overstated in every political situation. Article no.7 and 17 on excessive land holdings and land rights had been a great political issue during that time. The original objective of this article was to establish a just land distribution for the peasant and to terminate the "landlords" system. However it was not realised that such a reform needs a comprehensive land record system to succeed. It was only later that some indication of the misconduct of the reform was revealed. On the 18th of March 1968, a ministerial decree was issued in order to purposely complicate the procedure of land redistribution and presumably to ensure the postponement of the execution of such legislation. The misconduct of Article No. 7 also resulted in some reluctance by the "New Order" government (after some political chaos in 1965 - 1966) to conduct the whole Agrarian Principles.

Larsson (1978) has pointed out that:

> **"If land reform measures are going to be implemented, maps and records of land and rights in land are almost imperative. It has been the experience of several countries that even when reform laws are enacted it is very difficult to enforce them unless precise information about land tenure is available."**

2.3.2 AGRARIAN ACT PRINCIPLES (UUPA)

The basic principle of the Agrarian Act is written in the "Undang-Undang Pokok Agraria"(UUPA) Act no.5 in the year 1960, when the Government was enjoying popular support. A summary of the Government authority as described in the Article 2, item no.2 is:

1. to regulate and implement the appropriation, the utilization, the reservation and the cultivation within the territory; and

2. to determine and regulate the legal relations between persons and the earth, water and air space in accordance with the legal acts.

The main objective of the Act is to convert all land rights under the Dutch/Western Law to a new system and to treat all land under the customary laws similarly in a uniform system. The system is based on the existing customary laws and is still influenced by the European system. There are several land rights mentioned in Article 16 (UUPA, 1960):

1. Right of Ownership - a hereditary right, which is the strongest and fullest right that may not be possessed by any foreigner.

2. Right of Exploitation - a right to cultivate the State land for a period of time (not longer than 25 years in each period).

3. Right of the Use of Buildings - the right to build and to own buildings on one's property for a period of 30 years and a maximum of 20 years extension.

4. Right of Use - the right to use and/or to collect the products from State land, or land owned by other person(s) for a flexible period of time (in practice only State land).

5. Right of Lease - the right for citizens or foreigners to lease and utilize land owned by another for the purpose of building by paying a rent based on an agreement.

6. Right of Opening-up land - the right of opening-up State land and of collecting forest products, only for Indonesian citizens.

7. Right of Collecting Forest Products and other rights not included in the above mentioned rights such as right of mortgages, sharecrop, temporary occupation etc.

To achieve these, the government should conduct land registration throughout the country to cover (Article No. 19):

1. measuring, mapping and recording of land;

2. registering the rights on land and the transfer of these rights; and

3. issuing certificates of rights on land, which will be valid as a statutory evidence.

On the 23rd of March 1961, the Government issued a more detailed Regulation concerning Land Registration (No. 10, 1961) as a legal basis for executing and conducting the tasks written in the Agrarian Act. Although the regulation describes the whole range

of land registration tasks, further technical and administrative guidances are needed. Even though the legislation has laid a fairly comprehensive foundation for a cadastral system, it was also realized at the beginning that the political, social and economic conditions of the country had to be considered. The execution of the legislation has not been consistently carried out. There has not been enough legislated emphasis or compulsion to register land.

Two and a half decades have passed since the issue of the Agrarian Act. Some considerable effort, mainly non systematic land titling projects have been done within the Land Registry. However there is no significant policy to integrate the whole land administration system in the government. Neither are there any systematic directions by the executive group in the government. Instead of UUPA, there are two other Acts on land that seem to overlap: they are the Forest Act or "Undang Undang Pokok Kehutanan (UUPH)" (Act no. 11, 1967) and the Mining Act or "Undang Undang Pokok Pertambangan (UUPP)" (Act no. 5, 1967). Hence there are two other departments: the Department of Forestry and the Department of Mine and Energy that have authority to issue rights on land. This problem has not been addressed by the government. It is a very difficult problem because most boundaries between forest and mining areas have not been delineated and are uncertain. The autonomy of the different authorities vested with powers to control land is not the major issue. What is critical is to harmonize the three Acts to achieve an integrated land policy.

2.4 THE EXISTING SYSTEM OF LAND REGISTRATION

2.4.1 THE LAND REGISTRATION PRINCIPLES

Like many English speaking countries, Indonesia has tended not to stress and use the term "cadastre" or "cadastral" (used by Dutch) after the independence, but more often prefers to use the term "land registration". Larsson (1978) comments that "this expression stresses registration of rights to land and its legal implications. But registration has no use if the object cannot be identified. An efficient registration system should therefore have a proper cadastral basis." The cadastral basis is therefore included in the Indonesian land registration system and the term "land registration" is used as the umbrella of all other components of the cadastre.

It is very difficult to choose the best method of registration although world trends have indicated that title registration is preferable to deeds registration because of the assurance of title as well as the relative ease and economy of the associated conveyancing (Griffith, 1975). Simpson (1976) argues that the best method can only be chosen if there is no system of land holding in existence. But unfortunately there is always one (or even several) system(s) already in existence, so the major task is to ascertain the land document before it can be registered.

In general the land registration system which is based on the Agrarian Principles (No. 5, 1960 - UUPA) and the regulations concerning Land Registration (No. 10, 1961), are not as

comprehensive as they should have been when they were implemented. But this is a simple system and perhaps the most suitable system for Indonesia. Improvements to the several existing regulations still have to be made to address the problems.

The present registration system is not truly a deeds system nor a title registration system. The certificate of title is a valid document but is not indefeasible. Because of this uncertainty of the title, the Indonesian land registration system may also be called "Quasi Positive" system (Henssen, 1978), where the person whose rights are registered may not be positively the true title owner. This title cannot protect the registered owner from further claims by a third party. If a third party succeeds in claiming rights to the land, the title holder can only resort to suing the vendor.

Triono (1979) describes the system of land registration as one based on the principles of publicity and speciality, in which it is made effective by publicly announcing details of each land parcel in its village head office and by giving each parcel a unique location on a cadastral map.

By this principles, the system has to be able to identify:

1. the location of the land parcel;
2. the area within the parcel boundary;
3. the owner of the land parcel; and
4. the status of the right on that land parcel.

The major operations of the compilation of a register consist of the identification of the parcel, and the identification of the owner and any limitation of his rights of ownership (Simpson, 1976). Parcel identification consists of the process of demarcation, monumentation and survey. The result of this process is a map or plan that can identify the location, the area and the boundaries of the parcel. However the identification of the owner and the right on a land parcel generally consists of an adjudication process, unless the land parcel is from State land (eg. a newly opened area for transmigration).

Traditional parcel identification is generally done by accurate measurement. The adjudication process by means of examination of documents to ascertain the right of the owner on a parcel is also done very accurately. The investigation is carried out by a committee that usually consists of the local community's head/ leader and the local Agrarian officials. This committee is formed by the government. The process of delimitation and indication of boundaries of each parcel requires approval of all neighbouring owners. This method is called "contradictaire delimitation" which is applicable in several developing countries such as Thailand and Liberia (Doebele, 1983). The boundary agreement should be confirmed and legally signed by the land owner together with his/ her neighbours.

In addition, before issuing the certificate of title, the details of the above agreement have to be publicly announced to the people in the village at the head village (lurah) office for a period of two months if the title is requested individually, and

three months in the case of a mass certificate production . The certificate of title can be issued after that period if there is no claim by a third party on that particular parcel. Therefore the accurate adjudication system has enabled the certificate to be accepted widely. The acceptance of this system is reflected in the much higher market value of registered land compared with unregistered land.

Even though the title is not indefeasible, the process for claiming rights is very complicated since it requires strong evidence and such a long administrative process which often takes several years or even decades. So the number of claims due to this uncertainty is relatively very small (less then 0.07 percent) compare with the number of titles issued (7,167,600 certificate of titles issued to August 1985).

2.4.2 THE LAND RECORDING SYSTEM

Cadastral systems rely on an effective method of records or register(s) that should be kept up-to-date (Simpson, 1976). In Indonesia, the (legal) register is kept and maintained by one agency (Land Registry). The records of land collected within the Land Registry process are stored in four lists (Government Regulation no.10, 1961):

1. List of name - a list of proprietor names kept on loose cards alphabetically for each Kabupaten. Only one card is kept for each name and it may describe more than one parcel. (See figure 2.2)

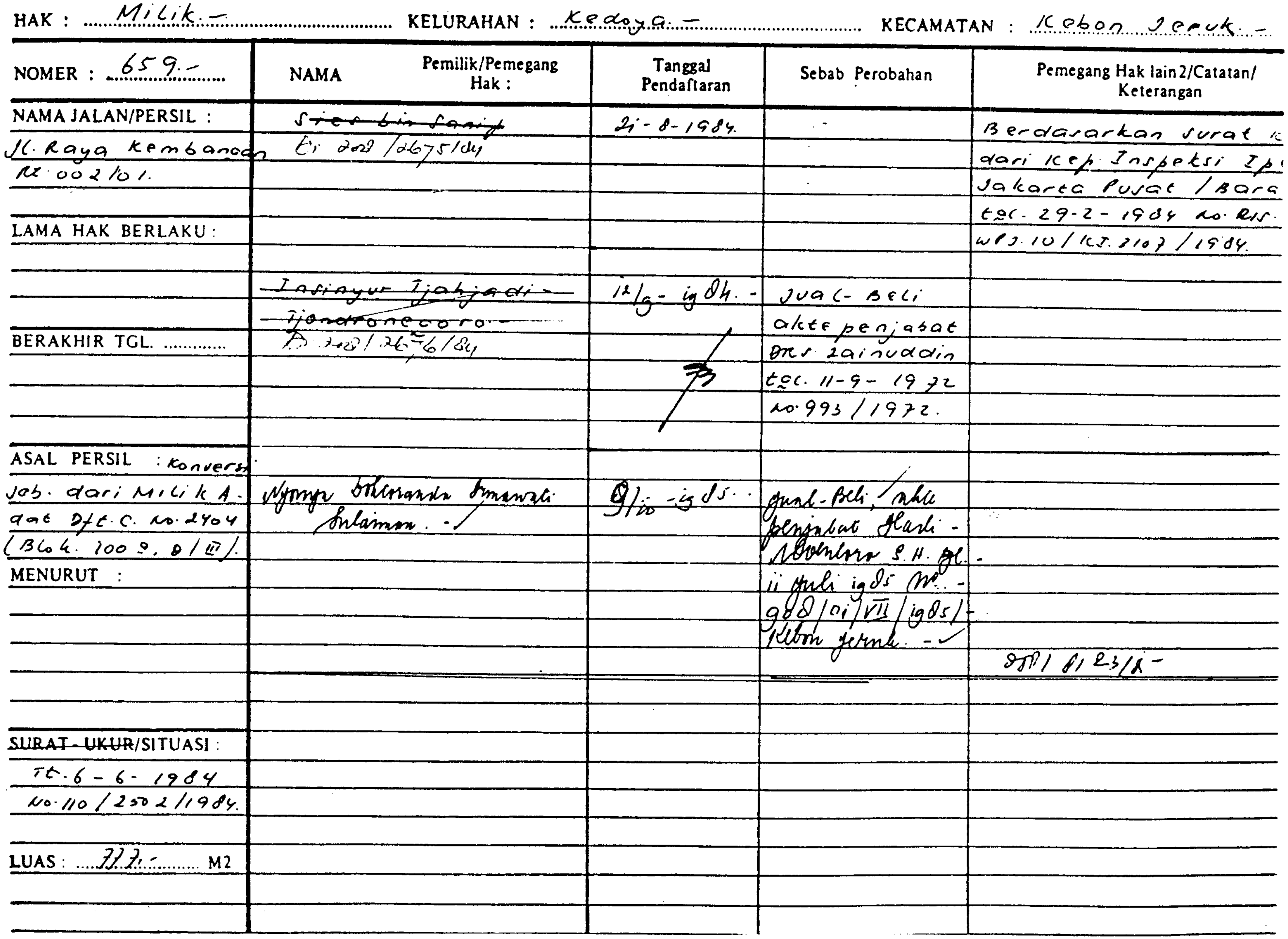
2. List of Land - a list of all land parcels within the lowest level of administrative unit such as the village, for both private and government land. This list ought to be a complete record for every village, but it can only be achieved through systematic land registration.

3. List of Ground books. (adopted from German term "Grundbuch" used widely in Central Europe) - a binding of original ground books within the lowest level of administrative unit such as village. The ground book is the main part of certificate of title. The content of ground book (four pages) is the descriptive data of the title. One binding of ground books is kept for each kind of right.

4. List of Letter of Measurement - the archives of all individual parcel plans. This is the whole map data of all registered land parcels within one administrative unit that has been mapped individually.

The certificate of title (CT) of the owner consists of a copy of the Ground book ("Buku Tanah") and a copy of letter of measurement (cadastral plan) bound in thick cover material (see figure 2.3 - 2.7).

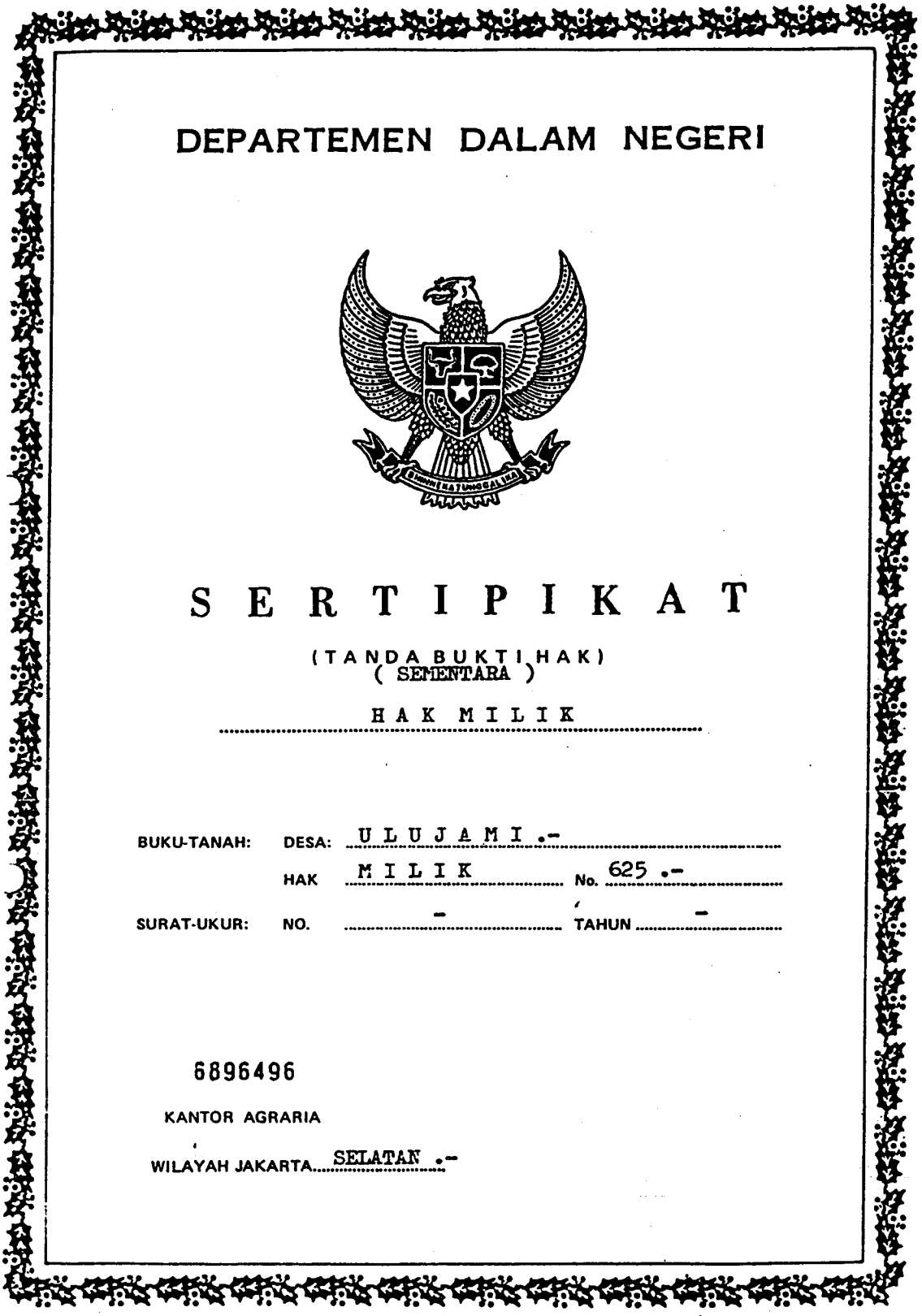
The recording and filing system is reliable enough. However the map component (cadastral map) which should serve as an index and register for the registered land parcels (similar to a kind of



HAK : Milik.– KELURAHAN : Kedoya.– KECAMATAN : Kebon Jeruk.–

NOMER : 659.–	NAMA Pemilik/Pemegang Hak :	Tanggal Pendaftaran	Sebab Perobahan	Pemegang Hak lain2/Catatan/ Keterangan
NAMA JALAN/PERSIL :	~~Sien bin Sanip~~	21-8-1984.	-	Berdasarkan surat [illegible]
Jl. Raya kembangan	[illegible] 2008/2675/84			dari Kep. Inspeksi Ip[illegible]
Rt. 002/01.				Jakarta Pusat / Bara[illegible]
				tgl. 29-2-1984 no. Ris.
LAMA HAK BERLAKU :				wl.J.10/KJ.3107/1984.
	~~Iasiayu Tjahjadi~~	12/9-1984.-	Jual-Beli	
	~~Tjondronecoro~~		akte penjabat	
BERAKHIR TGL.	[illegible] 2008/26-6/84		Drs. zainuddin	
			tgl. 11-9-1972	
			no. 993/1972.	
ASAL PERSIL : konversi				
Jeb. dari Milik A.	Nyonya [illegible] [illegible]	9/10-1985.-	Jual-Beli / akte	
dat DJ.C. No. 2404	Sulaiman.–		penjabat Hadi-	
(Blok. 100 S. D/III).			[illegible] S.H. tgl.	
MENURUT :			11 Juli 1985 No.	
			988/01/VII/1985/-	
			Kebon Jeruk.–	
				88/1/81 23/K–
SURAT-UKUR/SITUASI :				
Tt. 6-6-1984				
No. 110/2502/1984.				
LUAS : 777.– M2				

Figure 2.2. The Card of Name List in Land Registry



DEPARTEMEN DALAM NEGERI

S E R T I P I K A T

(TANDA BUKTI HAK)
(SEMENTARA)

H A K M I L I K

BUKU-TANAH: DESA: U L U J A M I .-

HAK M I L I K No. 625 .-

SURAT-UKUR: NO. - TAHUN -

6896496

KANTOR AGRARIA

WILAYAH JAKARTA SELATAN .-

Figure 2.3. The Certificate of Title (CT)

DAFTAR ISIAN 205

DEPARTEMEN DALAM NEGERI

BUKU TANAH

DAERAH KHUSUS IBUKOTA JAKARTA RAYA

WILAYAH JAKARTA SELATAN .-

KECAMATAN KEBAYORAN LAMA .-

DESA ULUJAMI .-

BIAYA Rp. 1.000,-

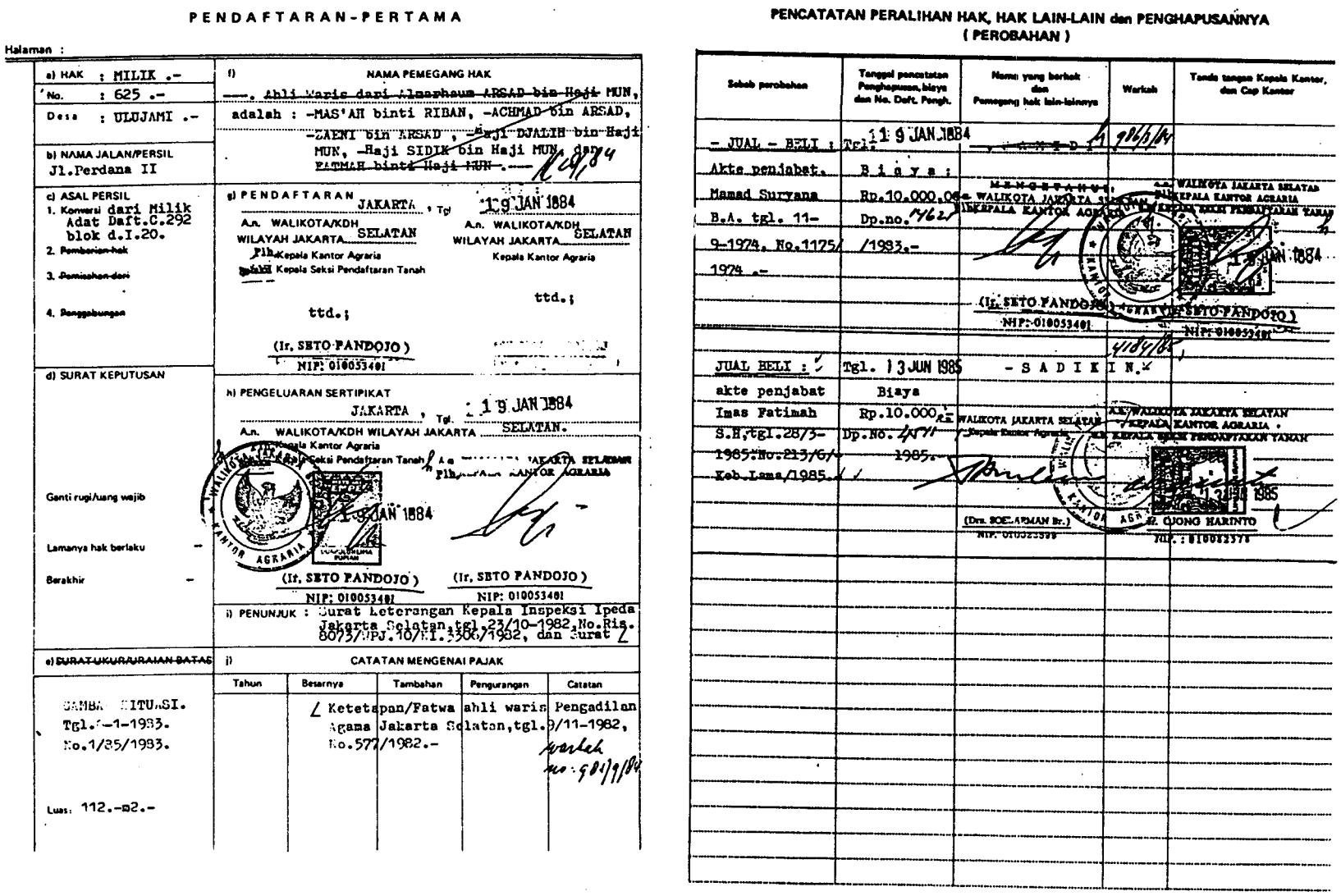
DAFTAR PENGHASILAN No. 14620/19 83.-

6896496

KANTOR AGRARIA WILAYAH JAKARTA : JAKARTA .-

WALIKOTA JAKARTA SELATAN * KANTOR AGRARIA *

Figure 2.4. Copy of Ground Book in CT



PENDAFTARAN-PERTAMA

Halaman :

a) HAK : MILIK .-
No. : 625 .-
Desa : ULUJAMI .-

b) NAMA JALAN/PERSIL
Jl.Perdana II

c) ASAL PERSIL
1. Konversi dari Milik Adat Daft.C.292 blok d.I.20.
2. Pemberian hak
3. Pemisahan dari
4. Penggabungan

d) SURAT KEPUTUSAN

Ganti rugi/uang wajib

Lamanya hak berlaku –

Berakhir –

e) SURAT UKUR/URAIAN BATAS

SAMBA SITUASI.
Tgl.2-1-1983.
No.1/35/1983.

Luas: 112.-m2.-

f) NAMA PEMEGANG HAK

----. Ahli Waris dari Almarhum ARSAD bin Haji MUN,
adalah : -MAS'AH binti RIBAN, -ACHMAD bin ARSAD, -ZAENI bin ARSAD, -Haji DJALIH bin Haji MUN, -Haji SIDIK bin Haji MUN, dan -FATMAH binti Haji MUN .----

g) PENDAFTARAN JAKARTA, Tgl. 19 JAN 1884
A.n. WALIKOTA/KDH WILAYAH JAKARTA SELATAN
Plh. Kepala Kantor Agraria
Kepala Seksi Pendaftaran Tanah

ttd.;

(Ir. SETO PANDOJO)
NIP: 010053401

A.n. WALIKOTA/KDH WILAYAH JAKARTA SELATAN
Kepala Kantor Agraria

ttd.;

h) PENGELUARAN SERTIPIKAT
JAKARTA, Tgl. 19 JAN 1884
A.n. WALIKOTA/KDH WILAYAH JAKARTA SELATAN.
Kepala Kantor Agraria
Kepala Seksi Pendaftaran Tanah

(Ir. SETO PANDOJO)
NIP: 010053401

A.n. WALIKOTA JAKARTA SELATAN
Plh. KANTOR AGRARIA

(Ir. SETO PANDOJO)
NIP: 010053401

i) PENUNJUK : Surat Keterangan Kepala Inspeksi Ipeda Jakarta Selatan,tgl.23/10-1982,No.Ris. 8073/WPJ.10/KI.330/1982, dan Surat

j) CATATAN MENGENAI PAJAK

Tahun	Besarnya	Tambahan	Pengurangan	Catatan
	✓ Ketetapan/Fatwa ahli waris Pengadilan Agama Jakarta Selatan,tgl.9/11-1982, No.577/1982.-			

PENCATATAN PERALIHAN HAK, HAK LAIN-LAIN dan PENGHAPUSANNYA
(PEROBAHAN)

Sebab perobahan	Tanggal pencatatan Penghapusan, biaya dan No. Daft. Pengh.	Nama yang berhak dan Pemegang hak lain-lainnya	Warkah	Tanda tangan Kepala Kantor, dan Cap Kantor
- JUAL - BELI : Tgl.	19 JAN 1884	- S A D I K I N -	9/6/84	
Akte penjabat.	B i a y a :			
Mamad Suryana	Rp.10.000,-	WALIKOTA JAKARTA SELATAN		WALIKOTA JAKARTA SELATAN
B.A. tgl. 11-9-1974. No.1175/1974 .-	Dp.no. 1462 /1983.-	KEPALA KANTOR AGRARIA		KEPALA KANTOR AGRARIA
		(Ir. SETO PANDOJO) NIP: 010053401		19 JAN 1884 (Ir. SETO PANDOJO) NIP: 010053401
JUAL BELI : ✓	Tgl. 13 JUN 1985	- S A D I K I N -	4/8/85	
akte penjabat	Biaya			
Imas Fatimah	Rp.10.000,-	WALIKOTA JAKARTA SELATAN		A.n. WALIKOTA JAKARTA SELATAN
S.H,tgl.28/3-1985.No.213/6/Keb.Lama/1985.	Dp.No. 4471 1985.	Kepala Kantor Agraria		KEPALA KANTOR AGRARIA KEPALA SEKSI PENDAFTARAN TANAH
		(Drs. SOE-ARMAN Br.) NIP: 010023378		13 JUN 1985 IR. DJONG HARINTO NIP. : 010012378

Figure 2.5. Copy of Ground Book in CT (continued)

PENCATATAN PERALIHAN HAK, HAK LAIN-LAIN dan PENGHAPUSANNYA (PEROBAHAN)

Sebab perobahan	Tanggal pencatatan Penghapusan, biaya dan No. Daft. Pengh.	Nama yang berhak dan Pemegang hak lain-lainnya	Warkah	Tanda tangan Kepala Kantor, dan Cap Kantor

Ketentuan-ketentuan P.P. 10 tahun 1961 yang perlu diperhatikan.

Pasal 19.

Setiap perjanjian yang bermaksud memindahkan hak atas tanah, memberikan sesuatu hak baru atas tanah, menggadaikan tanah atau meminjam uang dengan hak atas tanah sebagai tanggungan, harus dibuktikan dengan suatu akte yang dibuat oleh dan dihadapan penjabat yang ditunjuk oleh Menteri Agraria selanjutnya dalam Peraturan Pemerintah ini disebut (Penjabat). Akte tersebut bentuknya ditetapkan oleh Menteri Agraria.

Pasal 20.

1. Jika orang yang mempunyai hak atas tanah meninggal dunia, maka yang menerima tanah itu sebagai warisan wajib meminta pendaftaran peralihan hak tersebut dalam waktu 6 bulan sejak tanggal meninggalnya orang itu.
2. Menteri Agraria atau penjabat yang ditunjuk olehnya dapat memperpanjang waktu tersebut pada ayat (1) pasal ini berdasarkan pertimbangan-pertimbangan khusus.

Pasal 21.

Selambat-lambatnya 3 hari sebelum sesuatu hak atas tanah dilelang dimuka umum, maka Kepala Kantor Lelang harus meminta surat -keterangan kepada Kepala Kantor Pendaftaran Tanah yang bersangkutan tentang tanah yang akan dilelang itu.

Pasal 22.

(1). Mengenai tanah yang sudah dibukukan, maka penjabat dapat menolak permintaan untuk membuat akte sebagai yang dimaksud dalam pasal 19, jika:

a. permintaan itu tidak disertai dengan sertipikat tanah yang bersangkutan;
b. tanah yang menjadi objek perjanjian ternyata masih dalam perselisihan;
c. <u>TIDAK DISERTAI SURAT TANDA BUKTI PEMBAYARAN BIAYA PENDAFTARAN.</u>

Pasal 33.

1. Sertipikat baru hanya dapat diberikan oleh Kepala Kantor Pendaftaran Tanah kepada yang berhak, sebagai pengganti sertipikat yang rusak atau hilang. Sertipikat baru tersebut diberikan atas permohonan yang berhak itu.
2. Sebelum sertipikat baru sebagai pengganti suatu sertipikat yang hilang diberikan kepada yang berhak maka hal itu harus diumumkan dua kali berturut-turut dengan antara waktu 1 bulan, dalam surat kabar setempat dan berita Negara Republik Indonesia. Biaya pengumuman tersebut ditanggung oleh pemohon.
3. Jika dalam waktu 1 bulan setelah pengumuman yang kedua tidak ada yang mengajukan keberatan terhadap pemberian sertipikat baru itu, maka barulah sertipikat tersebut diberikan kepada pemohon.
4. Jika ada keberatan yang diajukan dan keberatan tersebut oleh Kepala Kantor Pendaftaran Tanah dianggap beralasan, maka ia menolak pemberian sertipikat baru itu dan memperselisihkan permohonannya untuk meminta keputusan hakim.
5. Jika Kepala Kantor Pendaftaran Tanah menganggap keberatan yang diajukan tidak beralasan, maka sebelum memberikan sertipikat baru kepada pemohon, ia harus meminta terlebih dahulu pendapat Kepala Jawatan Pendaftaran Tanah atau penjabat yang ditunjuk olehnya.

Pasal 42.

1. Barang siapa dengan sengaja merusak atau memindahkan tanpa hak tanda-tanda batas yang dimaksud dalam pasal 3 ayat (7) diatas dipidana dengan hukuman kurungan selama-lamanya 2 bulan dan/atau denda sebanyak-banyaknya Rp. 5.000,-
2. Perbuatan yang dimaksud dalam ayat (1) pasal ini adalah pelanggaran.

Pasal 43.

Barang siapa membuat akte yang dimaksud dalam pasal 19, tanpa ditunjuk oleh Menteri Agraria sebagai penjabat dipidana dengan hukuman kurungan selama-lamanya 3 bulan dan/atau denda sebanyak - banyaknya Rp. 10.000,-

Pasal 44.

1. Kepala Desa dilarang menguatkan perjanjian yang dimaksud dalam pasal 22 dan 25 yang dibuat tanpa akte oleh penjabat.
2. Pelanggaran terhadap larangan tersebut pada ayat (1) pasal ini dipidana dengan hukuman kurungan selama-lamanya 3 bulan dan/atau denda sebanyak-banyaknya Rp. 10.000,-

Figure 2.6. Copy of Ground Book in CT (continued)

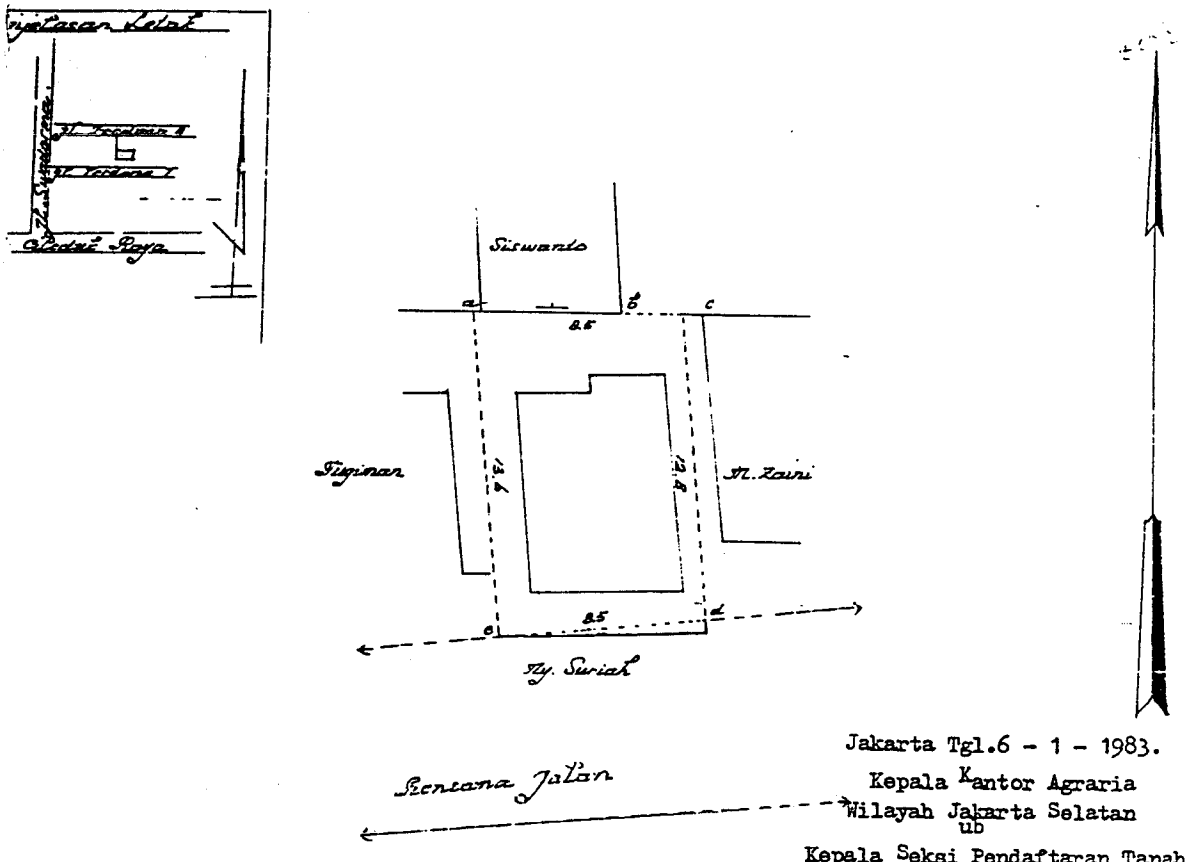
Kecamatan : Kebayoran Lama . Kota Jakarta Selatan

Daerah Khusus Ibukota Jakarta

Peta : Ulujami lembar No.4,kotak e/3.

Luas :112.M2. (Seratus duabelas meter persegi.).-

Perbandingan : 1 : 250.-



Jakarta Tgl.6 - 1 - 1983.

Kepala Kantor Agraria

Wilayah Jakarta Selatan

ub

Kepala Seksi Pendaftaran Tanah.

ttd

PENJELASAN :

Gambar situasi ini diukur oleh : Imam Rustiono.

Atas permintaan : Sdr.Samidi Hardjo Dikromo.

Untuk mengetahui luasnya,

.....batas tanah ini ditunjukkan oleh yang berkepentingan,dan akan ditetapkan kembali dalam suatu surat ukur berdasarkan P.P.10/1961,pasal 11 , ayat 1.

302/4785/Si/1982.Tgl. 15-12-1982

302/3462/Si/1983.Tg. 22-7- 1983.

(AMAT MUBADI B.Sc)

Nip.010071514.NRK.10068.

DISALIN SESUAI DENGAN ASLINYA.

Jakarta Tgl. 26 - 7 - -1983.

Kepala Kantor Agraria

Wilayah Jakarta Selatan

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Kepala Seksi Pendaftaran Tanah

(AMAT MUBADI B.Sc)

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Figure 2.7. Copy of Letter of Measurement in CT

general map used in the English system) is inadequate, because most cadastral maps are not well maintained within Local Agrarian Offices. Cadastral mapping will be discussed in section 2.5 and chapter 4.

The four lists kept and maintained in Local Agrarian Offices can be considered as central to a land database. The maintenance of these lists are appropriate but they are incomplete. Therefore this database has not been useful to either the local agencies or the central government agencies. Besides, no guidelines are stipulated for access to the database. It is necessary that specific regulations be introduced to determine authorized users and access procedures.

The Agrarian Minister Decree, no. 7, 1961, article no. 19, requires that each copy of new or renewal owner's name card be sent to the head office of Land Registry, but this has not been done. An large data base of owner's names for the whole of Indonesia ought to be held in the head office. If completed, the data base can only be useful for land reform, while under current circumstances it is very difficult to achieve.

Since a characteristic of land registration is to secure the ownership, the Land Registry adopts the conventional attitude of maintaining very "precise" survey data on cadastral plan. As a result, it is an expensive system. This may be still necessary for urban areas, where land is becoming very expensive. But in general it is inappropriate for rural areas. Significant changes must be introduced to simplify procedures and minimise "accuracy" constraints.

2.5 CADASTRAL MAPPING

The importance of an accurate large scale map is stated by Binns (1953):

> **"An accurate large-scale map is the only sound basis for a record of such rights, privileges, duties and responsibilities. No system of registration of rights can be effective and no system of land taxation can be just and efficient without a description which enables the land affected to be identified with certainty on the ground, and no such identification can be regarded as certain without a suitable map to which the description can be referred".**

Accurate large scale maps of property boundaries i.e. called cadastral maps are the responsibility of Land Registry. It is realized that the cadastral map is the foundation of the land registration process, particularly in fulfilling the principle of speciality (see 2.4.1). The main function of a cadastral map is as an inventory of plans (from isolated parcel surveys as discussed in 2.6.), and it acts as an index of all parcels that enable rapid access to the land register or cadastral records.

The Land Registry's progress in producing cadastral maps has not been adequately achieved. In fact the agency effectively started

this task in about the mid sixties. The work is enormous, but the available staff are insufficient. The mapping technique has been modified and has become relatively simple. Even some regulated technical requirements have been changed and some are not totally followed in order to achieve significant progress. Some regulations are still based on the Dutch system which requires more comprehensive and accurate procedures. If accurate methods (e.g. numerical cadastral methods) are to be used, it has been estimated by Triono (1979) that the work of land registration may take about 200 years. Therefore since 1936, an attempt to introduce photogrammetric methods were initiated by the Dutch, but it was discontinued due to the Second World War. In 1960 the attempt was resumed and in 1969 the new technique of photomaps was implemented when the First of the Five Year Plan of the Government of Indonesia came into effect. The most efficient map is the photomap. Although a full rectified photomap is desired, some technical difficulties often limit access to only unrectified photomaps. This method which is appropriate, particularly in rural areas, has also been applied in many less developed countries.

A photomap is used primarily as a base map, and the cadastral map is derived from the photomaps by overlaying and drawing the necessary physical features on transparent film. Identification on the ground is executed by the local staff. The Land Registry considers that this simple technique can accelerate the land registration process. However this technique still needs some extensive support by the government in terms of technical staff and equipment. This can be very costly.

Some but still limited financial support from the government has been provided since 1969. But the recruitment and training of skilled personnel is not easy. Moreover, the staff in regional offices who are unfamiliar with the application of photographs (photomaps) will also require additional training.

Photomaps and cadastral maps are supplied to the regional offices for the registration process. However the use of these data for other purposes in local government has not been recognized. Presumably the effective use of the photomap as well as cadastral map depends on the ability to familiarize local staff with this new application, particularly in public planning and administration (land tax, utility works, statistics, coordination of government owned land etc.).

At present there are various forms of maps used in the Land Registry from old cadastral maps in colour on a stable base material to a new simple cadastral map on drafting film and photomaps (rectified and unrectified). Figure 2.8 shows a small part of sub urban area of Jakarta. However most cadastral maps are not well maintained within the Agrarian offices, and they are not easily accessible by other agencies. The importance of cadastral maps have not been emphasised. Consequently, little attention is paid to their maintenance. This is probably the result of ignorance and poor facilities available in regional offices. In addition, the lack of appropriate guidance and supervision in the regional offices is also another problem. More emphasis is placed on the individual plans rather than cadastral maps. This contrasts Simpson's suggestion (1976) for developing

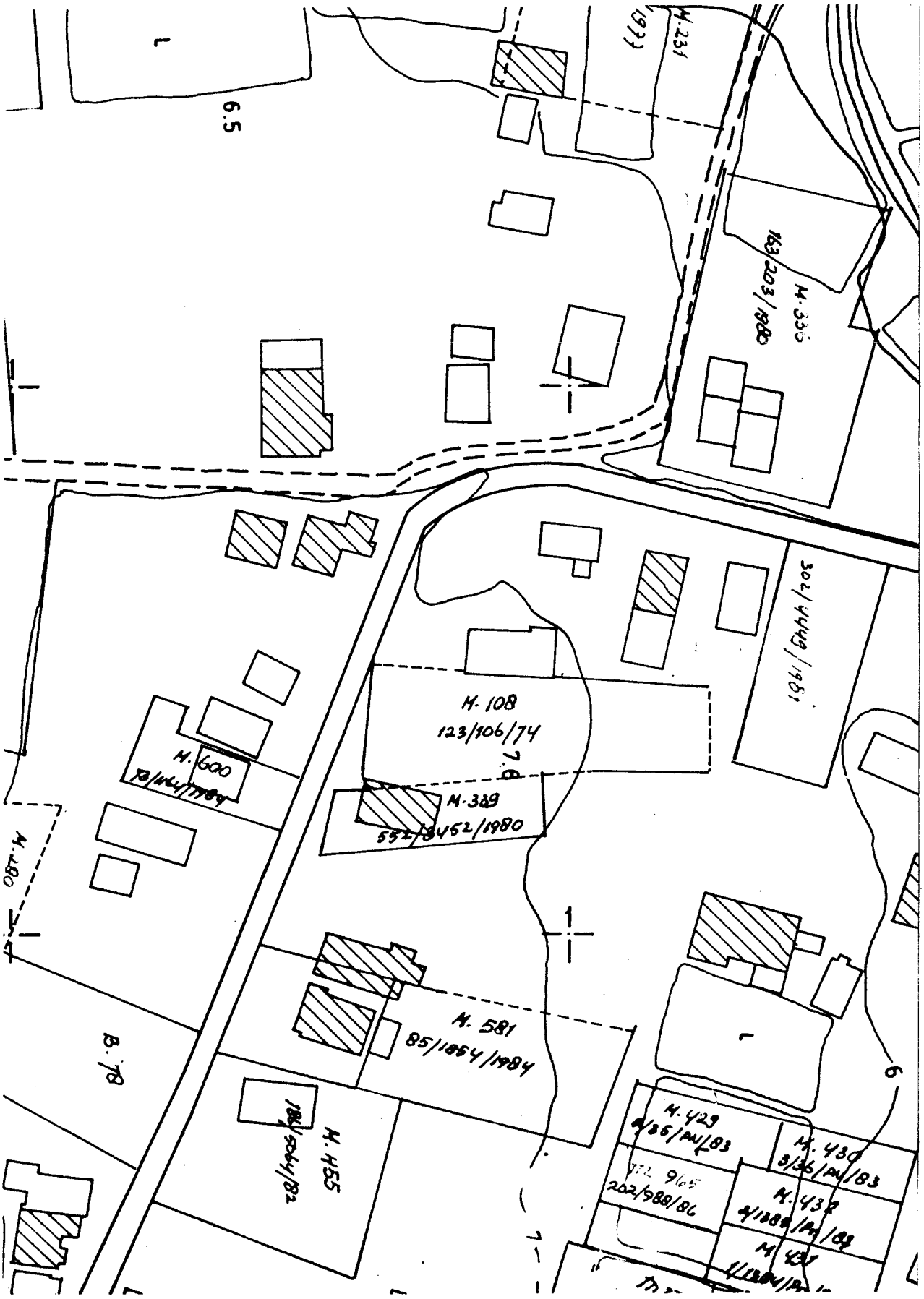


Figure 2.8. A part of Cadastral Map of Sub-Urban Jakarta scale 1: 1000 (from Land Registry)

countries:

> "The system of individual filed plans prepared from a general map (as now used in the English system) would appear to be ideal, but despite the recent great improvement in the techniques of map reproduction it may still be too expensive to be worth while for small holdings in developing countries. In any case, if a land registry general map is prepared and properly maintained, it is questionable whether individual plans are really necessary."

The dilemma in cadastral mapping in the Land Registry lies in the judicial allocation of limited financial resources to technical requirements and equipment needs. This dilemma is exacerbated by the need to reach the target of establishing a large scale map within reasonable time.

More discussion on cadastral mapping together with other large scale mapping activities in Indonesia is given in chapter 4.

2.6 CADASTRAL SURVEYING

It is easier to understand the cadastral survey system in Indonesia than to understand the registration system and its land law. The land laws and registration system have changed quite dramatically in the last few decades but without the support of surveyors. The cadastral survey system has not improved. Thus the evolution of cadastral surveying has fallen behind the land registration system and land laws. In general cadastral surveying in Indonesia is adopted from the former system in the Dutch Era. Surveys are conducted in a piece-meal manner and are uncoordinated. The survey system is conventional, but is of a high standard.

Henssen and McLaughlin (1986) suggest six integral operations for cadastral surveys, the first three belong to the role of private surveyor and the later three that of the public sectors:

a. The initial gathering of information necessary for delimiting the cadastral parcel boundaries;
b. The analysis of this information;
c. The actual demarcation of the bounds on the ground.
d. The registration of the bounds.
e. The maintenance of the boundary information.
f. The dissemination of this information.

In some cases, cadastral surveying acts as the initial process of parcel creation (such as Australia and the United States), but in most of the cases in Indonesia cadastral surveying is mainly for the identification of the created parcels since most existing land parcels are not recorded. As mentioned in section 2.2.2, the Indonesian private surveyors have very limited (or even no) participation in cadastral activities. The role of surveyors will be discussed in 4.4.

A few articles in the Agrarian Minister Regulation (No.7, 1961) briefly describe methods for the location on the base map

(cadastral map) of each parcel of land. Position is related to the grid system instead of coordinates. In practice, without an unified coordinate system and sufficient control points it is difficult to fit the individual plan on the base map. Figure 2.9 shows the original (simple) cadastral plan kept in Land Registry. Therefore it is of little use if the plan is not compiled into a map of a larger area as in the cadastral map. For the purpose of the thesis, the term "plan" refers to an individual map or diagram showing dimensions of one parcel. The copy of a registered parcel is attached to the title and the original is kept in the register (see 2.4.2).

Cadastral surveys are only used to describe a land parcel on a plan and to mark the boundaries on the ground by monumentation or physical features. The purpose of cadastral surveys is purely for land registration and to facilitate conveyancing. Marking by monumentation and physical features are paramount to plans as in Commonwealth countries (Dale, 1976). But many of these marks are lost or destroyed quickly, especially in the course of development. Therefore the Land Registry intends to use the plans as conclusive evidence of the position of boundaries when the marks are lost or destroyed. More about boundary survey will be given in 4.3.2.

2.7 THE EXISTING LAND TITLING AND CONVEYANCING PROCESS

Within the Land Registry, there are several processes of land registration, including all conveyancing processes as well as rights conversion from the Dutch system. To distinguish the processes within the Land Registry, the activities can be grouped into two major activities. The different processes of land registration are shown in table 2.1.

(a) Systematic Land Registration

Systematic land registration refers to a village by village land registration approach, for example the project called "PP 10" (meaning Government Regulation No. 10, 1961), and the project for transmigration, agricultural and plantation estate schemes. The registration process in the PP 10 project is mainly for existing land parcels based on the "village by village" principle in which registration should be completed for one whole village before preceding to another village. Usually only a few land parcels may be left unregistered due to incomplete documents or other administrative reasons. Certificates for each parcel are not directly issued unless the owner pays the fee of registration. The project for transmigration, agricultural and plantation estate schemes is a subdivisional process of the State (newly opened) land. The right of this land originally belongs to the Forestry department. Therefore there are few if any problems for registration in this project. Certificates of title are directly issued in this instance. A project called "PRONA" ("Proyek Operasi Nasional Agraria" or National Agrarian Operational Project) subsidized by the government was introduced to reduce registration cost. Although the initial attempt in PRONA is to carry out systematic land registration, in practice it is still a mass sporadic land registration process, because the project is still based on the voluntary registration. Also there are always

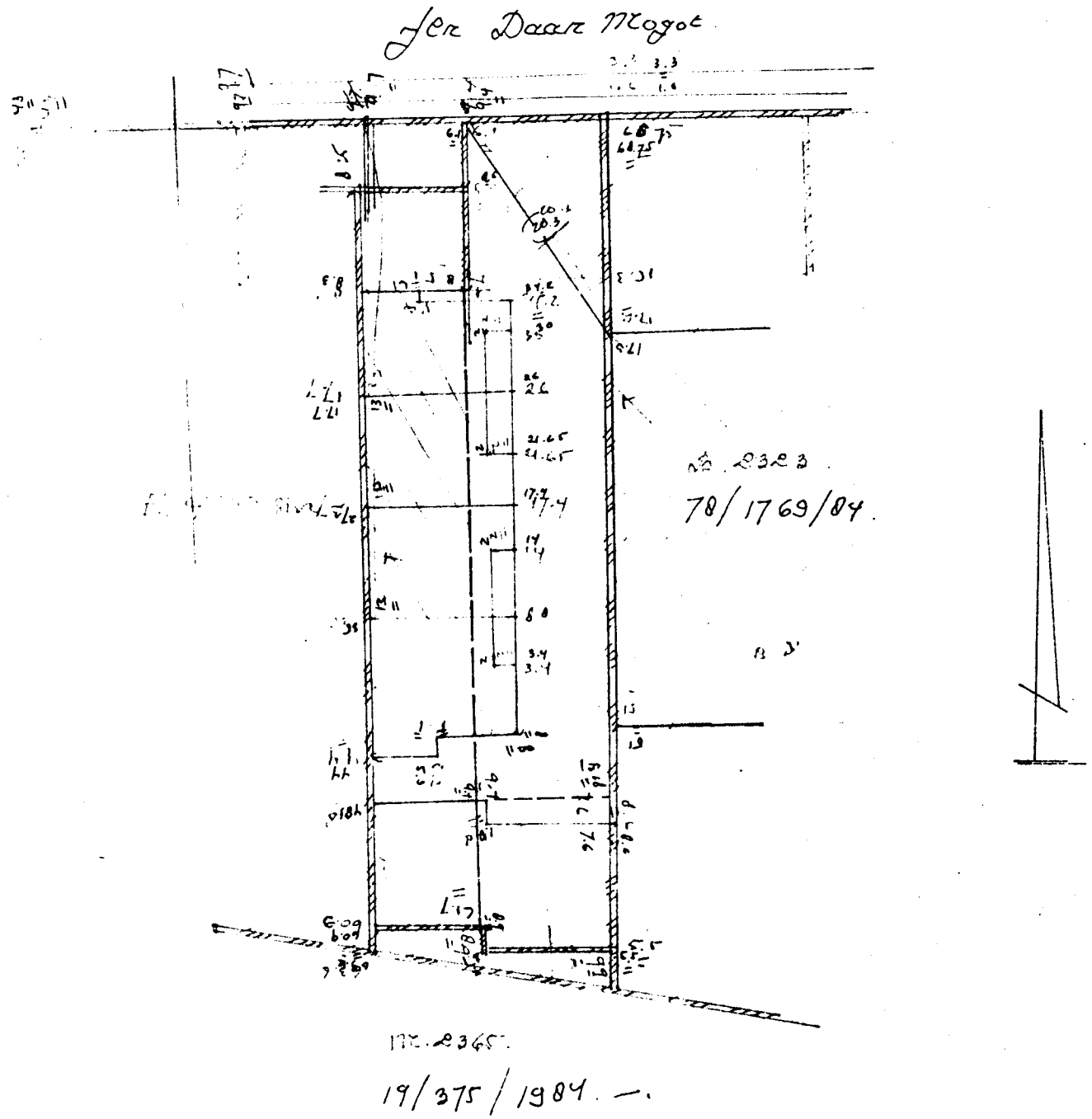


Figure 2.9. The Original of Cadastral Plan

Table 2.1. Land Titling Process Characteristic

Land Titling Process Name	Titling Approach	Location	Cost	Initiated (subsidized) by	Adjudication Problem	Cadastral Survey	Volume of CT issued	Former Right
* Special Projects (Transmigration, Agricultural, and Plantation Estate Projects)	Systematic	Rural (new)	Low	Governm.	Low	Graphical (Photogram.)	Mass	State Land
* "PP 10" Project ("village by village")	Systematic	Mixed	Low	Governm. (Agrarian)	High	Graphical (Photogram.)	Mass	Customary and State Land
* Existing Parcel:								
- PRONA (Agrarian National Project)	Systematic	Mixed	Low	Governm. (Agrarian)	High	Graphical (Terrestrial)	Mass	Customary and State Land
- Individual Request	Sporadic	Mixed	High	Individual Owner	High	Graphical (Terrestrial)	Individual	Customary and State Land
* Sub-divisional of existing parcel.	Sporadic	Sub-urban & rural	High	Individual Owner or Developer	Moderate	Graphical (Terrestrial)	Individual or Mass	Customary and State Land

Note: +CT: Certificate of Title

a few owners who do not wish to register their land or who do not have enough documentary support.

(b) Sporadic Land Registration

The sporadic land registration refers to a purely voluntary request by the existing individual owner to register her/his land; to convert the State land to a new land right under the new system; or to subdivide the existing registered or unregistered land parcel. In practice the fee for this land registration is fairly high, because the process is carried out individually. Most sporadic land registration is in urban areas because most urban population owners appreciate the advantage of registration. Nonetheless, most land is still unregistered.

Registration of land parcels in areas that have large scale base maps (these are called "daerah lengkap" or prepared areas) is not a major problem. Cadastral survey is usually done with a very high accuracy and certificates of title can be issued. However if the area has not been mapped, only a temporary certificate of title can be issued; this area is then called "daerah persiapan" or un-prepared area. For this registration, a very rough plan is the minimum requirement. If the area has no map at all, certificates cannot be issued.

In the application of photogrammetric methods (after 1969) in land titling processes under PP 10 and PRONA projects, the identification of land parcels can be done directly from the photomaps. Although the absolute position of the parcel is less accurate, the relative position can be ascertained. The parcel boundaries which are usually hedges, paths, roads, rivers and other man-made or natural features are visible on the photographs. This registration process is called "initial registration" which is considered less accurate. When a transfer of ownership has occurred, a "second registration" is carried out based on an accurate survey of individual boundaries.

The PRONA Project is one promising process of achieving land registration. It should accelerate the formation of a complete register, even though the time of completion is still uncertain because it is not really a systematic land registration. Another approach could be applied to the subdivision process of mostly large land parcels in suburban and urban areas which is usually executed by land developers. A compulsion to register the newly created parcels in these areas should also achieve an acceleration of land registration. However, there are always some remaining parcels which lie outside the area of registered parcels. The remaining unregistered parcels can only be registered through a systematic approach that may be similar to PP 10 project.

The existing systematic land registration method appears to be the best approach for the Land Registry office. However it should be realized that the registration process is not only required to secure land ownership and to facilitate conveyancing, but also to provide information to other agencies. Hence the recording system should be improved both of the ownership records and the cadastral maps that can be accessible for other agencies. These records should be effectively maintained.

2.7.1 BRIEF CONVEYANCING SYSTEM

Transactions on land can be done using several procedures in accordance with the status of the land, registered or unregistered. The land deed itself has to be prepared and signed in front of the "Pejabat Pembuat Akte Tanah (PPAT)" (land deed official) appointed by the Agrarian Office. There are two different kinds of PPAT: a notary, a private practitioner, who is a lawyer with two additional years of notary course (usually called "notaris", but not all notaris' are automatically appointed to be PPAT); and a PPAT who is automatically appointed because of his position in local government as a camat (head of district). For unregistered land parcels, transactions in desas are done by the desa head's recommendation and the deed is prepared by the camat as PPAT. A copy of the land deed is sent to the regional Land Registry either by PPAT or the buyer, for changes in the owner's name on the land register and on the land title, or for inserting a new ownership record of unregistered parcel for the issue of a new land title. For the purpose of transfer of State land rights, only notaris as PPAT is assigned for the preparation of the land deed.

2.8 RECENT INITIATIVES

Since the Agrarian Reform in 1961, systematic land registration under the PP 10 Project were carried out very slowly using only terrestrial methods until the early 70's. Since 1972 (the effective year of the use of photomaps) photomaps including unrectified photographs have been produced covering an average of 100,000 to 200,000 hectares each year in mainly rural areas. The scale of the photographs is 1:5000 and a five-fold enlargement is made.

The involvement of the World Bank since 1972 under the IBRD (International Bank Reconstruction and Development) Loan for urban development has been mainly for the kampung (Indonesian typical settlement) improvements and services projects. In earlier Urban I & II Loans projects, the cadastral system fiscal as well as legal, has only been considered and studied without any significant physical activities, as mentioned in some of the Bank's appraisal reports. Some important recommendations appeared in the reports for land registration and land property taxation improvements in regard to public land acquisition process, mortgages, compulsory land registration, and mobilization of resources required for continuing urban development (Sherer, 1985).

The first substantial study on Land Registry and IPEDA is contained in Urban III Loan (1979) for the City of Surabaya in a land titling program to improve kampung areas and technical assistance for improvements to the property tax system. The mapping element is more significant in the Urban IV Loan (1981), in which mapping is one of the three principal objectives, which include the initiation of a national program for urban mapping of 100 cities called Urban Mapping Project. It comprises an amount of US$ 9.55 million out of the total project cost of US$ 85.89 million. Superimposed (50cm x50cm) photomaps (rectified) on a scale of 1:1000 will be produced in this project (see chapter 4).

They will be used by IPEDA and Regional Planning Offices.

The technical supervision for the mapping work from the Bank is very thorough. The irony is that this thorough supervision has caused some significant delays, because the local consultant has not been ready for such tight supervision and considerably high accuracy requirements. For example the first stage (46 cities) planned to be completed in 1983 was not totally completed until the end of 1985. Improvements on the next stages can be expected following the initial experiences.

Since the main component of Urban IV Project is mapping, it is important to draw a strategy for further steps that involve more than one agency in gathering the descriptive information and maintaining the whole collected data effectively. One initiative by the Center for Land Research and Development of the Ministry of Interior (Pusat Penelitian dan Pengembangan Pertanahan) in a Land Information System Research Project was scheduled to commence in September 1986. The project should study the existing land data systems, and the design and implementation of land information systems through a pilot project. The project looks very promising, but it must be co-ordinated by an executive committee with representation from relevant agencies. Thus the designed system can be implemented, so that it is acceptable and useful for a wider group of users.

2.9 CONCLUSION

To conclude the discussion, there are two main issues that should be highlighted within Land Registry office:

1. The completeness of the land register.
2. The role of cadastral survey and cadastral mapping.

In association with this, the major technical problem is how to aggregate a large number of ownership records in order to obtain a complete register where cadastral maps are a pre-requisite. The time should be short and the cost should be as low as possible.

The problem on land administration in directing existing land data system toward an efficient system (LIS) in Indonesia is similar to the problem in many countries world wide; that is how to obtain a complete up-to-date record of land in the system. Without complete and reliable data in a system, that system has no meaning at all to users. Whether the land registration system can be used to obtain a complete record in Indonesia is debatable, even though land registration is compulsory according to existing regulations. In practice the government has been unable to enforce these regulations.

The government is very reluctant to carry out systematic registration extensively, because the administrative structure is inadequate, and in addition demands from the population in most areas have not been great. Therefore an approach should be adopted based on the priority of certain areas over others in both city and rural areas according to the level of general development.

The principle of the land registration system in Indonesia has been developed from the Dutch system and customary law. The certificate of title is a valid document of ownership based on publicity and speciality principles. Although the adjudication ("contradictaire delimitation") process and boundary survey are done accurately, the title is unfortunately not indefeasible. It is impossible to trace back the true owner to obtain an absolute title without appropriate written document. Although the system seems to be uncertain and insecure, the title is well recognized as a legal document. Thus the land title registration system has been accepted and is thus suitable for this country. If an improvement in the uncertainty and insecurity of the title is felt necessary, the government may need to guarantee the title, for example by an assurance as in the case of the United States.

The adaptation of the Western land recording system ("Grundbuch") seems to be understood well by the Land Registry staff, but the mapping element has not been appropriately recognized. Cadastral mapping and cadastral survey are the major weaknesses in the Land Registry. They are loosely related and lack a conceptual base, particularly in specifying survey and mapping work to fulfil the necessary and reasonable requirements. Cadastral survey and cadastral mapping are in fact very important. They will be discussed separately in Chapter 4 in relation to other survey and mapping activities of other agencies.

The emphasis of all improvements in the operation of the Land Registry is not towards a collection of comprehensive data, but the most important requirement is the collection of complete data that should be available even in a very rudimentary form. In cases where land parcel owners cannot be determined due to incomplete documents or other administrative reasons, a temporary file can be created. It is a matter of "better to have something than nothing", as the well-known saying goes (Triono, 1979). A temporary filing system may not provide complete legal data, but as long as the data is useful for other purposes, the record is worthwhile.

This study is not intended to introduce or recommend a new record system, but it aims to stimulate attention and understanding of the land administrators in Land Registry towards an improved concept of land registration and cadastral system. It serves to promote the role of the Land Registry in a broad spectrum of land administration. If possible the government may provide the impetus to increase the capability of Land Registry to function as a centre of land data in the whole land administration.

CHAPTER 3

3. LAND TAXATION SYSTEM IN INDONESIA

3.1 GENERAL VIEW

As described in previous chapters, land taxation originated from land rent introduced by Raffles. The name was changed from "Land Rente" to "Pajak Tanah" (Land Tax) by the Japanese around 1942. After the declaration of independence in 1945 it became known as "Pajak Hasil Bumi" (Agriculture Production Tax), and in 1965 it became the "IPEDA (Iuran PEmbangunan DAerah)" (or Contribution for Regional Development) administered by the Directorate of IPEDA under the Directorate General of Taxation, Department of Finance. Very recently, under the new Law, No. 12, December 1985, the name was again changed to "Pajak Bumi dan Bangunan (PBB)" (or Land and Building Tax).

The original (colonial) purpose of the tax system introduced by the (Dutch) government was for revenue only. Taxes on agricultural land were collected by each village head. The collection of taxes from the native people under Land Rente (see 2.3.1) created much pressure on the village heads. After independence the revenue was sent directly to the central government and the pressure was significantly reduced. Besides Land Rente, there was also another tax system called "verponding". Basically, this tax system was applicable under the Dutch law to a small number of land parcels in urban areas, and to a few large agricultural land parcels cultivated by non native people. This system was administered by the Kadaster (former Agrarian Office).

For the purpose of this thesis, discussions will be mainly on the present land tax system and the term "IPEDA system" will be used for this tax. The term "IPEDA" will be used as the Indonesian land tax office. However some issues relating to the "PBB", which will effectively be in operation in 1990, will also be mentioned.

3.1.1 RURAL LAND TAX

Generally, after Independence, the land tax system lost its popularity although some new policies have been implemented. The tax rates were increased but the increases were small compared with the very high inflation during the unstable political and economic situation in the sixties. The level of data collection and reassessment remained low compared with the improvement of agricultural facilities and the increase in the number of taxpayers that have occupied land, such as forest land or state land. In general, less than 50% of potential revenues are collected (Sherer, 1985).

In many less developed countries where the imposition of taxes is usually politically sensitive, Pepper (1972) argues that it makes sense to link land taxes to services and empower local governments to administer the taxes. The approach by the Indonesian government in introducing the IPEDA system is quite similar in this respect whereby revenue is mainly collected by

the regional governments under the direction of the central government. The IPEDA system is considered as a contribution of the people for the regional development and not a tax, though for practical use in this thesis, the term "tax" and "land tax" are used.

However since the introduction of IPEDA system (1965) until the eighties, there has been no significant change that would increase the land tax yield from the rural land. Operational budget and facilities available to IPEDA have been very inadequate, especially in local governments. Most of land data used by IPEDA are older than 30 years.

Financially, most developing countries cannot rely on taxes on the poor peasants even though financial support is still needed for developing the physical infrastructure in rural areas. The aim of every development, such as irrigation schemes in agriculture areas is to create better systems to increase crop production.

During the seventies, while the IPEDA system for rural land remained static, a tremendous amount of money has been spent on a large number of big projects in rural lands, because the First Five-Year Development Plan (1969/1970 - 1973/1974 fiscal years) of the New Order of Government emphasised agricultural developments. After each development, maintenance of the physical structure is imperative. This is generally the responsibility of local governments. It is rational that the people who enjoy the result of that development should also share this responsibility by contributing financially to the local government. If possible they should also share the cost of the development. Therefore the local government administration should significantly improve their capability for collecting that contribution based on up-to-date information through the IPEDA system. This is the major reason that has encouraged the government and major world organization to provide loan for IPEDA to carry out rural land tax assessment projects in the beginning of the eighties.

The major problem is in collecting data of each parcel of land, which must be done mainly in the field. This includes mapping and considerable office work for the tax assessment. Acceleration of these works can only be achieved if some new techniques such aerial photographs and modern survey instruments can be applied to field work and computer technology to office work.

3.1.2 URBAN LAND TAX

After independence, the verponding system was still applied for urban land until the sixties, when the Indonesian government realized that migration to the cities has been increasing very rapidly, especially in Jawa. Then it was realized that a land tax system directed at the middle and higher income class people in urban land is potentially lucrative to the government. Therefore, in 1966 a land tax system called "IREDA (Iuran Rehabilitasi Daerah)" (or Regional Rehabilitation Contribution) for the Metropolitan City of Jakarta was introduced. This name was used only for several years in that region, though the system is no different from other urban land tax systems (IPEDA system)

implemented in other cities to replace the verponding system. Currently, the term "IPEDA" is used universally in Indonesia.

A study of urban property taxation, with special reference to Jakarta, by Holland-Oldman under the sponsorship of the World Bank in 1972 for the Urban I project, found that only about two-thirds of the taxable properties were effectively registered and assessed in IPEDA. Moreover, a large part of property information contained under-declaration of property sizes and other relevant data, because the authority mainly rely on data given by the taxpayers which were rarely checked (Sherer, 1985).

Due to the increase in the size of taxable land in urban areas the government has put a higher priority on urban land tax than the rural land tax. As a result, some studies have been carried out to improve the tax system toward a more equitable assessment system in urban areas.

3.2 IPEDA ORGANIZATION

IPEDA is under the Directorate General of Taxation, Department of Finance. The general hierarchy of IPEDA offices is shown in Figure 3.1. There are 39 "Inspeksi IPEDA (IPDA)" (IPEDA Inspection) offices which are administratively under 9 "Kantor Pajak Wilayah" (Tax Territory Office) throughout the 27 provinces (see also figure 2.1). An IPDA office is allocated to an area according to the number of taxable land parcels or the magnitude of tax revenue in that area. Tax assessment activities which include collecting data in the field are mainly the task of the

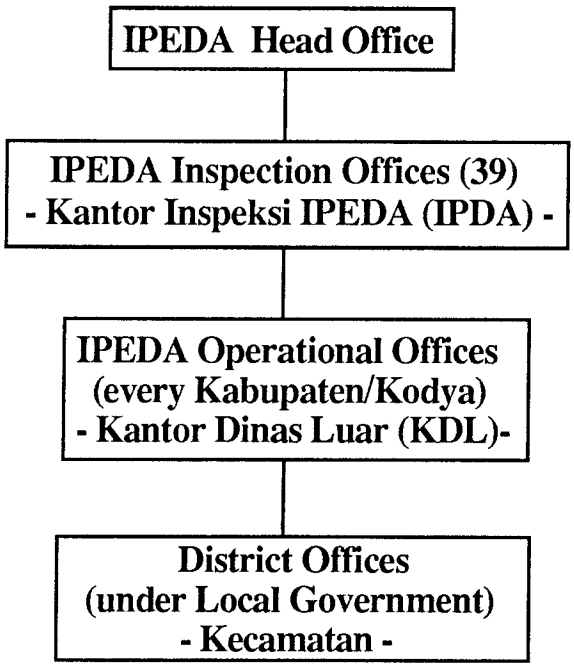


Figure 3.1. The Hierarchy of IPEDA.

IPDA office. But the maintenance and readjustment of tax if necessary, (for example readjustment should be done if the tax rate is changed) is done by the "Kantor Dinas Luar (KDL) IPEDA" (IPEDA Operational Office). The KDLs are located in almost every Kabupaten/Kodya. The collection of the tax is done by the Kelurahan or Desa (Locality/Village) office under the direction of the Kecamatan (District) office.

There are five different land uses taxed by IPEDA: rural land, urban land, forest land, large plantation land and mining land. They are classified under three different sections in IPEDA and in each IPDA office:

1. The Renewal Section I (called "P1") is for rural land. It covers dry farm land, paddy or rice fields and rural settlements (villages).

2. The Renewal Section II (called "P2") is for urban land. It covers all cities, industrial estates, real estate etc.

3. The Renewal Section III (called "P3") covers forest, plantation and mining land.

The mapping section does not exist separately within IPEDA. The professional land tax assessors have to carry out identification work and boundary survey by themselves if no map is available.

3.3 THE EXISTING LAND TAXATION SYSTEM (IPEDA SYSTEM)

3.3.1 PRINCIPLES OF THE IPEDA SYSTEM

The primary function of IPEDA is not aimed at revenue generation for the government. Rather, it provides a source of data on which other government agencies can rely on for revenue collection. As an information centre, IPEDA should be able to aggregate, store, process, retrieve and disseminate the processed data (information) into a form that is meaningful to the recipient in a systematic fashion.

In theory, the task of IPEDA is only to assess and determine a proper tax for each land parcel and provide the data to local governments for tax collection. The targetted increase in revenue every year by the government is about 20% (IPEDA, 1984). The increased target has forced IPEDA not only to update or re-assess taxpayer data, but also to determine a new appropriate tax rate.

In order to succeed in the task of assessing land tax, three major steps have to be carried out. They are:

1. To prepare a map base. IPEDA only requires cadastral boundary information for each land area. In preparing a map base, it does not necessarily have to carry out the mapping. IPEDA may also obtain maps from other mapping authorities.

2. To up-date taxpayer data, including tax assessment, re-assessment and to maintain the data. Basically from the assessment and re-assessment (in which data are collected from the field) processes, two lists (or registers) are created (this is similar to Land Registry) and stored: the map and descriptive data.

3. To issue tax statements for taxpayers and provide a list of taxpayers for local administrators for tax collection.

In addition, data about ownership should also be collected and maintained by IPEDA. The principle of tax assessment is fairly simple, but the need to maintain up-to-date ownership records and ensure equitable assessments is demanding and complicated. This is aggravated by the lack of skilled labour. Under the IPEDA system, the following data are expected to be available:

1. the location of the land parcel;

2. the area of the land parcel (and the building);

3. the owner and/or the taxpayer's name;

4. the class of the land (and the building).

Ideally, IPEDA should not carry out cadastral mapping which is the task of a survey office. A register of owners (taxpayers) can be obtained from Land Registry. Classification of each land parcel for the tax assessment based on land value and improvements is the task of valuation body. IPEDA needs only to concentrate on the tax assessment in order to achieve a principle of equity in taxation. This is difficult to achieve because IPEDA depends on other (or several) government body(ies). At present the major efforts of IPEDA are on the preparation of the map base, collecting and maintaining ownership data as well as classifying land and building for tax assessment.

The existing land classification process for tax assessment on urban and rural land for IPEDA system is very complicated. Several factors such as annual rental value, selling price, market price, tranportation system, urban facility, and national class of road and street for urban land; and annual crop production, irrigation system, terrain, soil, and transportation system for rural land then have to be considered. It is evident that a large scale up-to-date base map is essential for this process as well as for determining an appropriate tax rate.

In summary, the two major problems in IPEDA are the identification of the boundaries for determining land area and the equitable classification of each land parcel (see also 3.3.2). However details about the land classification and tax rating system are beyond the scope of this study.

Under the IPEDA system, the tax assessment system is generally based on annual land production (for rural, forest, large plantation and mining land), and annual rent of building and/or improvement (for urban land). Under the new PBB system (Law on Land and Building Tax No.12, December 1985) the tax assessment system is simplified, being based on the value of taxable land

using the approximate sale price and is applicable for all types of land uses. The value then has to be determined annually in accordance with the development of each region.

Although IPEDA can be considered as an information centre, the information provided by IPEDA are not directly useful to other agencies because collected data that are based on simple specifications are considered insufficient. For example the IPEDA cadastral map is not useful to the Land Registry or other agencies (see 3.3.4). A clear specification of all collected data, including mapping may have to be re-established.

3.3.2 IPEDA RECORDING SYSTEM

Each of the three sections (P1, P2, and P3) in IPEDA is distinctly based on its land use classification task (see 3.2). Each of them has also slightly different data collecting and assessment systems. The delineation of these three land use areas is not very critical. The criterion of an urban area is usually on the basis of whether it is a city, a town, or a planned established (built-up) area. Some urban areas are zoned by legislation of the central or local governments. Generally the section P1 and P2 adopt this criterion for differentiating between rural and urban lands without difficulty. For "P3" areas, a land parcel is delineated either on the ground or on a map based on a given right from the relevant department (see 2.3.2).

The P3 section deals only with firms (land holders) owning large land parcels, because only firms are allowed to own a right to a large area. Data are passively collected based on annual production reports from the firms without any field work. The "P3" land record is generally complete, being provided by each land holder, but the number of parcels held in this section is relatively small. Moreover a map record is not considered worthwhile. This section has a fairly simple tax system and will not be discussed further in the thesis. The list of total number of registered taxpayers (taxable parcels) and areas for P1, P2 and P3 land use types in 9 KANWIL to December 1985 is shown in table 3.1.

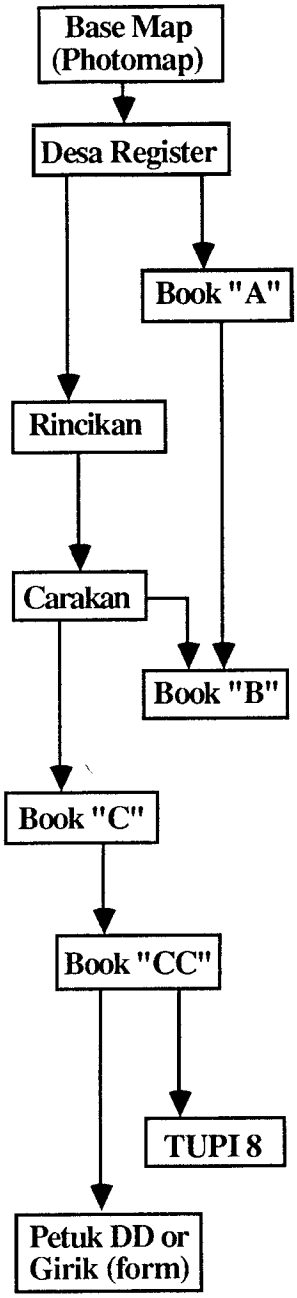
Since the three section have some significant differences in policies, working areas and assessment systems, the discussion will often highlight these differences.

3.3.2.1 RURAL LAND DATA COLLECTION FOR TAX ASSESSMENT

In general, the IPEDA system for rural (mainly agricultural) land is based on annual crop production. The main difficulty is how to determine the true annual production. The IPEDA system is very sophisticated but inefficient. It is time-consuming, despite the fact that it involves just a simple statement ("Petuk DD or Girik") from IPEDA. The process of land tax assessment for IPEDA system is shown in figure 3.2. The complex process is in the determination of land class, in which there are two major land use types: "sawah" or paddy field which covers most of rural land, and "darat" or dry land (including fish-pond). Land classification is based on the National Class which comprises 15

Table 3.1. Total Registered Taxpayers and Areas in IPEDA to Desember 1985.

Under Tax Territory Offices *Kantor Wilayah (KANWIL) Pajak*	**Rural land (P1)**		**Urban land (P2)**		**Forest,plantation & mining land (P3)**		**TOTAL**	
	Taxpayer	Area	Taxpayer	Area	Taxpayer	Area	Taxpayer	Area
KANWIL I (5 IPDA)	1,941,559	1,582,572	535,848	35,336	1,302	27,610,336	2,478,709	29,228,244
KANWIL II (4 IPDA)	1,233,840	1,300,399	290,521	26,407	336	8,496,635	1,524,697	9,823,441
KANWIL III (5 IPDA)	5,489,230	2,300,058	858,063	117,759	386	5,662,809	6,347,679	8,080,626
KANWIL IV (6 IPDA)	6,822,627	2,474,723	727,043	25,670	170	639,867	7,549,840	3,140,260
KANWIL V (6 IPDA)	6,628,424	2,896,968	748,586	36,493	230	3,079,220	7,377,240	6,012,681
KANWIL VI (3 IPDA)	506,157	931,251	268,910	26,900	783	25,140,686	775,850	26,098,837
KANWIL VII (3 IPDA)	2,905,693	2,206,492	346,758	31,542	181	1,004,239	3,225,632	3,242,273
KANWIL VIII (4 IPDA)	578,898	761,054	149,329	27,025	265	8,860,017	728,492	9,648,096
KANWIL IX (3 IPDA)	---	---	824,886	39,445	---	464	824,886	39,909
NATIONAL TERRITORY	26,106,428	14,453,517	4,749,944	366,577	3,653	80,494,273	30,860,025	95,314,367



CONTENT:

- Boundary of regencies, districts, and villages.

- Boundary of persils (in map form)
- Persil register
- Area and class of persils.

- List of persils for each desa.
- Area and class of each persil.
- Tax calculation for each persil.

- Boundary of land (tax-payer) parcels (in map form).
- List of tax-payer name and address with number.
- Area of each land parcel.
- "C" number (from Carakan).

- List of tax-payer names in alphabetical order with "C" number; for each desa.

- List of tax-payer names in alphabetical order, its "C" number, parcel area and the total areas for each persil.

- List of land parcel(s) of each tax-payer and its "C" number, area of land parcel(s), land class(es), and total area for each district.

- List of land parcel(s) of each tax-payer and its "C" number, area of land parcel(s), land class(es), annual production per hectare, rate of each class, and total area and total annual tax for each district.

- List of tax-payer names and the assessment annual land tax for each desa.

- Statement of tax-payer from IPEDA (as an ownership statement letter for unregistered parcel).
- List of his/her land parcel(s) in one desa.

Figure 3.2. The Process of Land Tax Assessment

classes for sawah and 17 classes for darat. Within one village, there should only be seven classes out of the 15 sawah and 17 darat classes. In each desa there is usually one "petak percobaan" (or experimental field), for example a parcel sawah used as experimentation for determining the annual rice production. The classification is therefore based on that parceland the seven classes applicable in that village under the National Class.

Classifying and identifying each land parcel involves two stages:

* boundary identification of areas that belong to a similar class in one village called "persil" (not the smallest land unit or block). The maximum area of each persil is 10 hectares for the sawah and 15 hectares for the darat. Parallel with this activity is the determination of its class category in the seven classes. A unique process of class determination is to compare each land parcel with the surrounding parcels one after another (sequentially). (Note: In IPEDA the term "persil", from the word parcel is used for a field or area of a similar class of land).

* boundary identification of each land parcel (the smallest unit block). The identification of this leads to a cadastral map. Theoretically, boundary identification involves demarcation and monumentation. In practice monumentation is sometimes neglected.

The recording system for the assessment of the rural land tax is very labour intensive. It is very complex and difficult to understand particularly in maintaining land records up-to-date. There are at least seven books for each desa before the issue of the annual taxpayer list ("TUPI 8") (for district administrator), and the tax statement ("girik" or "petuk DD") (for taxpayer). These seven books are:

1. List of persil ("Desa Register")

2. List of persil, area, class and total tax of each desa (Book "A")

3. List of land parcels and taxpayer names ("Rincikan")

4. List of taxpayers' (and owners') names in alphabetical order in two separate books ("Carakan")

5. List of taxpayers' names, land parcel areas and total area in each persil (for checking) (Book "B")

6. List of land parcels of each taxpayer (and owner), including the land class and total area held on two separate books (Book "C")

7. List of taxpayers in detail including their average annual production and total annual tax ("TUPI 8") for each district (Book "CC").

The complexity of this recording system is aggravated by the fact that IPEDA is interested in keeping and maintaining ownership records besides taxpayer records. This can be seen in the lists of each "Carakan" and Book "C" (for taxpayer and ownership) which are separately kept and maintained.

Large scale maps are a prerequisite for the above recording systems. But once the land tax has been assessed, descriptive data are more predominant than the maps. Consequently the maps seem to deteriorate immediately after the assessment process because of the lack of maintenance. Moreover the maps are not in one standard scale and unlikely to be useful for other agencies.

3.3.2.2 URBAN LAND DATA COLLECTION FOR TAX ASSESSMENT

The IPEDA system originates from a traditional system which is applicable to rural land. Hence the urban land data collection for tax assessment has been significantly influenced by the rural system, thus complicating the urban system. One additional element in the urban system is the identification of improvements (building and other construction) on each land parcel. Otherwise, the recording system for urban land is quite similar to that for rural land.

A contrasting feature of rural and urban land classification is that land parcel classes in rural areas are comparatively homogeneous being based of annual production for large areas whereas urban land is heterogeneous depending on its improvements (buildings). Buildings (improvements) on each land parcel in Indonesia are varied and mixed in form, structure, size and uses (commercial and non-commercial). Therefore class determination of urban land parcels can hardly be done on the same basis as persils as in rural areas.

Two technical problems can be identified in the field collection of urban data:

* Identification of building corners and land boundaries needs large scale maps. Photomaps are not always appropriate especially in a very densely constructed area.

* Determination of building classes is difficult. Building class requires considerable field checking to determine the structure, the use (commercial or non- commercial) etc. There are 32 classes of land and 16 classes of commercial and non-commercial uses of building.

In theory, the land classification for urban land by IPEDA is based on the general land value in conjunction with an estimated rental value. However for determining the general value, an areal class distribution of land should be issued by IPEDA before the tax assessment, to be in line with the equity principle. As discussed in 3.3.1, without adequate up-to-date large scale maps, it is impossible to impose a fair classification. Therefore the estimated rental value is closer to the present (rough) estimate of value and its improvements, than to the value based upon location or development value.

Efforts to improve the complex valuation system have been carried out by the World Bank under Urban projects begun in 1972. Some recommendations have been forwarded for a new property valuation system based on a separate market valuation tax-base, formed from an analysis of sales data, and a building valuation system based on type of building use. An improved computerized administrative procedure has been introduced (in Surabaya) for a better filing system of basic property and assessment records, and for improving land tax collection procedure including quicker supplying of tax bills (Sherer, 1985).

3.3.3 SECURITY OF OWNERSHIP BY IPEDA

Although security of land ownership is not provided by IPEDA, facts show that many people are familiar with the system and still rely on IPEDA records in land transactions. The system does provide a cheap and simple means of transaction. In the absence of a land registration project, IPEDA has more complete data on ownership of rural land than the Land Registry. IPEDA can issue documents of ownership ("girik") (example in figure 3.3) which are neither legal nor conclusive as to ownership status. Even though the statement letter from IPEDA is not a legal document as stated on lower left corner of the letter ("SURAT KETETAPAN IPEDA INI BUKAN TANDA BUKTI HAK TANAH"), this letter has been widely recognized, for example in tracing the true owner in legal land disputes. This is the reason why the role of IPEDA has been so important in land dealing, particularly in rural areas. This public recognition has forced IPEDA to continue keeping the ownership data up-to-date.

To understand this problem, it is important to review the historical evolution and existing conditions of rural communities. Since the Dutch era, the maintenance of written record of rural land has been left to the initial fiscal office. It is therefore very difficult to introduce a new land registration system (in 1960) to the people, the majority of whom are illiterate. The life styles in desas are based on strong community ties, which can be contrasted with individualistic life styles in urban areas. Common knowledge and the desa leader's authority prevails over written records. However since the government desired a formal written record, this record of ownership had to be established in the register of IPEDA. This was considered carefully before the introduction of the legal (title) register by the Land Registry. Since then there has always been a list of taxpayers and a list of owners in IPEDA registers.

As a result of a large growing population in Indonesia in the last 30 years, it appears that the number of land parcels and dwelling units is also growing extensively. Hence there are an enormous number of land parcel records still under IPEDA system that can be useful not only for IPEDA but also for other purposes even though these land parcels are not secured. It is commonly agreed that the land records without legal protection are less reliable, but they are still better than nothing.

TANAH MILIK ADAT

SURAT KETETAPAN IURAN PEMBANGUNAN DAERAH № 012492
DAERAH KHUSUS IBU KOTA JAKARTA RAYA

Nama : Mugiman Bin ..... No. C 735

Alamat : .....

Alamat Obyek : Kelurahan : Ulujami Rt. 006 Rw. 02

Kecamatan : Kebayoran Lama. Wilayah Kota Jakarta Selatan.

Nomor Kohir : .....

Sertifikat : ..... Hak .....

Nomor Persil/ Blok	Zone Komplek Dan Klas	Penggunaan	Luas Tanah Dan Bangunan		P SP NP	Ketetapan Ipeda	Keterangan
			Luas Tanah	Luas Bangunan			
IIa	D II		0.030				

urat Ketetapan IPEDA ini diberikan :

tas permintaan Sdr. .....

engan Suratnya Tgl. : .....

erkas/Agenda Tgl. : .....

HASIL VERIFIKASI No. TH. 1976/1977

No. .....Ris...../6/R/77.

SURAT KETETAPAN IPEDA INI BUKAN TANDA BUKTI HAK TANAH

Jakarta, 22 Juli 1977.

INSPEKSI IPEDA
KEPALA KANTOR IPEDA WILAYAH
D.K.I. JAKARTA

DRS. SAM HERLING LUMINGKEWAS
NIP 060037103.

Figure 3.3. The Statement Letter for Taxpayer (Girik).

The tax-payer and ownership lists in IPEDA (rural and urban), that need to be maintained, consists of the owners' and tax-payers' name and address, land area, class of land and building, and parcel identification number. Identification system in IPEDA is so complicated that will not be easily applicable by other users. The parcel cannot be identified on cadastral maps by the number written on the tax-payer list, without tracking back through several different lists (see 3.3.2.1). Therefore the only link that can be used to integrate the Land Registry registers and the IPEDA registers is with owner's name and address.

3.3.4 IPEDA (CADASTRAL) MAPPING ACTIVITIES

Although large scale maps have been considered as the basic component of the IPEDA system, survey and mapping techniques used in IPEDA were not improved until the early eighties. Cadastral maps produced by other agencies are very limited. Local government offices (Planning Section) can provide urban maps only for a small part of cities. Rural cadastral maps are virtually non existent within IPEDA.

The old rural IPEDA cadastral maps were mainly produced in conjunction with the Army Topographic Service (JANTOP) (see 4.2.1) based on a mutual cooperation agreement between these two government bodies. JANTOP supports the mapping of administrative and persil boundaries. To complete this map, IPEDA has to survey parcel boundaries using a very simple technique and identify the land class, taxpayer and ownership. As the initial purpose of IPEDA is only to determine land area, the emphasis of accuracy is on land area only. The area tolerance between a persil map and the area obtained from a parcel boundary survey should be less than 2%. One additional problem is that maps obtained by IPEDA vary in sheet size, map scale, projection, accuracy, system coordinate etc. Therefore using these maps by other agencies can involve considerable effort in reconciling differences. Figure 3.4 shows an old persil map of rural land by JANTOP (original scale is 1:5000). Figure 3.5 is one persil boundary map (rural land) at a scale of 1:2500 which is attached to the land parcel and taxpayer list or Rincikan (see 3.3.2.1), and figure 3.6 shows a cadastral map of urban land (original scale is 1:1000).

IPEDA faces difficulties in carrying out mapping work because of the lack of qualified surveyors. It was not until the late seventies that one graduate surveyor was recruited. Some important steps such as the introduction of aerial photographs, application of some improved survey techniques and better mapping specifications have been taken since. Within the last few years, aerial photographs were introduced in IPEDA to accelerate land data collection for tax assessment purposes of urban and rural land. The production of photomaps is done by local survey companies under the direction of the IPEDA head office.

IPEDA was able to keep the ownership records up-to-date for unregistered land, but to keep details of every change of land use and improvement and to keep the cadastral maps up-to-date are simply beyond its capabilities. Therefore, a revision or re-assessment is usually planned at regular periods, eg. every 10 years or based on the growth of the area. The revision usually

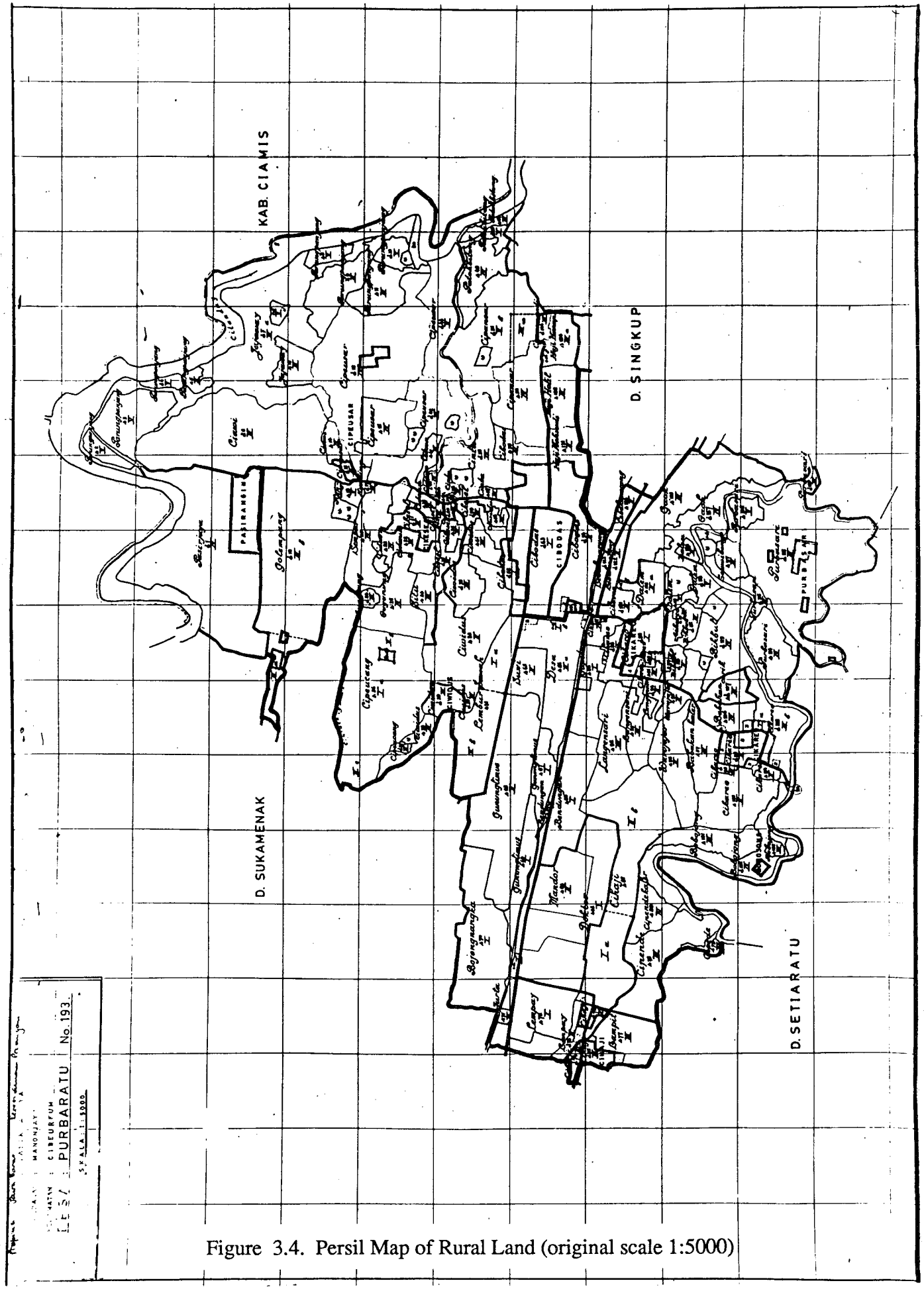


Figure 3.4. Persil Map of Rural Land (original scale 1:5000)

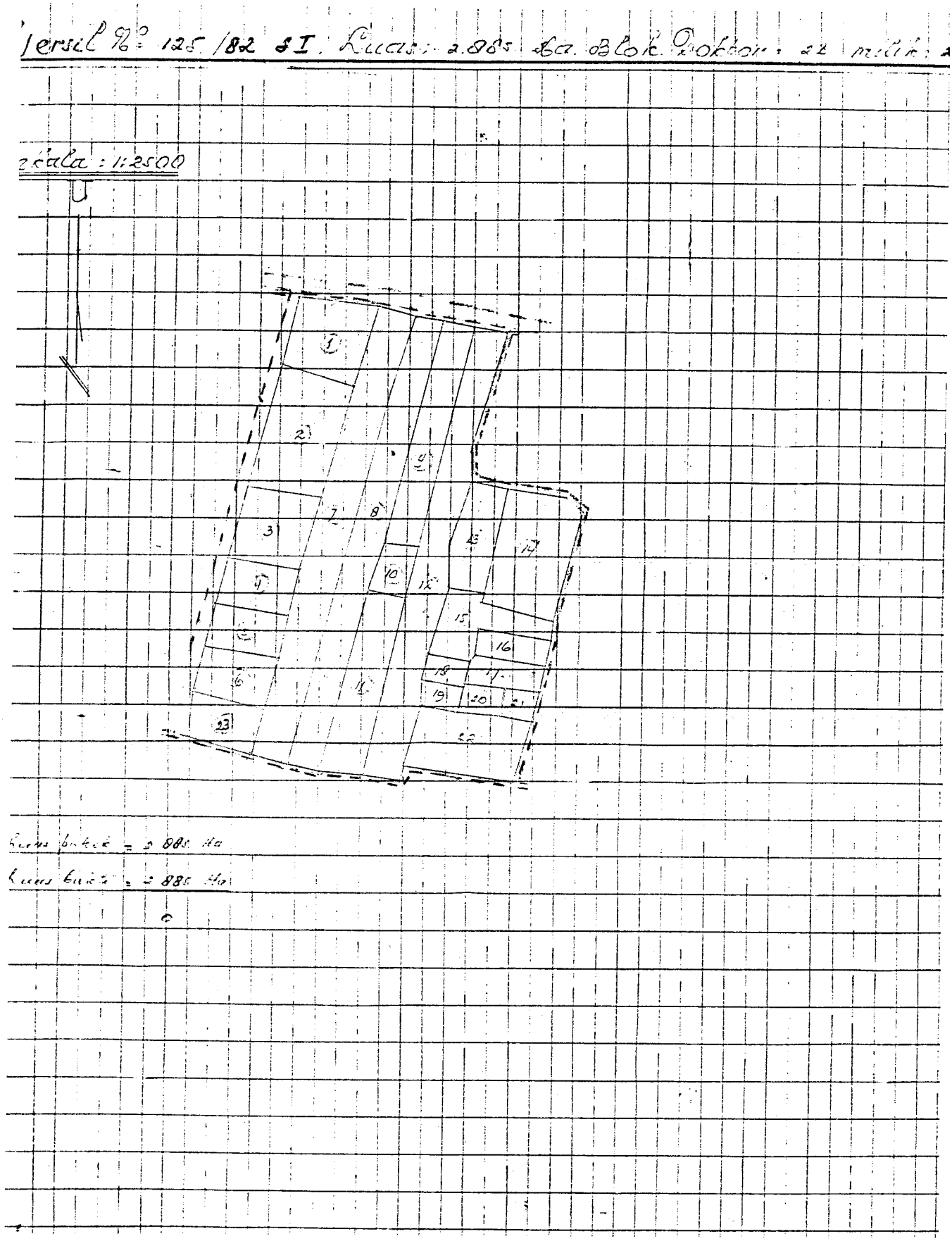
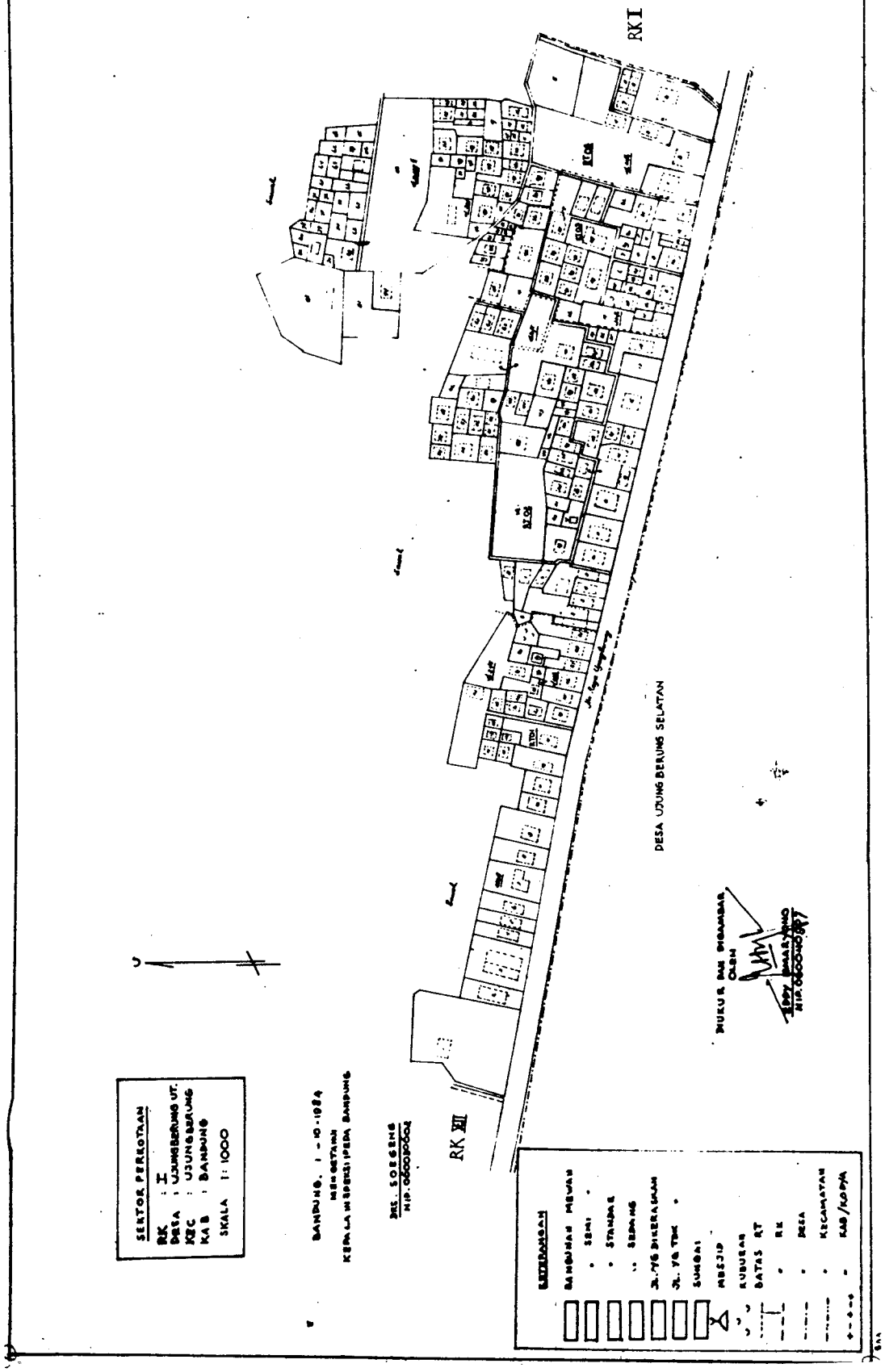


Figure 3.5. One Persil Cadastral Map of Rural Land (scale 1 : 2500)

Figure 3.6. Cadastral Map of Urban Land (from IPEDA)

(original scale 1:1000)



includes redrawing of cadastral maps. This process is clearly inefficient when the volume of data requiring revision becomes enormous. Thus, it is important to consider a more efficient method for maintaining collected data.

3.4 RECENT INITIATIVES

Most tax authorities are keen to intensify their procedures to collect land taxes. The reasons, as argued in the United Nations (1968), are:

> **"on the one hand, the ever increasing population pressure combined with the expansion of infra-structure facilities and general economic development have pushed land values constantly upward; on the other hand, recent technical innovations in survey and valuation methods and tax procedures make it much more feasible than before, also for developing country, to install a modern land tax and keep assessments up-to-date, and thus obtain worth-while tax revenues at a reasonable cost."**

It is apparent that the IPEDA system is not functioning adequately. Not only is the number of properties assessed very low, but the tax rate is greatly reduced by inflation, and the assessed tax properties are well out of date and well behind the growth of general development. As a result, resources for development and for maintenance of services such as roads and irrigations schemes have been largely affected, because of the low revenues from land and property which constitute generally only a very small fraction of public revenues, even including local government revenue. Dunkerley (1986) states that this is "in contrast to the much larger contribution that such taxes made to public expenditures in the now developed countries at earlier stages of their development."

Consequently, some aid have been provided by the government and world aid organizations since the early seventies for improvement programs in IPEDA. The emphasis of these all programs is applied to urban land. In the beginning, the primary aim was to increase revenue by introducing an efficient assessment system based on property values. However in practice, the increase in revenue results from the increase in tax rates, not a more efficient assessment system.

At present, the scheme is also being introduced to rural land. It involves extensive work in collecting basic data and maps. The work is primarily for fiscal cadastres and there are no plans of using it for other purposes. It is essential to consider whether these data collected for fiscal cadastre could be effectively used as a preliminary stage for the development of a multipurpose cadastre.

In August 1986, the World Bank, through the government, supported a project covering an area of 230,000 hectares under the Tenth Irrigation Project in West Jawa (Jatiluhur I). The project will be carried out over a period of 1.5 years. The aim of this project is to collect new data from the field for tax assessment. Based on the result of the increase of crop production after the development of the huge Jatiluhur irrigation system about 10

years ago, it is expected that this project can raise government revenue. The revenue is intended to be used for maintaining the physical structure of the irrigation network. Other similar projects are underway: a project of 266,500 hectares (over 2 years) under the West Tarum Canal Improvement Project (West Jawa); and a project of 103,000 hectares under the Kedung Ombo Multipurpose Dam and Irrigation Project (Central Jawa).

Studies on the methodology of assessment have resulted in a simpler process being introduced under a new PBB land tax system that may integrate the three different assessment systems (P1, P2, and P3). Thus a new recording system may be developed for more efficient maintenance of collected data and more useful for other users.

3.5 CONCLUSION

> **"Land taxes as set up currently present serious problems in equity and administration, which have become exacerbated in many countries where the base or even the amount has remained unchanged for decades and has failed to reflect changing price levels, land uses and revenue needs." (UNITED NATIONS, 1968)**

The introduction of a land tax system by IPEDA began in urban areas with the intention of levying tax on the medium and higher income class people during the first half decade of the sixties. Rural lands remained on a very low tax scale without significant revision or change in tax rates in order not to impose further financial difficulties on peasants. The government had reasons to believe that a better economy could only be achieved by increasing the production from the agricultural sector, where more than 60% of the population live.

The earlier aims were generally unsuccessful, because the urban tax rate is still relatively low. The equitable assessment system has not been properly applied in relation to the rapid development of the urban infrastructure facilities and general economic developments. The areas covering urban development have also been considerably enlarged. Consequently there are a large number of taxable land parcels in those areas, but due to an ineffective and inadequate administrative structure, many of these parcels have not been reassessed.

In rural land, a considerably better economy has been achieved after some extensive improvements in developing the physical infrastructure of agricultural land. However in the eighties, when the time has come to maintain the physical structure, the government realizes that there should be a more effective system of taxation that can collect a larger revenue at least to cover the cost of maintenance by local government.

Therefore the government has attempted to improve the land tax system in the urban and rural areas on a priority basis. The basic IPEDA assessment system is quite appropriate for Indonesia, although it is not simple. In general, the problem lies with the inadequate prerequisite resources available to IPEDA, such as a large scale cadastral map and a complete record of taxpayers. In

addition, the maintenance of ownership records has encumbered and impeded IPEDA's efforts in improving its capacity to carry out a more effective tax system. This is the most difficult problem that has to be overcome and it involves other relevant authorities in the government. More technical support must be given to IPEDA, otherwise the structure of IPEDA will not be sufficient to carry out a large mapping project.

The main objectives of several projects financed by the World Bank are likely to be achieved. Unfortunately, the data collected in these projects are unlikely to be useful to other institutions. A further step to coordinate the use of these data is necessary and highly desirable.

IPEDA has recently generated larger government revenues. This has been brought about firstly from the government action taken to authorize IPEDA to collect basic land data in urban and rural areas; secondly, from the introduction of a new efficient and reasonable tax system (PBB) based on a property valuation system. However it is important that the role of IPEDA in maintaining the ownership records should be gradually reduced, while the role of Land Registry in this regard should be increased.

CHAPTER 4

4 CURRENT SURVEYING AND MAPPING IN INDONESIA

4.1 INTRODUCTION

When the Dutch left Indonesia in the 1940's, less than 10 percent of Indonesia was topographically mapped at scales larger than 1:50000. Mapping facilities were left mainly to the Army mapping unit and a few small mapping units in other government departments. Hence the surveying profession was strongly influenced by the military which emphasised military mapping rather than management requirements. The importance and role of surveyors were only recognised by the government later, culminating in the introduction of UUPA (see 2.3.2) in the early sixties.

In 1968 an impressive development under the Five Year Development Plan (REPELITA - Rencana Pembangunan Lima Tahun) began. Over the last two decades, this development has fostered the growth of large scale sporadic surveying and mapping activities. These activities involved diverse departments and will be highlighted in this chapter. The current role of surveyors in government mapping institutions, and private survey and mapping companies will also be reviewed.

The views expressed in this chapter are influenced by the educational background and experience of the author who has dealt mainly with government mapping institutions and was formerly with one major private mapping enterprise.

4.2 GENERAL LAND SURVEY ACTIVITIES

4.2.1 SURVEYING INSTITUTIONS

It is very difficult to describe precisely the many existing survey activities within the overall government structure. Almost every organization is allowed to undertake relatively small surveying and mapping projects if they need maps for their activities. To avoid complexity in this chapter discussion will be confined to major survey organizations capable of carrying out large mapping projects. They are as follows:

1. The Army Topographic Service (JANTOP-Jawatan Topografi Angkatan Darat) is the earliest mapping unit ever established in Indonesia. It used to be the only organization responsible for producing topographic maps at scales mainly smaller than 1:25000, including the establishment of geodetic control networks.

2. The National Coordination Agency for Surveys and Mapping (BAKOSURTANAL-Badan Koordinasi Survey dan Pemetaan Nasional) formed in 1968 is the most modern mapping organization. It is responsible for the survey of natural resources, national thematic mapping, topographic mapping and national geodetic networks projects for non military purposes.

3. The Land Registry - Department of Internal Affairs as described in chapter 2.

4. The IPEDA - Department of Finance as described in chapter 3.

5. The Mapping Centre of the Department of Public Works (PUSDATA-Pusat Data) has a significant role in large scale topographic mapping for engineering and construction purposes. Within the Department of Public Works, several other units in four directorates can independently carry out or administer surveying and mapping projects. For example there are projects for irrigation, river, swamp, road, city and town planning development.

6. Other Urban Mapping Units in several large cities such as Jakarta have large mapping units for supporting city and regional planning, funded by their provincial government budget. This is compared with other small cities that may have a small unit existing within other activities supported by the Directorate of Land Use in the Directorate General Agraria and the Directorate of Urban Development in the Directorate General of Urban and Regional Development, both under the Department of Internal Affairs, and the Directorate of City and Regional Planning (Tata Kota) in the Directorate General Cipta Karya, under the Department of Public Works.

At present, the first two of the above list are concerned mainly with small scale mapping activities unrelated to cadastral records. Basically all activities in these organizations are carried out internally. Between these two organizations, a high degree of cooperation has been fostered through joint projects. There are also some joint cooperative projects with other mapping agencies on a contractual basis, for example the JANTOP assistance in IPEDA persil mapping, and the BAKOSURTANAL assistance for Public Works and Transmigration mapping projects.

Within the last four organizations of the above list, surveying and mapping activities are normally undertaken by contract by private (mainly local) survey and mapping companies. There is only little cooperation amongst these four organizations. In Indonesia, government projects are the only lucrative source of survey work for private companies. Hence the number of private survey and mapping companies has grown rapidly during the last three Five Year Development Plans (REPELITA I, II and III). Excluding a large number of unregistered smaller companies there were 59 private companies registered in a self-regulatory association - APSPI (Asosiasi Perusahaan Survai dan Pemetaan Indonesia or Indonesian Association of Surveying and Mapping Companies) in 1983.

The number of private survey and mapping companies with aerial survey facilities is small. Their aerial survey activities are strictly controlled by the government, in comparison to the relatively unrestrainted field survey activities performed by the large (superfluous) number of smaller survey companies.

4.2.2 GEODETIC CONTROL NETWORK

During the Dutch period, the geodetic control network for small scale topographic mapping activities was established by classical triangulation. Less than 40% of Indonesia was covered by the primary framework and considerably less by secondary and tertiary frameworks during that time. However, until the late seventies, little had been done in extending the frameworks because before the sixties, almost all surveying and mapping activities were fully controlled for military purposes. There were strictly no other significant mapping activities outside JANTOP.

Up to now, responsibility for establishing and maintaining the geodetic network is not very clear. According to the survey and mapping guidelines from the Ministry of Agraria (No. 6/1961), geodetic control has to be carried out by this agency, but in practice this agency carries out limited precise traversing for small areas only. It appears that all agencies rely on BAKOSURTANAL and JANTOP for which the geodetic network forms an integral part of their base mapping program as described in paragraph 4.2.4.

Some efforts to establish control were undertaken in Sumatra and West Kalimantan by trilateration methods using electromagnetic distance measuring instruments; and in Irian Jaya (West Irian) and Maluku Islands by satellite positioning system in a joint project with the Australian Army Survey Corps for topographic mapping program. In the late seventies, an important step was taken in the Doppler satellite positioning program initiated by BAKOSURTANAL in the framework of CIDA (Canadian International Development Aid) Loan Agreement. The program covering the islands of Kalimantan, Sulawesi, Nusa Tenggara and Jawa has successfully completed the observation of more than 300 stations. It aims at unifying the separated geodetic network systems of each island into a national geodetic system, and to complete the so-called zeroth order geodetic network (BAKOSURTANAL, 1980). However for the purpose of other mapping activities, these frameworks are still insufficient. Thus a systematic program to densify the network for primary, secondary, tertiary and even quartiary orders under the nationwide policy has to be seriously considered.

For the current sporadic mapping activities, the classical method of triangulation is replaced by precise traverse nets i.e. by ground traversing and electronic distance measurement. This work is undertaken mainly on a project-by-project basis to various specifications. The mapping systems are in general not tied to the National Coordinate System. Hence there is very limited contribution of these activities to the nationwide topographic mapping program.

4.2.3 AERIAL SURVEY

The most rapid map data acquisition method for a large areas is through aerial photography, even though not all information can be directly acquired. With photogrammetric techniques, a few types of restitution products, either the classical (line) map, or the (ortho-) photomap can be obtained.

The first aerial survey company in Indonesia was the government enterprise, "PENAS" (Perusahaan Umum Survei Udara Penas) established in 1961. Several other similar private companies were set up in the seventies.

Aerial survey is strictly controlled by the Army Survey and Mapping Centre (called PUSSURTA-ABRI / Pusat Survey dan Pemetaan Angkatan Bersenjata Republik Indonesia), and technically monitored by BAKOSURTANAL. Thus all aerial photography operations require clearance before execution. The number of aerial survey companies has been limited currently to less than ten. However the capacity of these local survey companies appears to be adequate to support the current mapping program.

High altitude aerial photography has been generally undertaken at medium to small scale (1:25000 - 1:100000) for small scale topographic mapping programs. This program has been carried out mainly with foreign aid and some foreign survey consultants in cooperation with BAKOSURTANAL and JANTOP. The progress of this program has been very significant. Almost the whole territory of Indonesia has been covered, even though this progress has not been reflected in the base mapping program (see 4.2.4) which is relatively slow. While the initial base mapping program is moving very slowly, these small scale aerial photographs are used mainly for providing basic data in a quickest possible way for land resource investigations and other minor activities, or uncontrolled mozaics for some other projects such as transmigration and forest conservation schemes.

Low altitude aerial photography (larger than 1:25000) is mainly carried out by local aerial survey companies. Most aerial photography projects are financed in whole or in part by engineering projects required by a number of government departments such as Public Works (for irrigation and water resources projects) and Transmigration departments, whereas other activities are financed by Land Registry and from IPEDA as its budget is increased. Even though the aerial survey capacity of the existing aerial survey companies is considered satisfactory, particularly for the existing large scale mapping program, the problems experienced are not only in photographic processes but also in other mapping processes i.e. ground control survey, aerial photography restitution, cartographic and map production processes.

4.2.4 BASE MAPPING

A base map is the graphic representation at a specified scale of selected fundamental map information, used as a framework upon which additional data of a specialized nature may be compiled. A topographic map on the other hand is defined as:

> **"a map which depicts the configuration and the horizontal and vertical positions of the features represented; distinguished from a planimetric map (line-map without elevation) by the addition of relief in measurable forms." (ASP, 1980)**

Therefore topographic maps can be one of the required base maps

for a cadastral overlay.

Looking at the government administrative structure, BAKOSURTANAL is the only agency that should be responsible for national base mapping (on small as well as large scales). However the only existing national base mapping program is for small scale mapping. The large scale base mapping program is non-existent, although there are sporadic attempts by different departments to carry out large scale base mapping contracted to private mapping companies. More large scale mapping activities are discussed in 4.3.1.

4.2.4.1 SMALL SCALE BASE MAPPING

After Independence (1945), developments of the base mapping program have been relatively slow compared with other developments. Current basic topographical series at the scale between 1/25000 and 1/100000 cover less than 35% of the country. There are topographic maps of Jawa and Bali (from before World War II), some of Kalimantan (in the 60's-70's) and Sumatra (in progress). They are all on different formats, map projections and coordinate systems. Moreover revision on these maps has been very limited. As noted earlier, before the seventies the topographic map series were considered more as military maps and distribution was restricted; meanwhile the demand for base maps has gradually increased.

Since the early seventies, the base mapping program in Indonesia has been only at the scale of 1:50000 and 1:100000. This is the task of BAKOSURTANAL which is centralized in the government and assisted by a better established (more experienced and skilled) mapping agency, JANTOP. Thus there has been increasing pressure on BAKOSURTANAL to provide base maps for a large number of major developments. The progress of this base mapping program is still very slow due to limited financial resources, and the lack of skilled persons.

The current small scale topographic mapping activities is nearing completion for Sumatra (scale 1:50000). Other minor base mapping activities required by a number of departments such as the Department of Transmigration are carried out on a priority basis. To speed up the production of topographic maps for other purposes, eg. resource inventory, another approach to mapping has been adopted. The conventional rectification photomap for flat areas and differential rectification orthophotomap for mountainous areas are the most acceptable approach.

4.3 LARGE SCALE MAPPING AND CADASTRAL SURVEY

4.3.1 LARGE SCALE (CADASTRAL) MAPPING

As already noted in chapters 2 and 3, the cadastral map has not been considered as an essential component in the cadastral system in Indonesia due to the lack of support from the overall government structure. The production and use of cadastral maps are insignificant, being limited to within Land Registry and IPEDA.

Most large scale mapping efforts outside the Land Registry and IPEDA are topographical in nature and are without cadastral boundaries. Photogrammetric techniques ranging from simple enlargements of aerial negatives to more complex methods are used in such mapping. The following discussion briefly looks into important features of map production and specifications used in many mapping projects in Indonesia. Among others, a comprehensive specification stipulated for the Urban (100 cities) Mapping Project (UMP) is briefly highlighted. An example of one sheet UMP photomap is shown in figure 4.1.

1. Preparation

Preparation for mapping in each project involves flight planning, ground control network design, preparation of existing materials (smaller scale maps), and mobilization of staff and equipment. The most important feature in UMP is that photomap sheets are carefully planned to assure that each sheet is derived from the central portion of one photograph, thus no mosaicing of rectified photographs is involved in the mapping process. Precise flight planing for navigation is becoming very important and it is based on uncontrolled mosaics of small scale aerial photographs from BAKOSURTANAL (see 4.2.3). Even though the uncontrolled mosaic does not provide a high standard of accuracy, a great deal of information on the area concerned can be obtain a relatively low cost. On this mosaic, map sheets (50cm X 50cm) and control point locations are also planned.

2. Signalization

In almost all mapping projects a reasonable number of premarked points are well distributed in the area with one horizontal control point for every 4 photo bases (with 60% forward overlap) in the perimeter of its block, and one vertical control point for every 4 photo bases in the overall block. Signalization (premarking) should be done before flights are flown, and should be maintained until the aerial photography is completed. But it is always difficult to maintain the marks for that purpose. Ideally photographs are taken shortly after all the marks are placed, subject to the vagaries of weather conditions. Moreover, natural disturbances to those marks by people, animals and weather are inevitable. In UMP, beside each premark, at least two identifiable photo points within about 50 meters are added.

3. Aerial Photography

The unfortunate situation with aerial photography is that aerial operations are usually disrupted by bad weather conditions. Especially in such a tropical archipelago as Indonesia, cloud cover is very common. Besides, occasional bushfires result in smog that also prevents the photography. Consequently the cost of aerial photography operations is highly dependent on the stand-by cost of aircraft which constitute a major part of the overall mapping cost.

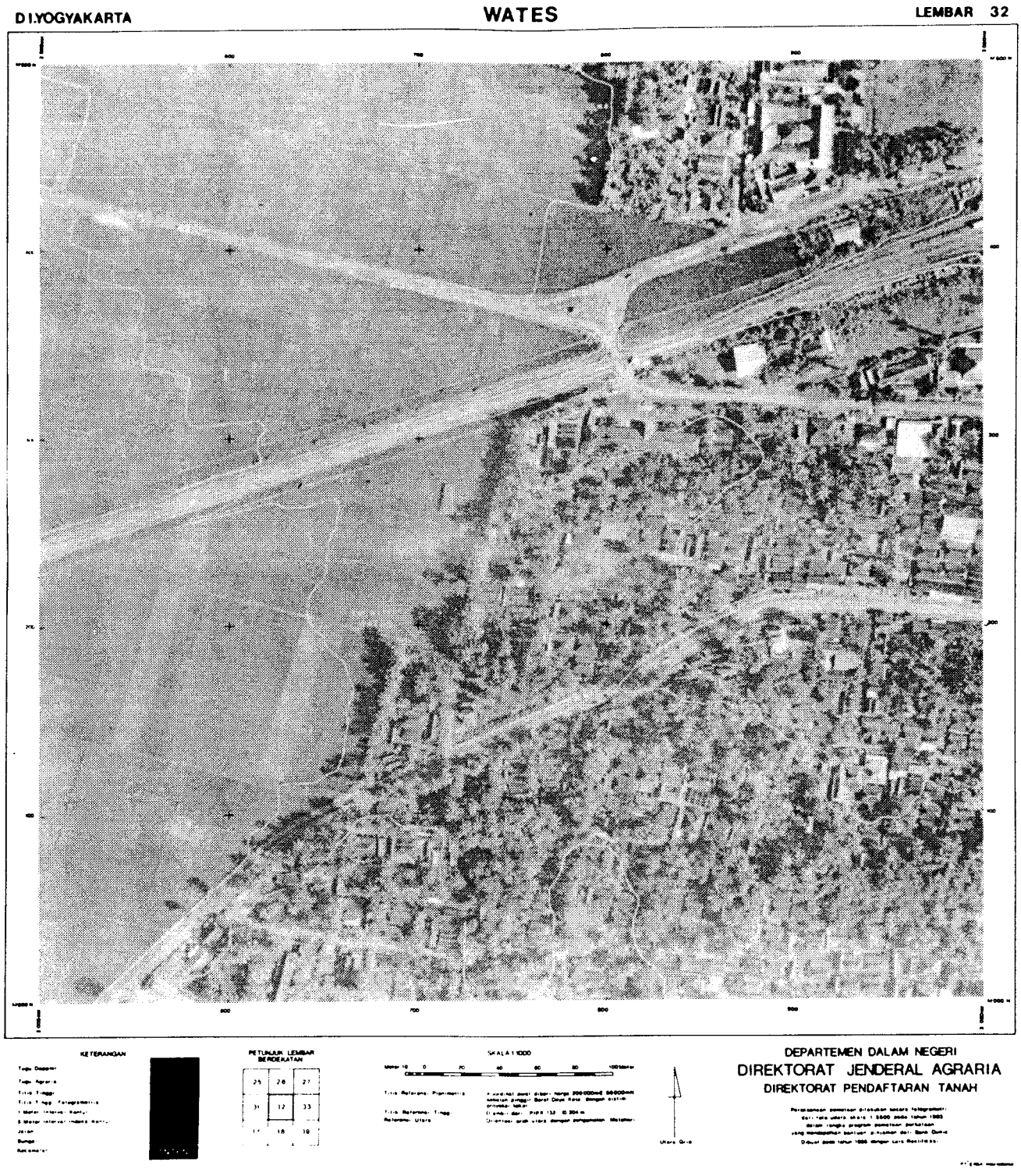


Figure 4.1. Photomap of Urban Mapping Project

A high precision wide angle (focal length of 152 mm) aerial camera is commonly used for mapping. The scale of aerial photograph varies between 1:5000 to 1:20000 depending on the use in each individual agency. The forward overlap (between exposures) of 60% and the side overlap (between exposures on adjacent flight lines) of 30% are usually adhered to for general interpretation, stereo restitution or conventional rectification. However in some orthophoto-mapping projects including UMP, the forward overlap can be as high as 80% and the side overlap 60%.

4. Ground Control Survey for Photogrammetry

The most troublesome aspect of photogrammetric mapping activities is the ground control survey which generally involves many field surveyors under very tight supervision. The works are mostly done by private companies employing a significant number of young surveyors mainly on a part-time basis. They are usually improperly trained and therefore many may be incompetent.

Ground control for photogrammetric mapping consists of a survey of the network of photo-identifiable points on the ground, for which horizontal and vertical positions are established. The adopted specification and requirement in control surveys varies according to the scope and the purpose of the mapping project. A detail discussion of this aspect is therefore not possible.

Generally, ground control survey works are done terrestrially by traversing using one second reading theodolites combined with electromagnetic distance measuring devices. Horizontal accuracy is expressed on the closure in position, usually between 1 part in 5000 to 1 part in 10000. The vertical accuracy of misclosure in levelling for loops and double runs (forward and backward) is between 6mmVD to 10mmVD, where D is the length of levelling loop/line in kilometres. A local coordinate system is generally used. For integrating with the National system in UMP, at least two control points called "Doppler Points" are placed but the position of those points is to be determined by the Doppler Positioning System in the future.

One major problem in the mapping process is error detection. Even with tight supervision on survey works, very often errors are only found at a later stage even as late as the block adjustment phase after the surveyors concerned have moved to other projects. Sending a survey team back to the field is very expensive and counterproductive. The reason for these problems is described by Mayes and Bramley (1982) as follows:

> **"Inexperienced surveyors were frequently employed without formal training or supervision by the survey companies. No independent checks were built into individual observations or the survey as a whole, resulting in multiple errors left unnoticed until an attempt was made to run the aerial triangulation adjustment."**

5. Aerial Triangulation

Aerial triangulation is the most important step that ties the photogrammetric compilation to ground control survey. The common aerial triangulation procedure consists of selection, transfer and coordinate measurement of photo control points and other selected photo points required for the adjustment of aerial triangulation. Coordinate measurement is carried out either by mono or stereo comparator, analytical plotter or precision stereoplotter.

In UMP at least one photo point is selected very close to each map sheet corner (within a centimeter) in order to strengthen the rectification of each map sheet taken from the central portion of photograph. The accuracy obtained in this project is reasonably high (25-40 micrometres at photoscale for horizontal control and photo points, and 0.0003 of altitude of aerial photography for vertical position). In many other mapping projects in Indonesia, such accuracies often cannot be achieved. Therefore the maps produced are relatively poor.

6. Map Compilation and Reproduction

The most complex, time consuming and expensive mapping procedure is line map compilation, because any unidentifiable feature such as cadastral boundaries must be surveyed in the field during the process of field completion. Thus careful coordination of field and office work is required. However line maps have a more complete and accurate record of ground features and are a more suitable product for many users. For several projects such as in the Jakarta Mapping Centre, a line drawn cadastral map is regarded as of paramount importance. Photomaps (unrectified, rectified and orthophotomaps) on the other hand offer considerable advantages because of their completeness of details, cost and speed of production. Therefore in general, photomaps have gained popularity in many mapping projects. Nevertheless, for the purpose of maintenance of cadastral records, photomaps still have major disadvantages, because the updating of cadastral records is not straight forward and changes cannot be incorporated on the original documents as soon as they occur. Usually new aerial photographs are required as a base for updating them (Dale, 1976). Further flexibility is gained with the use of photomaps because their application can be extended when presented in a more comprehensive form by overlaying line maps as transparent overlays onto the photomaps at a later stage, for example in irrigation mapping projects in Public Works and the PP 10 project in Land Registry.

Eventually, the choice between linemaps and photomaps is a matter of compromise, which is strongly influenced by cost. The cost is usually very high because the maps are generally produced in small quantities and for internal use only. Instead of considering that the map can be used in longer term and for other agencies, the production processes are simplified to reduce cost thus sacrificing quality and flexibility of the final product.

4.3.2 CADASTRAL (BOUNDARY) SURVEY TECHNIQUES

Even though aerial photography and photogrammetric compilation of maps has gained popularity within a number of agencies, as expressed above cadastral boundaries cannot be identified solely on photographs. This is the major difficulty in the use of photomaps especially in settlement areas, because of high density of buildings and coverage of big trees (see example of UMP photomap in figure 4.1). Therefore the precise size and shape determination of each individual parcel particularly in urban areas inevitably requires boundary survey.

A good boundary survey necessitates adequate monumentation, but this concept is considered expensive and cumbersome for developing countries. Hence in practice permanent concrete monuments required by the Land Registry and IPEDA are rarely placed. Instead, non-permanent marks and existing features are used for references. The survey technique for each single parcel is simple and therefore inexpensive. But still, if surveys are done sporadically without proper coordination, the cost involved can still be prohibitive. The common boundary survey techniques used in Indonesia are the orthogonal method for a small land parcel in urban area, and the polar method for large land parcel in open area.

In the Land Registry, the technique applied is restricted to the recording of individual property boundaries with a cadastral plan attachment forming part of the certificate of title (see 2.6). The survey is required to obtain lengths of each segment of parcel boundaries without azimuth. Little attempt has been made to relate this survey to control points even if they exist. Thus coordinated systems hardly ever apply. It is nearly impossible to carry out cadastral surveys precisely to re-establish missing boundaries on the ground. Despite this setback, little attempt is being made to improve the system for fear of slowing down the land registration process.

In IPEDA the initial boundary survey is reasonably accurate. The basic survey technique is very similar to that applied by the Land Registry. But the main objective of the survey is only to obtain the area of each parcel systematically, without considering any further use of the cadastral map of IPEDA. The boundary survey aims only to produce a simple cadastral map perhaps of various map scales. The grid and coordinate system are not shown on the map.

4.3.3 MAP REVISION

Maintenance involves the continual updating of maps so that they represent, at any given moment, the actual situation on the ground. Theoretically, the role of the cadastral survey should be associated with up-dating cadastral maps. But it has been noted earlier in this thesis that such efforts are virtually non-existent in Indonesia. Surveying and mapping agencies (in terms of structure and facility) .pa in general have not been able to maintain their maps. Map revision, if planned (for example in IPEDA), usually requires a total mapping exercise. Often, priorities are low and revision exercises are postponed or left

till financial resources are available.

4.4 OVERVIEW OF SURVEYOR'S ROLE

As persuasively stated by Weir (1981), the failure or success of professionalism is partly the responsibility of educational institutions and professional associations that can provide the means and facilities to enable the professions to be of service to the community. Therefore in discussing the surveyor's role in Indonesia, the educational background of surveyors and their professionalism should first be described. In general there are three levels of surveyors according to the level of their formal education. These levels are derived from the existing grades in the teaching institution program drawn up by the Minister of Education and Culture in 1980 (as shown in table 4.1).

The first level is the graduate (four years program) surveyor, called "sarjana/insinyur geodesi" (geodetic engineer). Surveyors from this grade come only from two government's universities (Institut of Technology: Bandung - ITB, and Gajah Mada University, Jogjakarta) which have produced about 800 surveyors, with a current average of about 100 surveyors per year. The second level is the graduate (three years program) surveyor, accredited with bachelor degrees from three privately managed academies: Institut Teknologi Nasional - ITENAS (National Institute of Technology); Akademi Teknik Pekerjaan Umum - ATPU (Public Works Academy) which is supported by the Department of Public Works; and the Akademi Minyak dan Gas - AKAMIGAS (Academy

Table 4.1. Grades in the Degree and Non-Degree Programs (Aziz, 1986)

	Degree Program	Non-Degree Program	Program Specialist	Cumulative CSU	Duration of Study (Semester)
Level 3	--	D1	--	40 - 50	2 - 4
	--	D2	--	80 - 90	4 - 6
Level 2	Bachelor	D3	--	110 - 120	6 - 10
Level 1	S1	D4	--	144 - 160	8 - 14
	S2	--	Sp 1	180 - 194	12 - 18
	S3	--	Sp 2	228 - 233	16 - 22

Note:
* S stands for strata, D for diploma, and Sp for specialist.
* Bachelor is not a terminal program, but it is included in the S1 program (Undergraduate program).
* S2 is a Master degree and S3 is a Ph.D. degree.
* CSU = Credit Semester Unit.

for Oil and Gas) supported by Department of Mines and Mineral Resources. The third level covers those graduating from various short surveying courses such as the one year Pendidikan Teknisi Survai dan Pemetaan - PTSP (Training for Survey and Mapping Technician) in ITB. Since there is no proper or compulsory registration of surveyors, the precise statistical data on surveyors' employment are generally not available.

The term "profession" can be defined briefly as a vocation, or occupation or employment involving labour, skill, education, and special knowledge; the labour and skill involved is predominantly mental or intellectual, rather than physical or manual (Black's Law Dictionary). Moreover the nature of any professional person is a high level of competence in providing good work and in obtaining, analysing and communicating information (Weir, 1986). In society, each profession is usually controlled by a board which is often a quasi-government body, not truly representative of the profession but benevolently manipulated by Government (Dale, 1976). In many cases the professionals are directly employed as government servants. The major characteristic of such professionalism is that it is controlled by one supervisory body. This is often through a system of licensing, as is the case in Indonesia for physicians, accountants, notaries, and attorneys, as their primary role is to provide public service.

Less than 20% of surveyors in Indonesia are associated with cadastral activities, mainly involving the Land Registry. This figure has increased in the last 4 or 5 years because a large number of graduate (4 years) surveyors were recruited, many of them being placed in local governments. However this figure is still small compare with the 80% of surveyors engaged in other specialities of engineering and photogrammetric surveying in the private sectors and various government agencies. Although the majority of surveyors are not associated with public service, almost all of them are engaged in government projects.

Notwithstanding the unrecognized surveying professional status in Indonesia there is an Association of Indonesian Surveyors (ISI - Ikatan Surveyor Indonesia), established in 1975, and an Association of Indonesian Geodetic Engineers (ISGI - Ikatan Sarjana Geodesi Indonesia) formed in 1985. Both associations have no authority to conduct any form of regulation in relation to surveying activities and professionalism. Nevertheless these are the only bodies that can provide forums for surveyors in sharing ideas, problems and solutions, and proposing recommendation to the government.

Within the above mentioned teaching institutions, cadastral surveying and land management subjects are not taught in detail. The emphasis, on the other hand, is on advanced surveying and mapping technologies particularly in geodetic science. As a result, graduate surveyors lack competence in providing services in the context of management of land. These problems and some proposed strategies to improve surveying education are further elaborated in section 6.3.4.

4.5 CONCLUSION

The overview of surveying and mapping in Indonesia has been concerned with the current activities inside and outside the Land Registry and IPEDA. More emphasis has been placed on the scattered large scale mapping activities within various survey organizations which exist because of the absence of large scale base mapping program. The efforts in map data collection during the last two decades have been tremendous, but the capability to coordinate or control these activities to enable multipurpose use of the maps produced is inadequate.

Generally speaking, the mapping techniques applied are designed to facilitate rapid engineering projects across the country only for specific uses. From the financial point of view, such diversity of mapping techniques demonstrated in this chapter makes it difficult to provide budget estimates for mapping projects by BAPPENAS (Badan Perencana Pembangunan Nasional - the National Development and Planning Board). Because most administrators involved in tender evaluations are usually not concerned with the complex technical details, very often reliable methods which involve more comprehensive mapping techniques and result in more accurate information and consequently are more expensive, are overlooked.

It is difficult within the scope of this study to identify the organization most suited to carry out large scale mapping. However, the merits of well co-ordinated mapping activities have been highlighted. If coordination of surveying and mapping activities is to be a reality, each government mapping organization has to change its attitude and begin to appreciate its counterparts' roles. For that coordination to occur, some basic elements have to be achieved as an integral part of the establishment of LIS as discussed in the following chapter.

The unfortunate situation today is that surveyors in the Land Registry and IPEDA as well as in the private sector do not fully comprehend the role of cadastral surveying and mapping, nor the conveyancing procedure in the operation of the modern cadastral system. The main reason can be traced to the inadequacy of teaching institutions. Thus the role of teaching institutions namely the two major universities has to be investigated, as stated by McLaughlin (1981):

> "The intellectual capital for expanded surveying profession initiative will come primarily, although not exclusively, from the universities. And, to a considerable extent, the success of this initiative will be dependent upon the nature and quality of the professional school of surveying. The role of the universities may be examined from the perspective of the human resources available, research thrusts, philosophy and direction of curriculum. Although all are equally important, perhaps it would be most appropriate in the present context to look at the curriculum function."

CHAPTER 5

5 GENERAL DESIGN PRINCIPLES FOR LIS DEVELOPMENT IN DEVELOPING COUNTRIES.

5.1 INTRODUCTION

The existing legal and fiscal cadastral systems and the need to improve individual activities have been discussed in previous chapters. The trend is that most existing efforts are ad hoc and largely uncoordinated, as evidenced by the general disregard for coordinated large scale mapping activities and poor support from the surveying professionals and the government. As a result, the foundation for the development of an integrated LIS is virtually non-existent. This chapter attempts to provide some theoretical design principles and general requirements for the development of a LIS in Land Registry and IPEDA.

Most LIS developments in developed countries are aimed at improving availability, quality and utility of property-based data through the use of computer technology (Bullock, 1984). To transfer the basic LIS concepts from developed countries to developing countries directly is unlikely to be feasible. However the principles are invaluable for long term strategic planning. In section 5.3, some conceptual requirements for LIS development are described. Technical and statutory requirements are reviewed in section 5.4 and 5.5 respectively. With these concepts, some alternatives for establishing an integrated LIS are discussed in chapter 6.

5.2 THE GENERAL ROLE OF LIS IN DEVELOPING COUNTRIES

Land is the basis for human activities.

> **"We live on the land and from the land, and to the land our bodies or ashes are committed when we die. The availability of land is the key to human existence, and its distribution and use are of vital importance."**
> **(Simpson, 1976)**

Associated with land there are a number of attributes that are of concern to all land related activities. They are physical attributes such as vegetation, people, or soil, and abstract attributes such as land value, land use or land tenure (United Nation, 1983). The optimum use of limited land resources ultimately concerns the administration and management of those attributes. The administration and management of land depends on a land recording system and how (cadastral) land data are made available. Therefore complete land records and up-to-date data become imperative to all land administrators. Cadastral land information is often depicted on large scale maps, registers of rights and other registers of land. Thus land information needs to be based on location and frequently related to a unit area, which can be described on a map or in descriptive form. A LIS (defined in chapter 1) is only an indirect tool for effective administration and management of land. Its effectiveness largely depends on its database and the processes which present the data

in meaningful information.

Larsson (1978) has stated that:

> **"A system is something living and dynamic. It is not merely a lot of static information but a flow of information. Data is brought into the system and data is taken out of it. To be a good system, all in and out coming information must be correct, the flow must function in an efficient way and there should be no leaks in the system. The purpose of the system is to fulfil certain functions. Depending on the intended functions, the system may be designed in different ways."**

The LIS may be used for land administration, legal and fiscal, planning and development control, and management of infrastructure such as gas, electricity, sewerage and telephone services. However, to have all these function incorporated into one single system is unlikely to be feasible. Therefore a more general approach is to have a distributed LIS, with each node serving a specific user group (Sedunary, 1984). The whole network must be linked on some common spatial system. In designing a computerised LIS, Bullock (1984) categorises two major LIS applications in which a LIS should be designed. The primary application of a LIS is to support the existing land administration, legal and fiscal procedures and the secondary application is for planning purposes. The question is: how should the strategy of a LIS for developing countries be designed?.

It has been noted in chapter 2 and chapter 3 that the Land Registry and IPEDA have functions that are common and duplicated. Both generate, keep and disseminate similar types of data but they operate independently with little coordination and exchange of data between them. Therefore the major task in introducing a LIS is to facilitate data exchange, improve coordination, and if possible to delineate responsibilities in land related matters within the whole government infrastructure.

5.2.1 INFORMATION REQUIRED IN DEVELOPING COUNTRIES

There are two major categories of land information needed by developing countries: that required for basic land administration and day-to-day activities such as land titling, land taxation, control of land, building transfer and zoning management; and that required for other specific developments such as road construction, rural developments and electrical services. Unfortunately, land data in developing countries are usually collected only when a particular need arises, compared with developed countries which generally have systematic methods for collecting, storing, maintaining and disseminating land information, either on a national or statewide basis (Furmston and Logan, 1986). The primary reason is that financial and professional resources in developing countries are often than not, inadequate. Thus any LIS development in developing countries should be confined to certain (lowest possible) stages only. A less comprehensive system is envisaged, but plans must be devised to incorporate future improvements. The methods of data collection from the field, maintenance and retrieval of these

data must also be improved. Training and education of LIS professionals must also be initiated concurrently with the development and the demand of these growing activities.

A comprehensive cadastral database through a registration system is crucial for the administration of the land taxation office and land registry. The database is comprised of two types of data: descriptive data and graphic (map) data related by some common mechanism. Other secondary activities such as zoning and control of minor development, especially in local governments of highly populated cities could also benefit much from this database. From the cadastral database, an inventory of land resources of both private and governmental nature can be provided. Moreover, details of unauthorized constructions, whether buildings are lawfully placed in relation to other constructions (street, building etc.) and public buildings can be controlled. Three phases of LIS development in developing countries may be identified:

1. Improvement of land administration activities (eg. Land Registry and IPEDA) to provide the database for other users and applications;

2. Improvement of the administrative structure of local governments for more effective administration of land and resources (eg. planning controls and zoning);

3. Development of specific management and development projects such as utility services.

Within these phases, the government may devise general guidelines for LIS developments. For more effective control, a responsible authority should be vested with the power to enforce the coordination of LIS activities. More information on this issue is given in sections 6.3.1, 6.3.3 and 8.1.5.

5.2.2 THE NEED FOR GEOMETRIC INFORMATION

> **"Accurate knowledge of natural resources and accurate description and record of such knowledge are the first essentials to their rational use and conservation."**
> **(Binns, 1953)**

Land is a primary resource that has a fixed location and size. An orderly administration of land use is only possible when there is accurate information of the land. In general, both large-scale cadastral maps and small-scale resource maps provide a good basis for these data since many government authorities on land are interested in their location. It is necessary to know the location of all facets of human activities and interests, as well as what and how much data directly or indirectly relate to that location. It is necessary for the government to know for example, where the people live, how facilities for people may be sited, or where the state lands are located and how much land is available. Location is a principal means of referring to information on land. Representation of location graphically in the form of large scale maps is a satisfactory means of identifying location with some certainty on the ground. Even in a less comprehensive

mapping system, the map is still the foundation for land administrators. For example the importance of large scale maps for land taxation is noted in the United Nation (1968):

> **"They (large-scale maps) provide the basis for the inventory of property and its owner. Without maps, the discovery of all land parcels is virtually impossible and inventories of property are incomplete. The inevitable result is that property is omitted from the tax rolls. The complete listing of real property on various assessment and collection records depends upon maps."**

In a broader view, land related information, in which location information are predominant, are shared by a number of government agencies. The following list shows the general land information functions shared to some extent, by some levels of a government.

* At National Level such as natural resources management (population and transmigration), monitoring land use, economic development, housing development, and topographic mapping (small scale and large scale)

* At Provincial Level such as planning of land use, housing, and management of environment, physical development and public services.

* At Regional level such as routine administrative land dealings, land tax and property tax.

5.3 GENERAL CRITERIA FOR LIS

As discussed in 1.1.3 all LIS developments in any government agency throughout the world are unique. There is no theoretical concept or technique that is applicable universally. Nor can the experience from one agency be transferred wholly to other agencies. LIS developments are usually founded on the prevailing cadastral system.

The major concern of a LIS in land administration is the regulation of data flows and exchange procedures amongst the various data sources. The responsibility for data collection, maintenance and storage must be well defined. Unfortunately, the data lacks integration and they are incompatible. To overcome these problems, two important issues have to be considered: the definition of a basic land unit and the selection of land unit identifier.

5.3.1 DEFINITION OF BASIC UNIT OF RECORD

The basic concern in a cadastre and LIS is the manner in which a record of land is unambiguously defined. Many different types of land units have been used for LIS applications, including: units of administration, planning, statistics and taxation, generally either province, state, county, region, district, city, town, village, block, zone, section, parcel, lot establishment, land-use unit, easement or building. The hierarchical nature of these units is usually applied to structure the record system. However

the major problem is in integrating data from different files, because a common denominator is rarely used. Therefore a smallest contigous unit of land area is often chosen as an entity capable of representing a unique common denominator.

Some views on the selection of land units for gathering land data for land administrative purposes are discussed by Ziemann (1976 A & B), Bullock (1984) and Moyer & Fisher (1973). It was universally agreed that the optimal choice of a land unit to serve as a building block is the land parcel (either ownership parcel, a rating or assessment parcel or a land use parcel). A basic unit of land as described in section 1.1.1 is a land parcel which is the smallest unit area that can be identified in a LIS. In the CLIPP Workshop V (Moyer & Fisher, 1973) a land parcel is defined as:

> **"a contiguous area of land described in a single description in a deed or as one of a number of lots on a plan; separately owned, either publicly or privately; and capable of being separately conveyed. For ease of indexing data, a segment of a street, highway, railroad right of way, pipeline, or other utility easement may be treated as though it were a parcel."**

One difficult requirement in this definition is the continuity of the parcel or "In other words, the physical land under consideration is deemed to be subdivided into contiguous, non-overlapping polygons without 'gaps' between parcels." (Goh, 1987). However in practice this has not always been the case. For example there are situations where an ownership parcel consists of two or more rating parcels. Selection of the best land parcel unit is a crucial issue, since the LIS is generally operated to integrate different systems used in different agencies. There is little doubt that the adoption of one commonly defined unit in all land related systems may be the best for such integration. However each agency always adopts the unit best suited for its individual application. Therefore in developing an integrated LIS, many countries have adopted one defined unit which should be the most suitable for relating individual units. As Goh (1987) proposes, it may involve subdividing a parcel into smaller units (polygons or subunits) or aggregating parcels into larger units by maintaining their relationship.

For every LIS there will be specific reasons for choosing the most satisfactory recording unit. For land property systems, the land ownership parcel is most likely to be the optimal choice; for zoning activities, land use parcel would be the best, and for fiscal application, the rating parcel is mainly used. If a legal cadastre is to be the foundation of other land administration activities, the land ownership parcel is probably the optimal choice for the entire system. There are a few practical reasons why the land ownership parcel can be more suitable than the others (Ziemann, 1976A).

1. Land is transferred as undivided ownership parcels.

2. A building is often erected on a single ownership parcel.

3. A unique address is often available for an ownership parcel.

4. The real property tax is assessed per ownership parcel.

5. Census data are collected per house address.

5.3.2 LAND PARCEL IDENTIFIER SELECTION

A land parcel identifier can be considered as a label attached to a land unit. For indexing and cross referencing purposes, every land unit should have a unique identifier. The term "identifier" can be described as a set of letters, figures, characters or marks, or a combination of the letters or the like associated with a particular entity such as a person, building, car or land parcel. An identifier is used to represent or to identify data relating to that entity. Moyer and Fisher (1973) describe:

> **"A parcel identifier is a finite, punctuated sequence of numeric and/or alphabetic symbols that is used as shorthand for referring to a particular parcel in lieu of its full legal description."**

In general, the identifier cannot directly describe the entity (or land parcel), even though some identification systems which use a codification system may provide some but limited information. A complete description of the entity should usually be referred and obtained from the files or set of documents. Cross-referencing depends on the indexing system. The indexing system itself can be understood as an ordered pairing of information that permits someone to use his/her information to obtain other information (Ziemann, 1976A). A common use of land parcel identifiers is to cross reference a parcel of land (ownership) register and cadastral map within a cadastral system, and with other land information that are related to the parcel.

Normally each agency has its own system of identification which is convenient for its daily operations. In many cases, it is most unwilling to change its established identification system. For example, the Land Registry has four identifiers for four files (see 2.4.2); the ownership name, parcel number, right number and cadastral plan number. They are unique only in each administrative unit (the village). IPEDA has a simple identification system within each list or book of records. However because there are seven books each with a different identifier, the procedure of identification becomes more complicated and time-consuming, particularly in recording the tax payer and ownership parcels.

Ziemann (1976B) refers to two different types of identifier commonly used for land parcels:

* entity (non-spatial) identifier, which is an identification for each self-contained entity of land without indicating the physical location of the land entity such as street address, block and parcel number, title reference number (Volume/Folio) number, map and parcel number, and tract index and parcel number.

* location (spatial) identifier which concerns its physical location and often referred to as a geocode. It is more restrictive in use, referring only to an arbitrary number derived from coordinates (of corner points, centroid etc.).

Both types of identifiers have advantages and disadvantages in every individual application. There is no general acceptance of what is the most suitable system for a particular purpose. A number of developed countries such as West Germany, England and Sweden, have adopted coordinates (usually national coordinate system) as the identifier for the purpose of spatial analysis and automatic data processing. However one consideration for using coordinate identification system is that a unified large scale map system must be available, at least within one administrative unit or jurisdiction such as a state, province, region or municipality. Even though current conditions in most developing countries are not favourable for the adoption of the location identification, it should still be carefully considered (at least as a secondary identifier) because of the profound effects it may have in the longer term. As considered by Dale (1976) that:

> **"Computers may not be relevant to the needs of some developing countries at present, but in long term they will undoubtedly have a profound effect."**

For a comprehensive land record system, six criteria are noted by Moyer & Fisher (1973):

1. Simplicity. The identification system should be easy to use, easy to understand and having a high degree of permanency.

2. Uniqueness. It should have one-to-one relationship, with the follow conditions:

   a. each identifier should be assigned to one and only one parcel.

   b. each parcel to which an identifier is to be assigned should have one and only one identifier assigned to it in that system.

3. Accuracy. Especially for locational identification systems a sufficient degree of accuracy to locate a parcel is necessary.

4. Flexibility. It should be flexible enough to be compatible with various systems currently in operation and to incorporate future advances in computer technology.

5. Economy. Cost and benefit justification of implementation and operation should be considered.

6. Accessibility. It is concerned with the availability of land information and data from sources that use the identifier.

These criteria are necessary for efficient land registration and automated data processing and were used by the authors in their evaluation of the existing identification systems in the United States.

The choice of a particular identifier is not absolutely critical for local usage provided that it is possible to map the identifier in the future into one primary (common) identifier system. However, if the use of identifiers is not coordinated and allowed to proliferate, unnecessary overheads will be incurred in the retrieval and maintenance of the database, especially in an integrated LIS. Even with advanced and high speed computer processing, the overheads should be kept to a minimum.

5.4 TECHNICAL REQUIREMENTS FOR A LIS

It has been emphasised that the primary goal of a LIS is to improve the administration and planning of land-related activities. In order to fulfil this goal, several requirements must be met, including a good geodetic control network, accuracy specifications, survey data recording system and a common map base. Many countries outside Central Europe were unable to introduce an integrated survey system in their early stages of development because (Konecny, 1978):

1. their territories are so large that existing surveys could not cover the complete territory in one reference system.

2. land tranfer was considered as a private matter, attracting little government attention.

Hence, their concern is primarily to solve these problems i.e. to establish the following four stages:

1. Geodetic reference framework,

2. Large-scale (cadastral) mapping,

3. Property (land parcel based) register,

4. Provision for LIS developments.

5.4.1 GEODETIC CONTROL POINTS

> **"The purpose of a control survey network is to provide a uniform reference system to support the orderly collection, recording, updating and disseminating of data pertaining to geographic location or to land use. This system is a pattern of physical survey monuments established on the surface of the earth, the relative positions having been determined to a selected order of accuracy, and the results expressed by means of suitable geographic or plane coordinates." (Ziemann, 1976B)**

In general the establishment of geodetic control network is undertaken systematically from high order (first order network at a high accuracy) down to lower orders (second, third or fourth orders of lower accuracies), the lower order controls having higher densities. The process of establishing control is still considered very slow, costly and time consuming. Unfortunately, the importance of a good control network is often not appreciated at the government level. Therefore programmes for control network densification are often neglected. Cadastral survey and mapping are conducted piecemeal and on a specific area without any correlation to a common datum. The cost of this survey is usually low and a quick mapping process is used that can be feasible for developing countries. But the disadvantages become evident when revision has to be done in the course of rapid land development and the data must be tied to a larger area. Developed countries on the other hand are usually more fortunate in this regard because of the availability of technical expertise and funding. In Indonesia, both are lacking, resulting in very slow progress in the control densification programme.

Many developed countries especially in central Europe established their control networks in the last two centuries. Since then, the networks have improved substantially both in terms of positional accuracy and density. The control network is able to serve all survey work such as for engineering work and property boundary surveys. Developing countries are not likely to attain the European standards in the near future. The requirements for developing countries as proposed by the United Nations Committee of Experts in 1946 (Binns, 1953) is for a minimum of one horizontal control station for every 51.8 sq. kms (based on a map scale of 1:25000 - 1:100000). However most developing countries still cannot achieve these figures. It is even more difficult if a larger map scale is desired.

Ideally, the density of control points for the whole country should be uniform. Control points coordinates should be adjusted in one network. However in practice, this concept is impossible and economically unjustified even within developed countries (Ziemann, 1976B), particularly in vast countries like Canada, USA and Australia. Therefore the density of control could be varied from densely developed areas to sparsely developed remote areas to suit the respective needs. Moreover the density of control points should also be related to the technique of mapping, terrestrial or photogrammetric, and the method of boundary survey, whether numerical or graphical and co-ordinated or unco-ordinated. In developing countries, the cadastral maps are of prime importance and should be accorded priority.

If national survey agencies are responsible for designing and establishing the higher (I, II, III) order networks, and densification for cadastral application are done by local surveyors and local survey agencies, there is a basis for a unified framework. However there are usually problems between local and national survey agencies and surveyors. Very often the national survey agency is unable to provide sufficient control points to meet the rapid developments in local governments. Besides, local survey agencies have the tendency to resist tying their surveys to any statewide system because of complications to their existing procedures. This is a very difficult problem that is unlikely to be solved in a near future.

5.4.2 SURVEY INTEGRATION

In panel discussion of the Workshop on Standards and Specifications for Integrated Surveying and Mapping Systems (Chrzanowski et.al, 1977), Konecny suggests that the integrated survey system is a system that "can be classified as a multipurpose survey carried out by different agencies referenced to each other, placed in a common framework, through a coordinate control system and permitting production of an up-to-date map for the purposes such as development survey, property survey, utility survey, etc."

The concept of integration in developed countries emphasises the technical aspects of survey and mapping on one coordinate referencing system, and accuracy. Polman in that discussion states that the characteristic of the integrated survey and mapping system is dependent on the individual cadastre model, numerical or graphical. It is largely defined by the accuracy standard of cadastral survey and mapping systems. In addition, Ziemann (1976B) suggests a system of recording survey data as one essential element for a LIS.

The integration of survey work is most readily achieved by coordinating land related organizations, both private and government, particularly in establishing standardization and specification of survey and mapping work. The technical issues pertinent to surveying and mapping specifications are discussed in the following sections.

5.4.2.1 ACCURACY

The term "accuracy" in survey has been used in different ways. It can be used in relation to measurement, position, map etc accuracies. It is essential that the meaning of this term be fully understood in this context. The accuracy desired in any particular situation must surely be dependent also on the survey method used which determines the achievable accuracy. Accuracy should always be considered to be related to the speed of the survey required (Chrzanowski et.al, 1977).

In developed countries (mainly Central Europe), accuracy standards of cadastral surveys as applied to monumented boundary points are often of the order of centimetres in urban areas particularly in countries where numerical cadastral system is

adopted. For developing countries, this high standard of accuracy is unlikely to be feasible in terms of cost and time. A more economy and faster system based on minimum accuracy specifications is required by developing countries.

Theoretically, for an integrated survey system, standards of accuracy for boundary survey and ground control survey are required. However when surveying practice is non-existent, very often accuracy standards are determined independently by individual agencies. Thus, to draw a strict standard for various surveying activities may not be feasible. Rather it is preferable to identify and classify the existing survey records based on their accuracy, although this may appear to be cumbersome, expensive and unnecessary. The aim of accuracy classification is to indicate the accuracy of survey records and to avoid survey records of unknown quality. Thus survey records should carry the qualification or limitation on how they can be used.

Moreover, accuracy requirements are dependent on many factors, including the available technology, methodology of survey densification (ground survey, aerial triangulation or even satellite positioning system) and the economic justification (value of the land etc.). The general consensus is that a primary geodetic reference framework is imperative. The cadastral survey network can be referenced to the primary network but with a lesser degree of accuracy as required. The accuracy of cadastral surveys should vary according to local requirements. In time, the accuracy standard may be gradually updated in tandem with the latest survey technique. Blachut et.al. (1979) argue that the accuracy of boundary survey is only one of several attributes that decide whether the cadastral system in operation fulfils its function. High accuracy requirements in the cadastre may only be justified after other equally important requirements i.e. completeness, continuous updating, and finality of cadastral documents are fulfilled. Ackermann (1974) strongly comments:

> **"Indeed, I would urgently warn against demanding extreme accuracy in cadastral surveys. This has in some cases, resulted in having no cadastral maps at all."**

5.4.2.2 SURVEY DATA RECORDING

All (cadastral or ground) survey works depend on the way data are recorded, and their effectiveness are determined by the accessibility and the correctness of those records. The recording starts with the surveyor's field book which is used to produce either numerical or graphical survey records.

The term "survey records" can mean field notes or a written record showing information, measurements and observations pertinent to surveying made by a surveyor in the field during the course of a survey.

A good recording system is not only useful to the owner of the records and used for one particular purpose immediately, but the (survey) record system should be intelligible to others and capable of being incorporated with other records. The ideal situation would be, for example, to incorporate every individual

boundary survey record with its land register in Land Registry and with the land records in IPEDA, and vice versa.

Cadastral survey is not only for land registration and facilitating conveyancing within the Land Registry office, but one major important use is to up-date the cadastral maps. Some other survey records from other mapping projects should also be compatible with the cadastral map which may then be more expediently brought up-to-date. Hence the ability to complete and update cadastral maps is largely depend on the compatibility of survey recording system within each agency to carry out large scale mapping.

Some other results of unclear and incomplete survey notes are also identified by Pafford (1962):

1. time and additional costs in trying to decipher them,
2. necessity of returning to the field to clarify the notes,
3. erroneous information being placed on maps which can result in costly design errors,
4. inability to defend the work, especially in court,
5. general mistrust of the party's work.

In several countries such as Singapore and South Africa, the surveyor's field books are filed in the Land Registry office and are considered to be of paramount importance in cadastral records. This is because these books contain the proof of the correctness although for most users, these books may not be very useful. In countries such as parts of Canada and Australia, instead of field books, original survey diagrams or certified copies of all information relevant to the cadastre are deposited in at least one government authority.

Dale (1976) points out that:

> **"The actual form of the optimal record system will depend on the methods of survey that are most appropriate to any individual country and on whether the results of a survey are best known as a complex survey diagram (so that, although containing much numerical information, the record is primarily graphical) or whether the prime record is a set of survey computations or coordinates."**

He also emphasises the two most important elements in survey record systems: standardization of recording procedures and reproduction facilities. The main purpose of those two elements is for easy access to users. Survey records are useful if they are simple to use and standards are enforced. The efficacy of the record system will be improved if simple reproduction facilities are available. The advent of electronic data storage facilities and processing opens the door for applications to be developed for survey records.

However, individual agencies must be prepared to make way for new methods and procedures, especially when introducing electronic

methods. Any change to existing procedures should emphasise the importance of data sharing and ownership.

5.4.2.3 MAPPING SPECIFICATIONS

Standardization of specifications is a very difficult and complex problem simply because every department generally prefers to keep its own standards which are just sufficient for its specific need. In large scale topographic and cadastral maps, disparities in the scale, format, content, projection, grid system and symbol are major issues for standardization. In countries where mapping is carried out by one institution, the introduction of a unified mapping specification is simpler. However when two or more institutions can carry out a similar (cadastral or topographic) mapping tasks, standardization is extremely essential but difficult to achieve. The use of their maps is usually restricted to individual agencies. It is even difficult to identify the responsible agency for the continuous maintenance of the map. The procedure of cadastral maps revision, if it exists, is likely to be very complicated.

Both developed and developing countries have problems in specifying cartographic standards, although there are efforts to bridge existing incompatibility of land related information. Dale (1976) is pessimistic about having a comprehensive standard to integrate land records, but is of the view that a simple method of linking cadastral and topographic data is possible.

5.5 STATUTORY REQUIREMENT FOR A LIS

As the French cadastre in the last century was empowered by a strong legislative action by Napoleon, it is always suggested that every land administrative change or improvement would be much more effective if the executive level in the government took a similar interest.

Land administration mainly cuts across several areas of administrative responsibility. Thus it needs strong coordination between those administrative authorities within the overall land administrative system. Considerable attention by executive level in the government is needed to provide not only financial support but the most important statutory changes, to allow necessary progressive development for an appropriate land administration system.

Doebele (1983) has stated that:

> **"In some cases, legislation will be non-existent. In others, legislation inherited from earlier years will be too restrictive, requiring technical steps that are inappropriate for modern conditions and unsuitable for large scale application."**

Land development must be accompanied by appropriate changes to the administrative structure and very possibly, changes to institution and legislation. In particular, legislation must include:

1. Regulations in the land registration system with regard to compulsory or voluntary registration.

2. Survey Integration regulations. In many countries a Survey Coordination Act is a major instrument for successful integration and standardization. This also calls for the nomination of an authority to oversee the enforcement of the rules as set out. The regulation may also provide delineation of responsibilities and coordination as well as the specification of survey standards.

3. Introduction of a legal identifier and an indexing system for cadastral maps as a link to several related registers. Only one authority must be responsible for assigning parcel identifiers.

5.6 CONCLUSION

In general land information systems evolve from existing cadastral systems. The design principle is aimed primarily at land administration of the cadastre and secondarily, to facilitate other agencies in local governments in planning and public services.

The basic requirements for a LIS in general are similar for developed and developing countries. Definition of the basic land unit and parcel identification system are the common basic criteria. A comprehensive and unified mapping system is also essential. The difference between developed and developing country requirements is mainly in the quality and accuracy of data, and priority of development. Hence the problem is to determine the necessary and appropriate techniques to solve these LIS requirements, this is often difficult due to administrative, political, social and financial concerns.

Developed countries are in the forefront of harnessing computer technology for LIS. Their approach may be indicated by better cadastral systems, availability of data and ever increasing labour costs. Developing countries on the other hand, have to concentrate on the more fundamental problems of establishing a suitable cadastral base and so coordinate efforts of data accumulation and dissemination.

Since the LIS foundation is on the prevailing cadastral system, the role of local cadastral surveyors is predominant. Their role should be a little beyond conservative processes of potraying topographic features and boundary measurements. They should be able to identify the problem and solution in the area of land management, land use, land development and land planning. The need for training and education of local surveyors and their professionalism are discussed in the last chapter.

CHAPTER 6

6 LAND DATA SYSTEM ALTERNATIVES AND STRATEGIES

6.1 INTRODUCTION

In this chapter, the juridicial, technical, administrative, and economic problems will be reviewed as they are applied to the establishment of a LIS in Indonesia.

Land, people and the law are the essential components that have to be regulated. Legislation should appropriately be applicable to existing conditions. In paragraph 6.3.1 some necessary actions relating to legislation are proposed, while paragraphs 6.3.2 and 6.3.3 propose the means by which the Land Registry, IPEDA and other survey and mapping agencies may operate to achieve optimal results. Education and training are also discussed as the supporting infra-structure for LIS developments.

6.2 THE APPROACH TO ESTABLISHMENT OF LIS

It has been universally accepted that a multipurpose cadastre is fundamental to all LIS. The modern (European) cadastre can be considered as being a multipurpose cadastre. The major components of the cadastre are the cadastral parcels, the cadastral records and the parcel identifier that relates parcels and records. However because this cadastre is not available in Indonesia, the initial approach must necessarily involve the creation of a "rational and simple" cadastre, however rudimentary its form may take.

In general the compilation of a cadastre solely for taxation purposes has been considered unjustifiable (Lawrance, 1984). However financial considerations are always paramount in deciding alternatives between legal and fiscal cadastres (major differences between legal and fiscal cadastres were discussed earlier). It has also been argued that the cost of survey work for the legal register is always higher than the cost of establishing the fiscal register. Moreover, direct financial benefits from a fiscal cadastre are more apparent to many governments than from a legal cadastre. Notwithstanding the arguments put for introducing the legal cadastre as a more sound basis for a multipurpose cadastre, this thesis has not been able to follow directly such opinion. For the purpose of Indonesia, it has also been noted that a cadastre used solely for legal or fiscal purposes is not feasible. Therefore a decision between either the fiscal or legal cadastre as a base for the LIS has to be made, otherwise compromises must be accepted.

Following the three phases generally associated with LIS developments (see 5.2.1), three further stages are followed for conceptual LIS development in the next chapter. The first stage of the development is aimed to improve the efficiency of the Land Registry and IPEDA. The second stage is aimed to facilitate local governments in general planning and development. There is no doubt that there are various groups of users: other local government agencies, state government, private firms and

individuals that can also benefit by using the land information. Thus the third stage is to allow other land related agencies to link with the cadastral database for particular applications such as roads, electricity and telephone facilities.

The Land Registry and IPEDA are integral to the LIS development, but more attention must be paid to their activities to avoid any duplication of effort of each agency. Amendments to existing procedures of each department must be made to accommodate the development of the cadastre.

The cadastral database development can be based on the available data even in a rudimentary form. Instead of beginning directly on a new comprehensive program with expensive technology, an incremental procedure of development can be adopted while a more comprehensive system based on more accurate data can be developed at a subsequence stage when funds, staff and equipment are available.

It must be realized that individual LIS components are not isolated; instead they interact with one another in such a way that improvements in one component of LIS cannot be made without considering other components (Palmer, 1984). Hence coordination and cooperation between the two major players i.e. the Land Registry and IPEDA are the minimum prerequisite at the preliminary stage before further steps can be taken.

6.3 THE ELEMENTS OF ESTABLISHMENT

6.3.1 JURIDICIAL ASPECTS

As a prerequisite it is assumed that existing land acts and regulations must be adhered to whenever possible. However, in any implementation, it is inevitable that some existing legal provisions may be contravened. For example, the existing land act (UUPA), which specifies compulsory and systematic land registration, is inconsistent with the real situation where land registration is mainly on the voluntary basis. The role of IPEDA as a land taxation office has also been to a certain extent involved in systematically registering possessory lands and taking part in providing ownership (possessory) letters which are initially the responsibility of Land Registry according to UUPA.

To circumvent legal conflicts, a decision has to be made either to fully regulate the acts consistently or to modify the acts in order to suit the practical conditions. It has proven that to regulate the UUPA consistently, within the local environment, is almost impossible. To upgrade the possessory title into a legal title must involve amendments to the existing legislation. This is often difficult to achieve, if not impossible. Therefore an investigation for a more viable solution has to be made at the executive level of the government.

For the purpose of cadastral database development, both existing (Land Registry and IPEDA) registers have to be recognised, for they present the most credible data existing today. The validity and the extent of legality of data should be indicated. For example, the possessory register of IPEDA at the lowest level is

not an ownership register. Temporary title from "initial registration" and full title from "second registration" by the Land Registry (see 2.7) have "higher legal status". The legality of information on ownership, encumbrances etc. can only be obtained if integrity of data collection of both the registers and its cadastral (index) maps from different agencies can be assured. The responsibility of agencies in creating legal and non-legal registers for the database should be identified, particularly in deciding responsible agencies for maintaining the registers.

Although for the current situation, the existence of different levels of land registration seems to be viable for Indonesia, for the overall land administration it is very inefficient and cumbersome. Therefore this approach should not be the final target. A more efficient system should be planned that can be achieved gradually.

The relationship between land and people poses both a legal as well as a political problem. Ultimately, the onus rests on the ruling government to decide how land should be administered. Of course, the decision must also reflect other concerns, for example, issues concerning technical, economy and administrative matters and the social condition in Indonesia such as customs and religious aspects.

6.3.2 TECHNICAL ASPECTS

Realizing that a common problem of developing countries is the unavailability of raw data for a land information system, this section concentrates on discussing current technologies for survey and mapping, for accelerating data acquisition and property register establishment for Indonesia.

One of the major breakthroughs in survey and mapping was the extensive use of photogrammetric techniques after the Second World War, notably the developments of optical and photographic technologies for aerial photography. In the last two or three decades, photogrammetric triangulation has also been introduced as a more efficient and effective technique for densification of survey control. Other major developments are the advanced electronic and satellite technologies of field surveying; and database and computer graphic technologies for land and geographic information systems.

These technologies if effectively used, can increase efficiency, accuracy and the capability of the existing environment. However the new technologies invariably involve large investments and must be financially justified. Institutional resources are needed to master the new technology and to improve and maintain them. Unfortunately these are not readily available in developing countries. It is imperative that cost-benefit studies be implemented before attempts are made to use them.

Introducing new technologies to developing countries may dramatically revolutionize the existing systems. But there are justifiable fears that the new techniques may reduce employment, something which developing countries can ill-afford. Therefore it

is important to ensure that the modern techniques be applied only when they become a means of increasing productivity, without the need for labour curtailment.

6.3.2.1 CADASTRAL SURVEY AND MAPPING

Large scale cadastral and topographic maps are the foundation for LIS. Therefore if the maps are not available, efforts should begin either for systematic mapping, or for finding alternative mapping techniques. In addition, steps for implementing those alternatives should be taken as a matter of priority.

In general, the techniques for topographic mapping may be based on the two major procedures: photogrammetric or field survey. The photogrammetric techniques has been introduced in order to reduce field survey work. Undoubtedly field survey work is labour intensive, time consuming - in short very costly. Moreover it is constrained by the physical and environmental conditions. Therefore considerable attention has been directed to minimizing and if possible to eliminating field survey work, though the later is impossible to achieve. Field survey work still plays a major role in almost every mapping process.

Field survey work is carried for photogrammetric mapping (1) to supply ground control points; (2) to measure unidentifiable features and; (3) to demarcate boundaries in the field. In order to increase mapping quality, many mapping projects have concentrated on obtaining a better distribution of accurate ground control. To reduce field work, ground control points for photogrammetric restitution are kept to a minimum. Photogrammetric triangulation techniques have also been introduced to provide additional control points with reasonable accuracy, speed, efficiency, flexibility and at low cost. Unfortunately this densification concept has not been applied in Indonesia, and must be given further consideration. Ackermann (1974) has concluded that:

> **"Point densification can in many cases be completed almost entirely by photogrammetric methods. Modern technology has brought us to the point where it is now possible to establish simultaneously with a cadastral survey a system of reference points for subsequent detail surveys. The number of steps required to establish a national network is thereby drastically reduced so that the expenditure of time and money required to set up this national network comes easily within the realm of possibility."**

Even though cadastral maps in the form of photomaps have been considered appropriate for Indonesia and can significantly reduce field survey work, for the purpose of land registration, (cadastral) boundary surveys still have to be carried out in the field, particularly when the boundary line and/or corners are not visible from the air and, therefore, unidentifiable on the photographs. In some cases, the actual property boundaries may not be in the location indicated by physical evidence appearing on the aerial photographs. For maintenance of small changes on cadastral maps of limited areas, boundary survey work is still one of the most suitable tools, for example, for a new layout or

subdivision in urban areas or for re-allotment.

Generally speaking, boundary delineation is considered necessary either directly on photomaps or superimposed as an overlay on transparent materials. For the purpose of this section, the term "cadastral overlay" is used for parcel boundaries in line map form.

For cadastral applications, a cadastral overlay is always an optimum choice. Even many developed countries such as Switzerland have cadastral overlays that can provide conclusive evidence of the position of boundaries, because of the high accuracy of the map. In contrast, for developing countries cadastral overlays may be too expensive and slow, and will be uneconomically justifiable particularly in rural areas. However, cadastral overlays can be reasonably feasible in urban areas even though the cadastral overlay would not provide as conclusive evidence as in Switzerland. Cadastral overlays, as an index diagram of all parcels can be applied to provide the approximate indication of cadastral boundary. In the following discussion, more appropriate cadastral survey techniques pertinent to cadastral mapping for developing countries are highlighted.

6.3.2.2 THE ACCURACY OF CADASTRAL SURVEY

To fulfil practical requirements, the accuracy of cadastral survey work usually has to be of a reasonable standard, without being necessarily high. The cadastral survey method, and the legal basis should be adapted to the local circumstances (United Nation, 1955). Hence there may be variations in accuracy from region to region. Cadastral surveys for urban lands usually require more accurate parcel definition than rural land due to intensity of development and high land values. There are four important "practical requirements" as suggested by Lawrance (1978) for cadastral surveying for a land registration system:

1. identification on the ground a parcel shown on the register;

2. enable the area of the parcel to be calculated;

3. enable mutations in ownership to be effected;

4. assist in the relocation of the boundary if lost.

To achieve the above requirements, it is doubtful whether cadastral surveying of low accuracy will suffice even for developing countries, although it is more economic, timely and demands lower level personnel. High surveying accuracy on the other hand using more sophisticated survey techniques is more expensive, time consuming and demanding on high level of personnel. However it has been stated by Badekas (1981) that for many objectives of LIS, high accuracy survey methods are not prerequisites, even though more accurate survey methods may gradually evolve. The issue of survey accuracy must therefore be resolved, at least to the satisfaction of the Land Registry and IPEDA.

The three major problems that have to be investigated regarding cadastral survey for land registration, involving research and academic institutions, Land Registry, and IPEDA are:

1. whether photomaps alone would be sufficient for boundary identification;

2. whether the concept of "fixed" (precise) or "general" (less precise) boundaries or a combination of both can be adopted in conjunction with the establishment of boundary markers;

3. whether cadastral plans are necessary and if so, the accuracy required.

To some degree, photomaps are sufficient if boundaries can be identified by the existing physical features. Field surveys should be carried out only on boundaries that are unidentifiable on the photograph. This is the simplest method for accelerating acquisition of cadastral records. However there are always some traditional opinions in Indonesia that boundaries should be precisely surveyed and plotted to prevent boundary disputes. Moreover it is claimed that boundaries of properties should be defined by establishing boundary markers on each turning point on the frontage. This concept has been regulated in Indonesia (Agrarian Ministry Regulation No. 8, 1961), but is usually considered inefficient, because the maintenance of boundary marks is difficult. The marks are difficult and expensive to establish and are easily lost or displaced in the course of development. Hence in practice, boundary marking is usually not applied according to regulations. In most cases they are only identified by the existing physical features such as fences, hedges, trenches, wall, roads, streams and foreshores.

Dale (1976) discusses the issue of precision versus cost:

> **"Could such disputes be avoided by carrying out surveys to lower degrees of precision and hence at lower cost? Where is the cut-off point at which the investment in cadastral surveys ceases to produce any further benefits to justify higher expenditure? At what point would the cost of settling disputes in Court exceed the costs of a low grade cadastral survey system?"**

In many countries, the manner of boundary definition viz. (1) fixed or precise boundary definition and (2) generalized or less precise boundary definition are still being debated. To say that the former method is more applicable to developed countries while the latter to developing countries is unfounded. Although it is generally true that the less precise boundary definition is more appropriate for rural land and for countries that are in a preliminary stage of building a cadastre, the original concept of "general boundary" was introduced in the British cadastral system (see 1.2.2). The system provides provisional survey for precise boundaries to be "fixed" and for beacons to be emplaced and surveyed, if the owner wishes. But by experience Lawrance (1974) states that:

"although in a system of registration of title with general boundaries there is an option for land owners to have the precise position of their boundaries fixed and marked by beacons, very few indeed, either in England or elsewhere, have bothered to do so."

However the additional "fixed boundary" survey to the provisional survey is considered by Simmerding & Henssen (1986) to be cumbersome, expensive and unnecessary. From the author's viewpoint, it appears that land disputes in Indonesia generally occur not because of boundary conflicts but mainly because of (1) administrative failures such as insufficient land records resulting from the dualism during the Dutch era; (2) abuse by some people who take advantage of the uncertainty of the title; and (3) squatter cases on abandoned land. Therefore a simple, technical method with less precise boundary definition is more appropriate in order to keep cost low, speed up the process and improve the overall land administration. In fact an attempt to adopt this approach has been performed by the Land Registry for rural land only, but it still lacks supportive mechanism from the government.

For the systematic land registration process it is doubtful whether conventional terrestrial surveying of individual parcels for cadastral plans is necessary. Individual cadastral plans are useful only in defining the precise "fixed" boundaries of each parcel, relocating beacons or boundaries, and eliminating duplication of efforts by the City Planning section in several big cities. For small rural land holdings of poor peasants, cadastral plans are of little benefit when considering the value of their land. Thus a cadastral map, used as an index diagram of all parcels without individual cadastral plans, will be sufficient for rural land and perhaps acceptable for urban land as well at least for the initial stage of cadastral database development.

Nevertheless, if the cadastral plan is still deemed essential, categorization of areas and specifications of procedures and accuracies have to be clarified and accepted by the Land Registry and IPEDA. With respect to this categorisation, the land registration system may be modified such that the indefeasibility of land title can be classified. For example, for systematic land registration ("initial registration") without detail boundary survey, the Land Registry can issue a (temporary/possessory) title in which the boundaries will not be fixed, as the aim is to obtain a complete parcel based data in a timely manner. Full title can only be issued on demand, but must be accompanied by a detail boundary survey at the owner's expense. A cadastral plan is therefore considered as an additional attachment to a full certificate of title. This boundary survey work can be carried out either by the local Land Registry or by private practitioners approved by the Land Registry.

6.3.2.3 GENERAL TRENDS IN CADASTRAL MAPPING

The world-wide trends in cadastral mapping techniques have emphasised the following features (Department of Lands; Thailand, 1985):

1. Adoption of cadastral index map concept rather than the strict cadastral overlay approach (see 6.3.2.1) (e.g. Australia; Maritime provinces, Canada).

2. Representing all land parcels on cadastral map without considering the status and type of ownership (e.g. New South Wales, Tasmania and South Australia).

3. Optimization and simplification of information on a cadastral map.

4. Continuous updating by a single agency (e.g. South Australia; New Zealand; Maritime provinces, Canada).

5. Simple parcel identifiers (e.g. New York State; New South Wales).

6. Broader use of cadastral maps in land administration, planning and management.

7. Relating cadastral maps to the national topographic maps series (common/national coordinate system, and compatible map scales and sheet formats).

8. The use of computer storage for cadastral maps.

Realistically, most of the above features are applicable to Indonesia, but they must be incrementally approached. However, for drawing the basic common strategy toward a common goal, these features should be placed at the front line. Chapter 4 describes two major map forms used in Indonesia - the photomap and the line drawn map. Both of them will continually be used in order to facilitate the immediate projects in various departments. Digital methods are not considered feasible at present, but in pilot projects such method can be partially implemented to prove its viability.

In general the existing large scale maps have very little role in Indonesia's cadastral system, either as an index map or a survey record. Thus, besides escalating the role of large scale (cadastral) map in the cadastral system, the apparently viable uses by other agencies have to be considered as indicated in point 6 above. Therefore the adoption of a quick technique of map production can be the most relevant issue as discussed in the next two sections.

6.3.2.4 ALTERNATIVE MAPPING TECHNIQUES

There are several possible procedures for the production of cadastral maps, ranging from simple to very sophisticated. The two major groups are terrestrial (field) survey and photogrammetric methods. The advantages and disadvantages have

been discussed in detail at the Meeting of the Ad Hoc Group of Experts on Cadastral Surveying and Mapping (United Nations, 1972). From the discussion, it was agreed that terrestrial survey for base mapping projects, especially at the initial stage of building a cadastre is considered obsolete and generally inappropriate.

Photogrammetric methods have been quite acceptable for obtaining topographic features as a base map for cadastral purposes in Indonesia. For more efficient mapping, many countries have categorized their land into highly developed, sparsely developed and remote rural lands. The scale of aerial photographs, accuracy and the density of control points required will vary in accordance with each land category. The form of map may range from line maps, orthophotomaps, rectified and unrectified photomaps to aerial photographs. Since field surveys form an important aspect in all mapping activities, the optimal choice of an appropriate field and photogrammetric combination is therefore essential.

Ideally all mapping projects undertaken by several agencies, particularly those by the Land Registry and IPEDA must adhere to a common specification. This may only be achieved gradually, after user requirements are carefully studied. For example, the high altitude photography introduced by the United States Geological Survey in 1978 (NRC, 1983) and BAKOSURTANAL in 1982 (BAKOSURTANAL, 1984) may be applicable for rural land. Orthophotomaps carried out in UMP on 100 urban cities by the Land Registry (see chapter 4) may be useful as a basis for a comprehensive urban LIS. In the selection of the most efficient procedure, the following must be considered:

1. current and future accuracy requirements;

2. current and future available resources (finance, materials and personnel);

3. urgency of the project;

4. possible future improvements in terms of new methods, technologies and accuracy required;

5. available resources (personnel, instruments and finance) for maintenance; and

6. other possible uses of the product.

Originally, photogrammetric techniques throughout the world were introduced only for mapping. The ground control points for this mapping process should be of sufficient density and accuracy for photogrammetric restitution. However in the last two decades this technique has been improved for use in densifying control points for other survey works, without significant loss of accuracy (see 6.3.2.1). This is the result of improvements in field data processing and by stereo restitution methods using modern block adjustment techniques. This method requires a fairly uniform density of vertical control points for densification of height points, but for horizontal control points, sparsely distributed control at the periphery of the block, with spacing at about

every five photographs is adequate. The planimetric accuracies are nearly uniform throughout the block.

The recent technology in GPS (Global Positioning System) (see 6.3.2.5) can also provide solutions to photogrammetric mapping by providing ground control points more rapidly than previously. Current experiments in the United States have shown another possibility for aerial triangulation without ground survey. One GPS receiver is attached in the aircraft of the aerial photography mission, and another receiver is stationed on one fixed point on the ground. Thus, the position of the central projection of every photograph can be determined through positioning of the exposure station on the aircraft with submeter accuracy (Lucas, 1986).

6.3.2.5 TECHNICAL ALTERNATIVES FOR SURVEYING

Survey equipment have improved substantially in the last two or three decades, particularly through more advanced electronics and digital circuitry and the introduction of satellite positioning technologies, such as the Doppler Positioning System, electronic tacheometer and Inertial Positioning System. Global Positioning System (GPS), is an emerging technology that may revolutionize conventional surveying and all current horizontal positioning methods.

In section 6.3.2.2, the necessity of cadastral surveying in developing countries has been discussed. The methods of cadastral surveying vary between countries as described in detail by Dale (1976). The methods used in Indonesia were briefly mentioned in 4.3.2, but they will not be discussed further in this thesis because an extensive investigation would be required. Thus no specific recommendations are presented herein. It must be realized that alterations to the existing cadastral survey are very difficult. But some modifications are inevitable. In the following paragraphs, some modern survey equipment that may be appropriate to accelerating the mapping process in Indonesia are considered.

The use of electronic distance measurement (EDM) instruments for the automatic recording of angles and distances are recent innovations in terrestrial surveys. Together with electronic data loggers (such systems are called "total station"), they are effective means of improving field productivity. Besides reducing human errors in data transcription, total station equipment when interfaced with computers are highly efficient. Unfortunately, the relatively high initial investment will often deter their use.

Satellite Doppler positioning system using signals from US Navy TRANSIT Navigational satellites is economically feasible for Indonesia (see 4.2.2), especially for first order networks in terms of cost, accuracy and timeliness. For densification of lower order geodetic networks (shorter distances between points), Doppler positioning system may not be appropriate as the operation becomes more costly and more time consuming if reasonable results are desired. However, another satellite method (the NAVSTAR Global Positioning System - GPS), a successor of the

Navy TRANSIT satellite navigation system has raised hopes in providing more extensive capability for mapping projects. GPS is designed for a three-dimensional coordinate determination almost instantaneously. All necessary control point coordinates can be directly obtained in a matter of one or two hours, with relative accuracy in the range of submetres or even decimeters on the ground. GPS method is fast and accurate. The receivers used are small, lightweight, portable in almost all weather conditions and require no highly skilled operators. Thus it would increase productivity, reduce cost and produce data with accuracies that are not attainable by any other means (NRC, 1983). Although it has been operationally applicable in many countries since the mid-1980s and used on several off-shore surveys in Indonesia, GPS technology is in fact still in its experimental stages. It will not operate to maximum capacity until the end of this decade. If this potential technique is readily available for developing countries and a large number of receivers can be sold, it is predicted that the costs of the GPS receivers will decline (at present the price of a GPS receiver is about US$100,000).

The total station and GPS instruments are generally suitable for easy handling and maintenance. They can be used in various physical and environmental conditions. Another technique, inertial positioning system has not been introduced in many developing countries because it requires substantial capital investment for the hardware as well as the maintenance. Moreover, transportation of the bulky equipment during survey operations is cumbersome because a high accuracy can only be obtained if observations between points are made within a short interval of time. Inadequate transportation is largely the major drawback in developing countries.

Despite the problems of inadequately skilled personnel, the use of these advanced techniques is still feasible if finance is available. But to ensure that technologies are applied in a way that maximises output, a comprehensive cost-benefit investigation should be carried out. The necessary maintenance for this equipment, and services provided by the vendor should not be forgotten.

6.3.2.6 COMPUTER BASED SYSTEMS

As briefly discussed in 1.2.2 and 5.3.2, computers and automation offer significant possibilities for LIS. The cost of hardware and software have declined dramatically in the last few years, while the capacity to handle and process large volumes of data quickly and accurately is improving. The new generation of computers can improve the efficiency of conventional labour and be more economically even for the poorer developing countries. It must be realised that this technology is only an option that would not necessarily be feasible to every situation. A cost-benefit study in the light of existing resources must always be made to determine the viability of new methods and techniques. In developing countries, the indiscriminate use of technology without adequate support may have even adverse effects.

In the field of computerised land information systems, developments are far behind other applications of commercial

information systems and databases. Experiences with LIS computerization in many developed countries shows that they are still striving to solve many problems, even though most supporting resources are available. Palmer and McLaughlin (1984) state that the realization of what the computer based LIS has promised in increasing information quality, availability and effectiveness has not been achieved even in developed countries.

In 5.2.1, it has already been noted that a LIS comprises of two major components: a graphic database and an attribute database linked by some common mechanism (see figure 6.1). Each component is, in most instances, developed independently since the requirements of a graphic database are quite different from the attribute database. A LIS that attempts to integrate the two components without proper system design may result in a poor system (Goh, 1987).

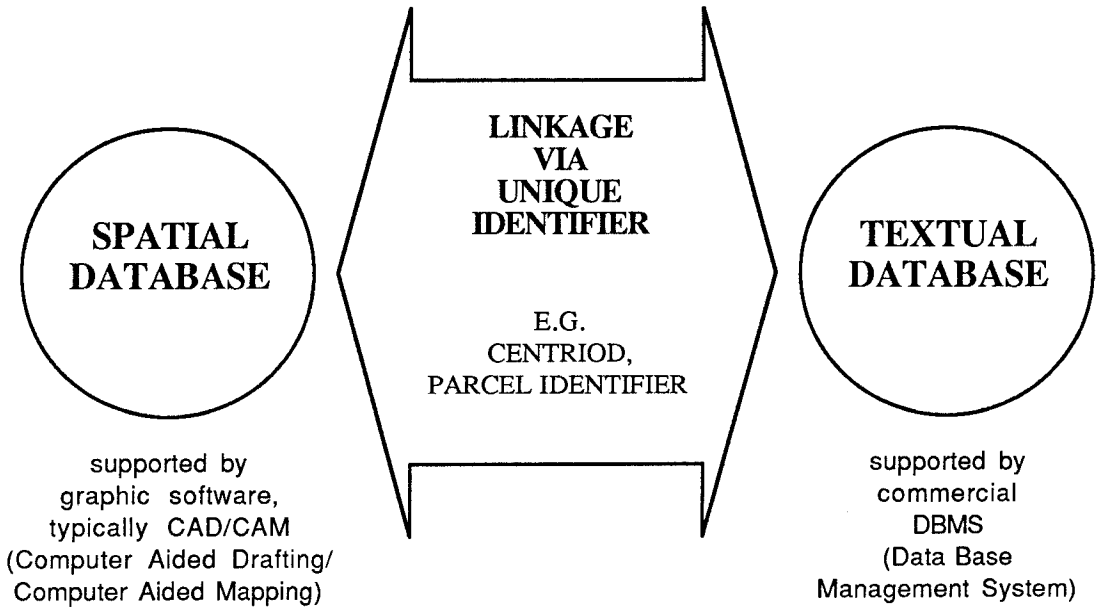


Figure 6.1. A Typical LIS Software Package Arrangement. (Goh, 1987)

Therefore the improvement of the existing systems in developing countries should not necessarily depend on upgrading from a conventional to a computerized system. It is even more important to ensure that any existing manual system is functioning well before introducing the computerized systems. After the manual system has proved itself, computerization can then be introduced, usually in the latter stages because the benefits, such as faster up-dating, better access to the maps by users, better map production can be realized. Ultimately, the decision to implement a computerized database system should test four criteria (Dale, 1976): whether the computerized land database is useful, technically possible, economically justifiable, and politically acceptable and possible.

6.3.2.7 MAINTENANCE ISSUES

> **"A cadastral system [as implied to LIS] can function efficiently only when the data gathered is completely up- to-date and accurately reflects the actual situation, which is of a fluctuating character and subject to change." (Watermann, 1974)**

One important prerequisite for a cadastral land information system is that of the continuing maintenance of both the cadastral record (register) and cadastral map, which should be in a high degree of integration. Thus close contact between register and cadastral map is essential. The process of updating can be done continuously and/or periodically. The administrative structure in Land Registry, that is responsible for both the title register and cadastral map, seems to enable such integration (see 2.2.2), but the mechanism of data collecting and the updating procedure have not been fully applied.

As the characteristic of the immovable property is always changing, registration of mutations of land property and building, and changes in land rights belong to the daily routine. This implies that a cadastre or other system of land administration, once established, will have to be maintained daily (Henssen, 1974). Data maintenance may also include errors that may be discovered such as incorrect ownership data, incorrect parcel number, incorrect boundary data, incorrect parcel area and mapping errors.

Ideally, every change and error found should be entered immediately into the database. However this is rarely possible unless the party concerned such as owner, purchaser and user desires to have the change entered. Thus, it requires a rigorous adherence of all concerned to the operational scheme and regulation, and specific bylaws should be passed and strictly enforced to ensure the administration of such problems.

A complete up-to-date cadastral data base can be achieved not only by establishing the common procedure of data collecting and updating but also by appointing a responsible single agency that can update each particular item in the database. In Indonesian context, such an arrangement should be made between Land Registry and IPEDA.

Finally it must be realized that the maintenance process in cadastral maps will involve a considerable budget. The front-end investments in cadastral mapping will be wasted if insufficient resources are allocated for keeping them constantly up-to-date. It was estimated in the United States by NRC (1983) that the annual cost of the technical personnel needed for maintenance may average more than 5 percent of the original cost of the maps.

6.3.3 ADMINISTRATIVE AND ORGANIZATIONAL ASPECTS

To ensure that the on-going LIS development proceeds in an orderly, efficient and co-ordinated manner, an ideal administrative structure is essential. Tomlinson (1984) emphasises that:

"the absence of appropriate institutional structures can render even the most sophisticated technologies useless."

The recent initiatives within Land Registry and IPEDA and other agencies described in chapter 2, 3 and 4 have shown that the strategy and policy are largely determined by the central government. Most survey activities including the data acquisition process also fall within the jurisdiction of the central government. Additional support in the form of loans or grants, technical aid and training may come from external sources.

An ideal situation in the government involves one single authority, at least at the level of the directorate general, overseeing cadastral survey and mapping, land registration, land assessment (as valuer) systems and the statewide LIS. An example of a successful administrative structure is the Lands Department in South Australia in which the Registrar General, the Surveyor General and the Valuer General Offices come under one jurisdiction. Such an ideal administrative set-up may not be possible, in which case an alternative arrangement should be made.

The question is: which institution should be responsible for LIS, and how it should be organized within the framework of the government? Ideally the responsible agency for a statewide LIS should be independent, so that it can effectively provide access to many users. The existing agencies are still responsible for maintenance of their cadastral databases but their operations must be coordinated by the LIS centre. Thus the LIS centre should only create the link between databases and other record systems held in several organizations. However creating a new independent body is difficult. It is easier to rest this responsibility with an agency within the existing administrative system. The proposed LIS framework for Indonesia will be discussed in 7.2.3.

According to existing regulations, the Land Registry is the only agency that holds a cadastral data base. However the Land Registry is not sufficiently equipped to handle the land registration, cadastral survey and mapping activities. Any attempt to make the Land Registry responsible for LIS activities will necessitate the involvement of the Directorate General. In the Meeting of the Ad Hoc Group of Experts on Cadastral Surveying and Mapping (UNITED NATIONS, 1972), it was strongly argued that there should be two separate offices or organizations responsible for legal land registration and cadastral surveying (usually under Registrar General and Surveyor General). But in order to guarantee the best possible coordination, they should be in one administrative jurisdiction.

If the administrative structure of Land Registry remains unchange, any attempt to establish a statewide LIS will be futile. Separated establishments of independent LIS by individual agencies such as IPEDA, the Land Registry and the Planning departments in local governments and other service organizations will proliferate. The objective of a LIS cannot then be achieved.

Another alternative arrangement in orchestrating the various

organizations in a common strategic plan is to form a strong authority either on an existing government body or on a new interdepartmental committee consisting of appointed members of high level staff represent relevant professions and institutions. The task of this committee is to control and monitor the overall project, and to acquire government commitment. This approach is considered to be one of the most effective and is adopted in Australasia (see figure 6.2).

6.3.4 EDUCATION AND TRAINING ASPECTS

6.3.4.1 RESEARCH ORIENTATION PROBLEMS

The issues of problems in implementing a broad land administration and general short and long term strategies are of primary importance for other supporting activities in LIS development, i.e. research work, education, training, seminars, workshops, and symposia. These are the task of academic, professional and research institutions. They should be responsive to the society and the related professionals by providing, stimulating and gaining maximum opportunities for related professionals of knowledge and general acceptance of the technologies and its multidisciplinary nature.

Research in some particular disciplines and subjects is necessary, particularly in the new technology applied to surveying techniques for technicians, but a thorough scientific and technical knowledge for system oriented engineers is also essential that can permit each experienced individual in the surveying profession as well as outside this profession to appreciate the overall land management problems.

It is not only essential to keep up-to-date with rapid developments in modern technology, but also to understand problems and sometimes failures encountered by many countries in attempting to introduce an LIS. Dale's (1976) statement on fundamental education problem is relevant to this discussion, as:

> "The fundamental weakness of survey education is that it has tended to be method oriented rather than problem oriented. The most significant developments in land surveying have tended to come from instrument manufacturers rather than from academic research; what limited research that has been undertaken has been, primarily, in the fields of survey mathematics, physics and technology. Land, law and people have tended to be avoided as topic for research, yet it is just those areas which most affect cadastral surveying. It is as if problems which do not have a finite answer are taboo. Education in matters relating to the land is rare; where it exists it has tended to be oriented to the finite problems of how to work within the law in relation to town planning, subdivision design or conveyancing. Problems of the environment are, in most cases, avoided. Land surveying appears to be about technology and not about the land."

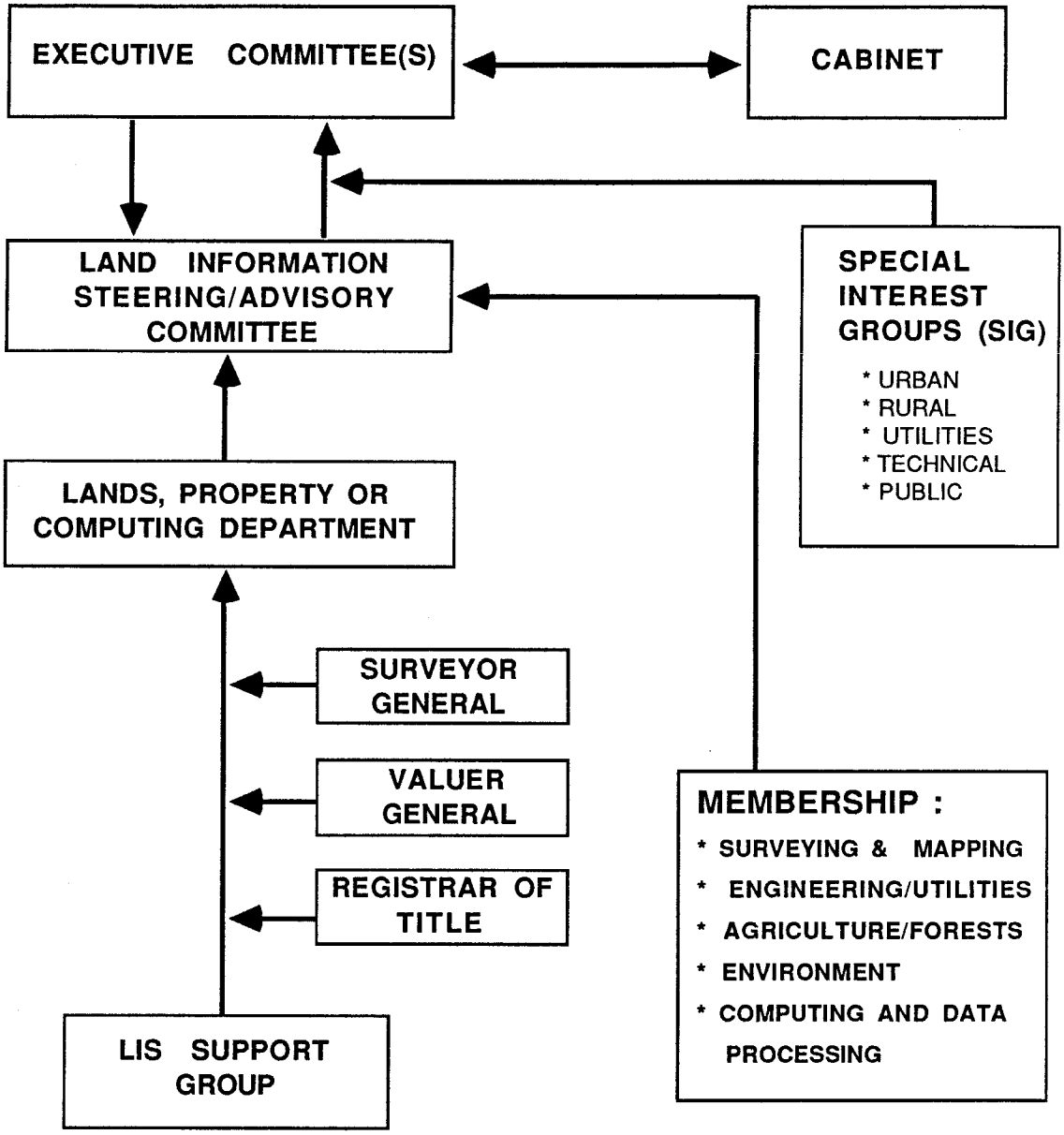


FIGURE 6.2. General Administrative Infrastructures in LIS in Australasia. (Williamson & Blackburn, 1985).

6.3.4.2 LAND INFORMATION MANAGEMENT ISSUES

> "It is not enough to teach a man a speciality. Through it, he may become a kind of useful machine, but not a harmoniously developed personality. It is essential that the student acquire an understanding of and a lively feeling for values. He must acquire a vivid sense of the beautiful and of the morally good. Otherwise he - with his specialized knowledge - more closely resembles a trained dog than a harmoniously developed person. He must learn to understand the motives of human beings, their illusions, and their sufferings in order to acquire a proper relationship to individual fellow men and to the community." (Albert Einstein)

The need for land information managers must surely be re-assessed in this era so that proper training and education may be provided by the academic institutions. Indeed, as noted by the United Nations (1983), a manager with cadastral surveying, geodetic scientist, survey engineering or a computer scientist qualifications is expected to be conversant with a wide range of subjects including: (1) the cadastral system, land laws, survey laws and practices, land and public administration, general planning and land use policies; (2) data acquisition methodology including field survey, photogrammetry, cartography, remote sensing and digital mapping; and (3) computer science including information systems and database management systems. Since some of these subjects are very specialised in nature, it may be necessary for courses to be introduced at post-graduate level on a supplementary basis. At the under-graduate level, the coverage may be on a broader base.

In general, the surveyor can play a major role in initiating investigation on land administration problems and to propose methods to improve the existing system. However the present surveying courses for undergraduate level offered in Indonesia have lacked coverage on information and land record related fundamentals (Aziz, 1986). Problem-oriented research is often ignored resulting in the stagnation of the profession. Furmston and Logan (1986) suggest that:

> "We would rather see an emphasis put onto the systems approach to investigating information needs and designing information systems, which is extremely useful even where improvements to existing LIS may not involve computerization, at least in the early stages."

An ideal conceptual framework for surveying curriculum as described by McLaughlin (1981) illusterates the intellectual foundation for a surveying program which has to be built upon the earth sciences and mathematics (see figure 6.3). The purpose of this concept is to develop an in-depth understanding of those technologies relevant to surveying disciplines, not only the traditional measurement technologies, but also a wide range of resource information technologies. So surveyors must have an appreciation of the social sciences and law, economics and the management sciences.

The revision of education to fulfil the demands of land information expectations is needed. Dale (1976) suggests two stages for educational reform; the first is to examine in detail the nature and uses of surveying in a broader spectrum of land information system and the second is to re-educate the educators. Specialized subjects pertaining to the problems of land administration in Indonesia should be made available at the managerial level. Technical exchange programmes between departments and overseas institutions should also be encouraged. At lower levels, provisions must also be made to train technical staff to higher levels of competency and to assist them in the operation of new techniques and procedures that may have to be introduced.

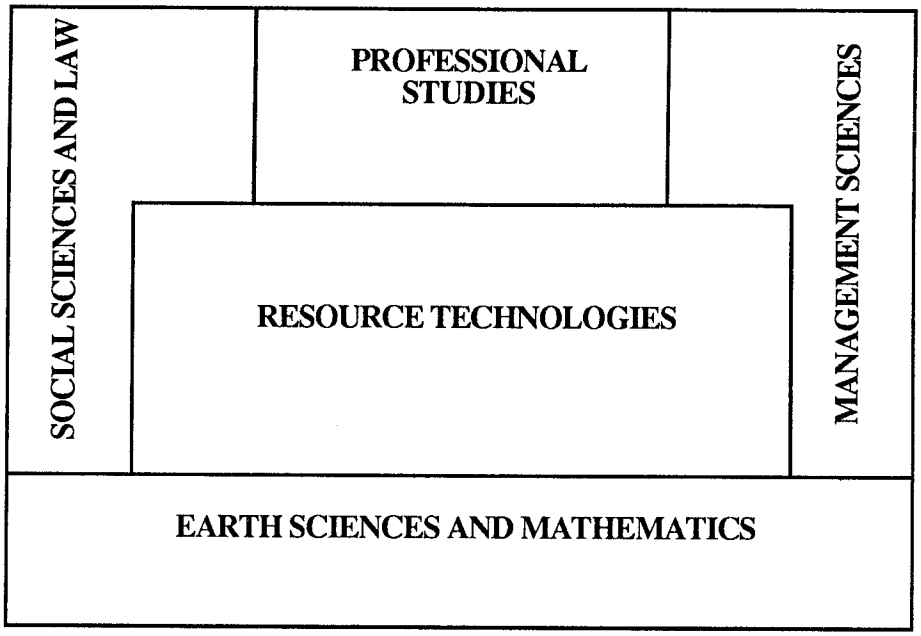


Figure 6.3. The Conceptual Framework for an Undergraduate Surveying Curriculum. (McLaughlin, 1981)

6.3.5 ECONOMIC ASPECTS

If support for LIS is to be obtained from the government, it is imperative that the cost-benefit of such systems be favourable. Notwithstanding the difficulty of measuring cost/benefit, it would still be necessary that a quantitative measurement be adopted. However, the intangible benefits that may result must always be tabled to the decision-makers. Furthermore, there is always a substantial time lag from the time of investing in a LIS to the time when the system becomes fully operational, as noted by McLaughlin and Wunderlich (1983):

> "Almost without exception, the costs and the time to develop computerized land information systems have far exceeded initial projections. And while the costs have been high and rising, the perceived benefits have been extremely difficult to quantify. A significant share of the responsibility for the limited success to date must be

borne by managers who have not effectively documented the need for these new information products and services, who have not been able to get on top of and effectively manage the technical developments, and who have all too often been unwilling or unable to foster the open, cooperative and supportive environment necessary for bringing together the diverse actors, agencies and institutions involved with land information."

In many systems, the benefit may only be realised after a decade or even longer. Very few countries can implement a system in less than 3 or 4 years (Williamson, 1983A). An initial study carried out for the Maritime Land Registration and Information Service in Canada in 1971 for cadastral system development evaluation is thoroughly described by McLaughlin and Larsen (1976). It consists of:

Stage 1. An initial feasibility study, i.e. benefit-cost analysis which documents the problems associated with the existing services and facilities, and demonstrates the merits of proposed alternative programs.

Stage 2. An on-going monitoring program is designed to continuously measure the costs of producing cadastral services and products, the benefits actually accruing to the public from the use of these services and products, the value added components of the professions, and the changes in consumer demands.

Stage 3. A periodic system review provides for the periodic analysis of the value and performance of the cadastral system, an analysis of the impact of any pending technical changes, and the analysis of the impact of any proposed additions or modifications in system service or products.

This concept appears to be a feasible evaluation process for any cadastral system development. However for some practical reasons in many institutions or countries, including Indonesia, some of the monitoring procedures may be difficult to follow due to political reasons or unavailability of data for the cost-benefit analysis during Stage 1.

It should be realized that the tasks of establishing a good land data system are quite formidable and the capital involved in the development is very large. Thus the financial consideration is always the decisive factor. Whether the establishment of the overall system will progress slowly, incrementally or at a rapid pace will depend on financial resources. The important thing is that financial commitment to an ongoing development as well as for the immediate maintenance must be ensured.

6.4 CONCLUSION

From practical and theoretical standpoints, the alternatives and strategies for LIS development are rather limited due to the complexity of land administrative arrangement and other constraints. Past experiences have demonstrated that some ideal concepts for cadastral systems have been introduced in Indonesia. Very little were successfully implemented. Failures were often caused by social, political and economic issues. But the major weakness is the lack of conceptual guidelines within the overall government structure caused by poor coordination of activities.

The LIS establishment always involves several relevant agencies. Hence the development of strategies has to involve those agencies in order to achieve a general acceptance of the basic concept.

The approach to establishment begins with the cooperation and coordination between the Land Registry and IPEDA statewide. The efficacy of land administration cannot be attained by any other means. Failure to do so will prevent a LIS from being productive.

The adoption of various methods and technologies in surveying and mapping has generated a wide variation of specifications on accuracy and procedures, that can only be formulated by particular needs of each organization concerned. This proliferation appears to be the major impediment in specifying a proper standard in survey and mapping. Thus the need to fulfil the technical requirements as described in 5.4 is becoming more evident.

It is commonly accepted that the fundamental concept of LIS should not be bound by advanced technological developments. Instead, it should initially be focussed on a concept for a land administration mechanism over a long time frame. Modern technologies are effective for reducing problems in data acquisition and manipulations. They are a means to an end, not the end per se.

Moreover, the LIS and implementation of modern technologies should not be viewed as a replacement for existing land administration procedures. Rather, their impact will be to create a better mechanism, and to provide more extensive new functions.

Finally, the success of LIS establishment is largely dependent on the recognition of land administration problems and feasibility of the solution by the executive level in government. To gain significant government interest, discussions of issues on relevant land matters have to be encouraged within the existing professional, research and academic institutions.

CHAPTER 7

7 CADASTRAL DATA BASE DESIGN APPROACH AND IMPLEMENTATION

7.1 INTRODUCTION

The increasing interest in developing LIS's and some degree of awareness among land data administrators show that there is an ambition and necessity to improve the land data system in Indonesia. Even during the field study, the author gained some impressions that there is a strong tendency toward a computerized LIS as a means of improving the existing cadastral system in the country. However neither short nor long term goals and strategies for LIS development have yet been drawn. Experiences in developed countries have shown that failures in LIS implementation have been caused by a lack of understanding of general concepts. The programme of every LIS development whether it is of a very rudimentary form or a more advance one has to be well planned before it is put into operation, because once it is started, it is difficult to change. Therefore a foundation for such development is very important.

A conceptual model and strategy are proposed and rationalised to suit conditions in the country. The approach for the system development is based for a long term development strategy. Therefore, the main target of an improved cadastral system may not be achieved in the immediate future. Experience of many governments and institutions have shown that the development of an LIS requires better coordination through a formal framework. The recommended framework is discussed in conjunction with a proposed model. Design stages for implementation of a cadastral data base system are considered in the context of Indonesia.

7.2 LIS MODEL FOR INDONESIA

As stated at the beginning of the thesis, a cadastre is a (ownership) parcel based LIS. It is the foundation of all other LIS applications. Therefore the strategy of a LIS development should be geared towards improving the cadastral system to meet the needs of administrative, legal, fiscal, planning, statistical and economic purposes of this country.

Williamson (1983A) emphasises the importance of long term planning and modelling in his statement:

> **"Long-term planning and modelling should be an important element within any land administration system. It is necessary to formulate long-term goals and to perceive a 'model' system. Otherwise, improvements will have no direction and individual sub-systems may not be compatible in the future. It is accepted that as technology improves and the demands of the state and public change, so the ultimate 'model' will need to be continually updated."**

He also broadly evaluates the existing theoretical models in Australia as well as in many developed countries. It is evident that no single theoretical model or concept can be practically

applied, even within developed countries. He also noted that the spatial representation of the parcel and the cadastral mapping component have a central role in most existing models. Title registration has a secondary role. However, he argues that in practice, both cadastral mapping and title registration are of equal importance in a modern cadastre.

One important goal in this study is to introduce a rational model of LIS development for Indonesia. The background of the design model follows the concepts of a modern cadastre (see 1.1) to achieve an initial basis, but the situation and the needs of this country have influenced the design approach considerably. The manner in which cadastral systems have evolved and experiences of system developments in developed countries provide the background to the design. This proposal is the first attempt to introduce a systematic approach to an overall system development. It is preliminary and should be gradually improved to accommodate the requirements of the major organizations in Indonesia.

The design does not propose dramatic changes in the existing system, but rather recommends relevant and necessary improvements to the mechanism of land administration system. One primary important feature is that the cadastral system has to be dynamic to allow modifications with time (Williamson, 1983A). An ideal cadastre is achievable through gradual evolution long term.

7.2.1 THE STRATEGY AND LIS MODEL

In some cadastral systems, the mapping component (base map and cadastral overlay) tends to be separated from land parcel records. Thus land registration lacks contact with the cadastral map, as shown in the proposed multipurpose cadastre model in the North American context (NRC, 1983) in figure 7.1. This is also

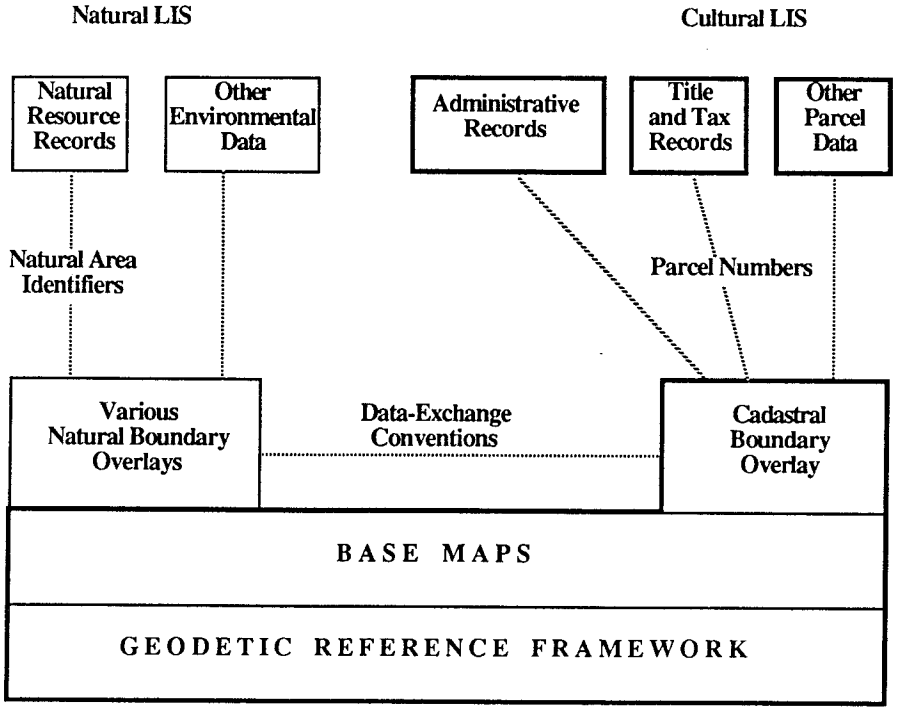


Figure 7.1 : Components of a multipurpose cadastre (in heavy outline) as the foundation for Land Information Systems (LIS's). (National Research Council, 1983)

reflected on the placement of the land registry separate from the survey and mapping agency. Williamson's model (1984) emphasises the importance of the close contact between these components, centralized within a juridical cadastre as a foundation for a statewide parcel-based land information system (see figure 7.2).

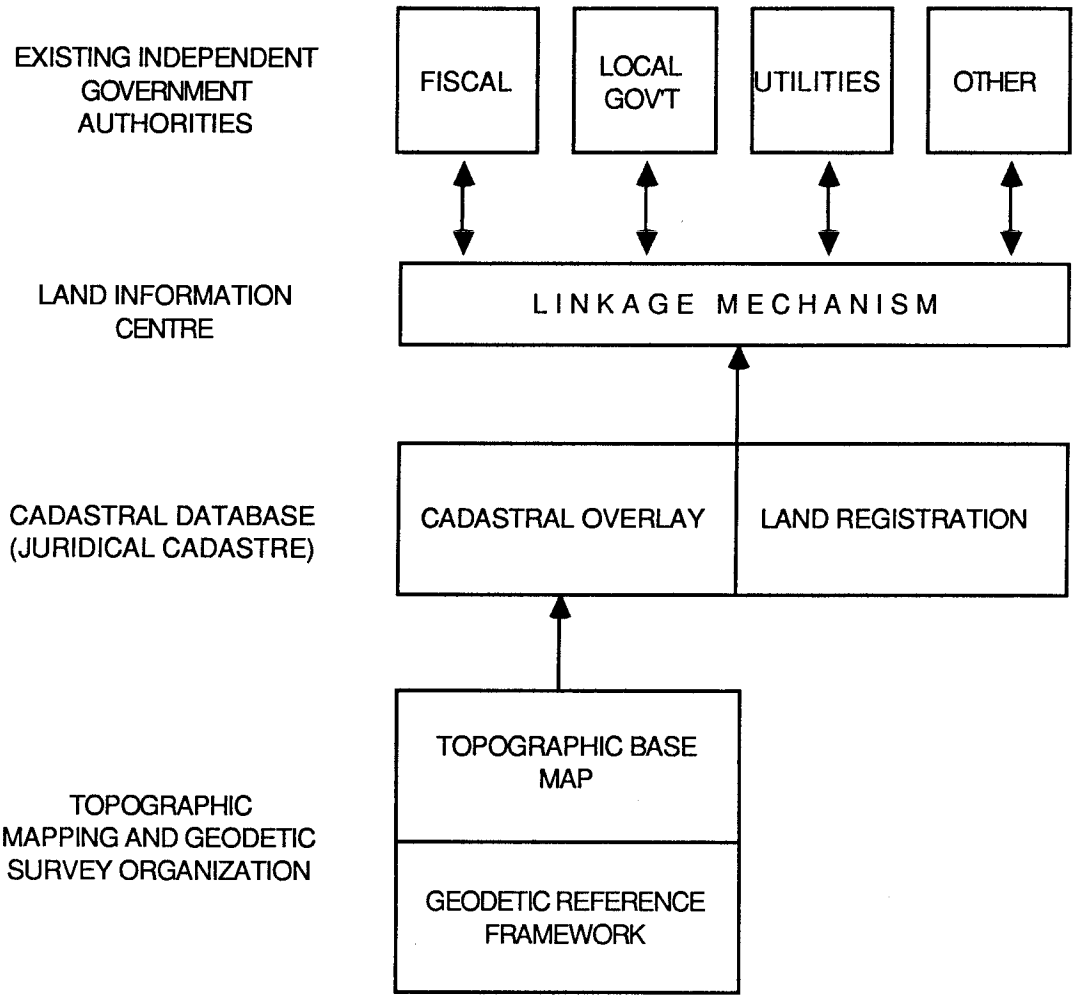


Figure 7.2 : A statewide parcel-based land information system centred around a juridical cadastre. (Williamson, 1984)

For Indonesian conditions, the latter model appears to be more suitable, where both components are the responsibility of Land Registry. However the separation and independency of IPEDA from Land Registry as shown in figure 7.3 is the most inevitable problem that enforces the adoption of the model shown in figure 7.4.

Central to the LIS development is the establishment of a cadastral database which integrates both fiscal and legal cadastral surveys and mapping. The database consists of parcel based cadastral records, comprising a register, cadastral maps and an index that links the register and the cadastral map. The IPEDA and the Land Registry are responsible for the inputs of parcel ownership records in the data base. Thus, the merged information from the two sources is the basic concept of the LIS for Indonesia.

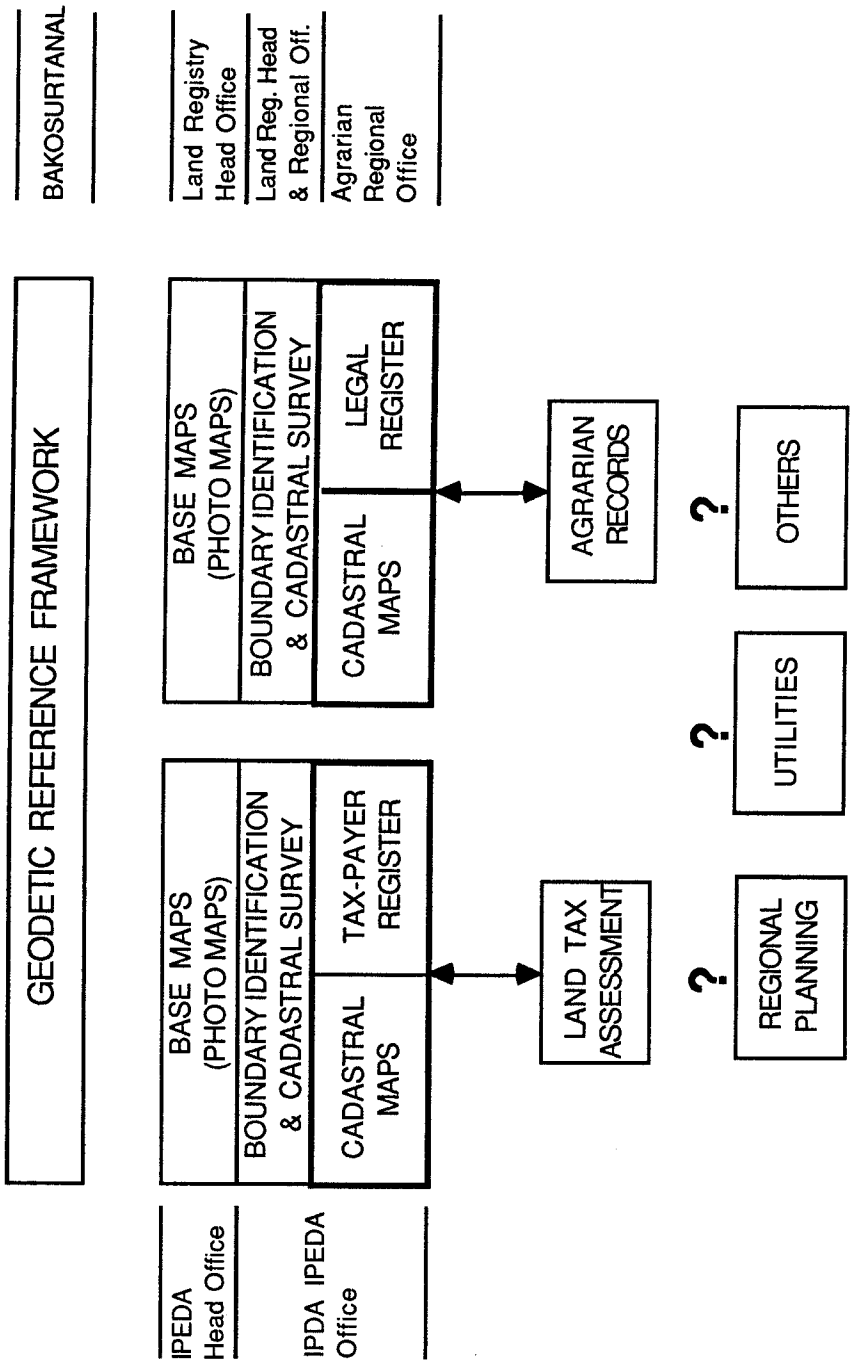


Figure 7.3. The Existing Cadastral System in Indonesia.

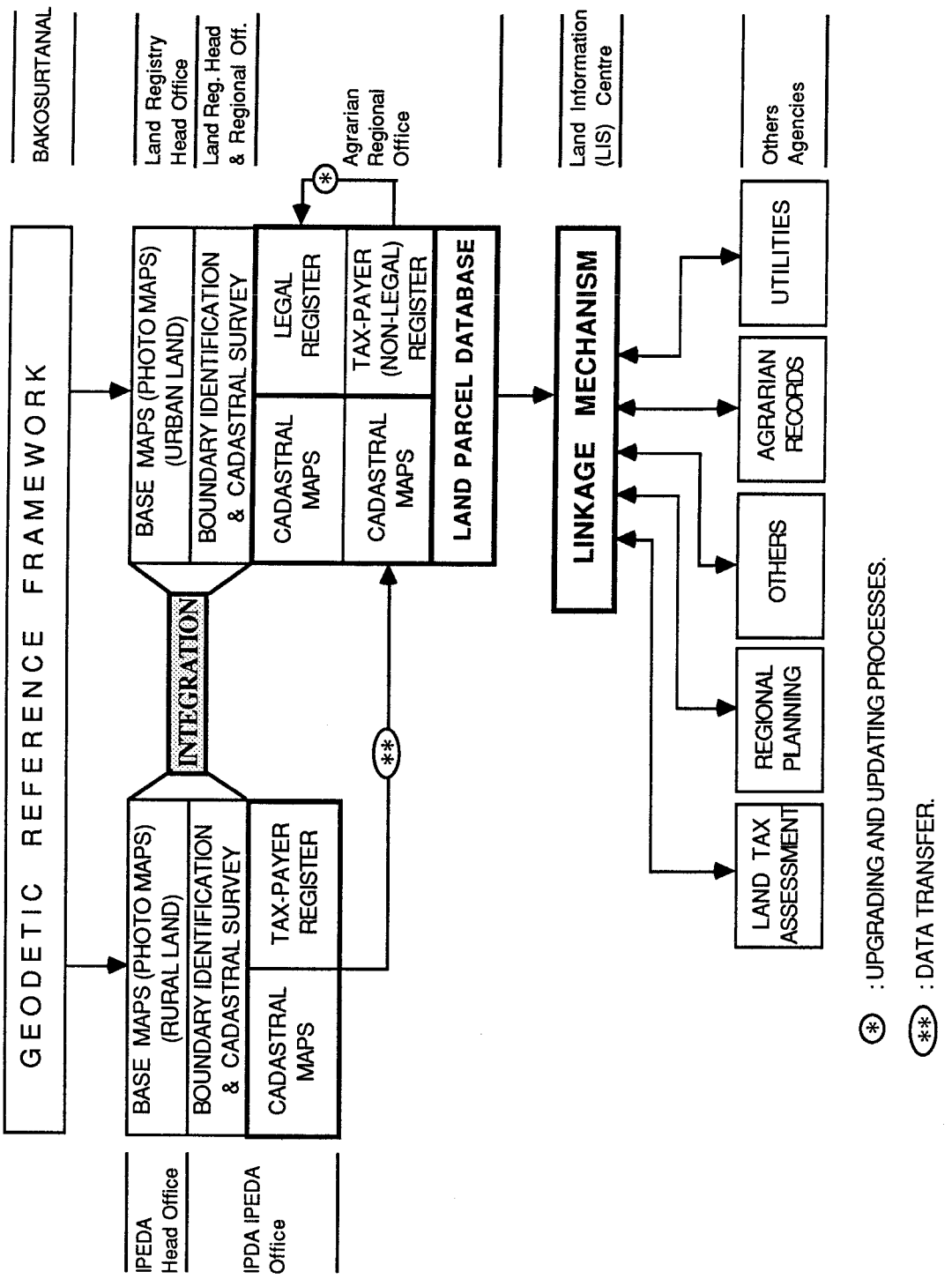


Figure 7.4. The Proposed Cadastral Database Creation.

The strategy of LIS design is broken down into two levels. The first level is carried out only within the head office with a Committee for the Statewide LIS strategy. The task of the Committee is to establish a basic concept, pilot study, and guidelines for regional offices. The second level is the implementation stage in regional offices. It includes setting up pilot project. The Committee should provide specifications and procedure documents in detail, supervise the implementation stages, evaluate, and control the operation of the LIS.

7.2.2 THE MECHANISM OF THE PROPOSED MODEL

Urban and rural areas may be operated under separate agencies; these are Land Registry for urban land and IPEDA for rural land. However this separation is not necessarily rigid. It should be based on these agencies' individual program and budget which are usually based on their annual plan. The main constraint is in cooperation and integration which are absolutely essential to avoid inefficiency and duplication efforts.

It is certain that once the database is created, the maintenance becomes a key function of the system. The responsibility to maintain the data base should be within the organization that holds the data base. This may become the task of the local Land Registry that holds the cadastral data base. The major element in maintenance of the data base is the land registration process. This must apply to single land parcel transactions or ever a mass land titling project such as PRONA. Consequent to updating land registration transactions, other non-legal records must also be maintained and kept up-to-date by the Land Registry.

Conveyancing processes for both registered and unregistered parcels should be processed only through the Land Registry. IPEDA should not be burdened with registration processes. It should concentrate on tax assessment, reviewing and improving the valuation system.

The database created is not considered to be comprehensive. Its target is to achieve a complete record of land, even if it is without complete legal records. The final goal is to complete the legal database. The complete legal database can be incrementally created, but it will depend very much on the progress of land registration.

In order to achieve survey integration of the legal and fiscal components of the system with other ad hoc mapping projects, it is strongly recommended that all mapping should be carried out on one reference system, that is the National Coordinate System on UTM projection. But sufficient control points should be provided by relevant agencies if necessary on an ad hoc basis.

7.2.3 LIS FRAMEWORK

A LIS framework is designed for a regional office on the level of Kabupaten that holds cadastral database. The LIS is centralized within this office but under strong head office supervision.

In practice there are two alternatives for a formal LIS framework based on the government structure, but there are advantages and disadvantages of each. Firstly, a separate LIS centre in a regional office can be established as an independent unit outside the Agrarian Office (see figure 7.5a). It should have a very close link with the regional Land Registry unit that holds the data base. The legal database is kept in each regional Land Registry unit under the regional Agrarian Office. This approach has some disadvantages such as inefficiency of land data transfer through an extra agency especially on paper medium, bureaucratic inertia and difficulty in recruiting skilled personnel. The advantage of this approach is that several functions are localised at a LIS centre. It can serve several agencies and is theoretically more effective. The centre can control many different types of land data and create links to the data base.

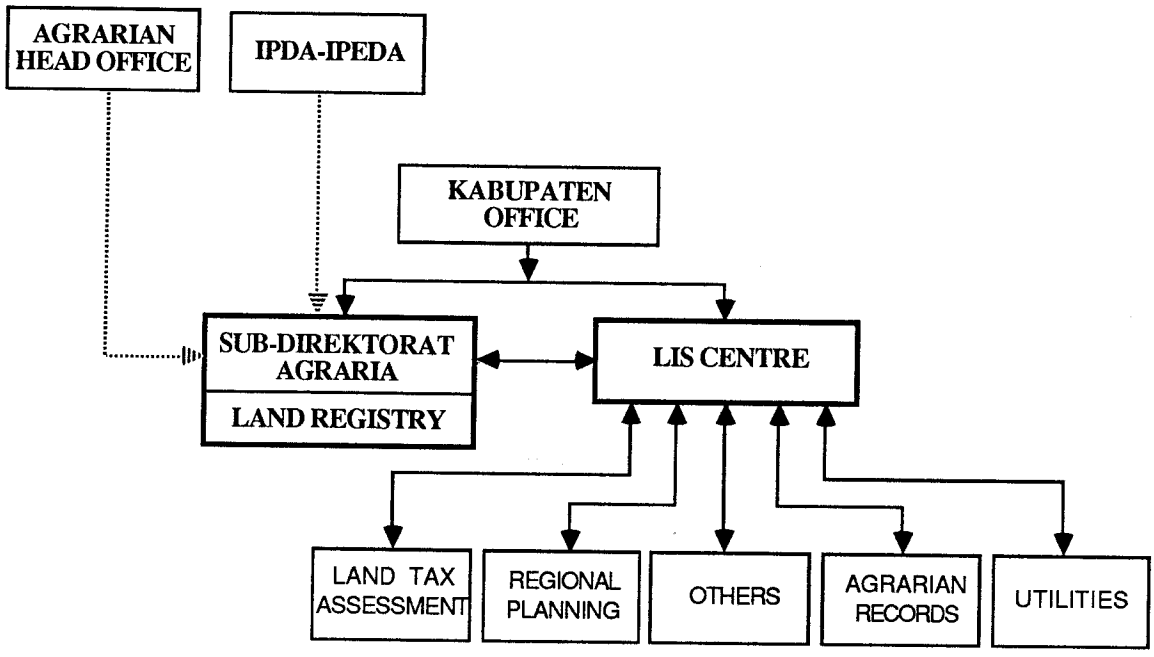


Figure 7.5a. First alternative of LIS framework

Secondly, the LIS centre is the sub-unit in the regional Agrarian Office (see 7.5b). It would be administratively and technically under the Head of local Agrarian office. The LIS centre holds the database and serves as a linkage with other databases. The disadvantages of this approach are that the functions of the LIS centre may emphasise more on the cadastral database maintenance rather than to serve outside agencies and creating linkages. The advantage of this approach is that it is easier to establish within the existing government structure. The existing local staff can be employed while new staff may be gradually recruited in accordance with the growth of the system. Finally it may create a new centre if it outgrows its present capacity. Under prevailing Indonesian conditions, this approach is more appropriate than the first one.

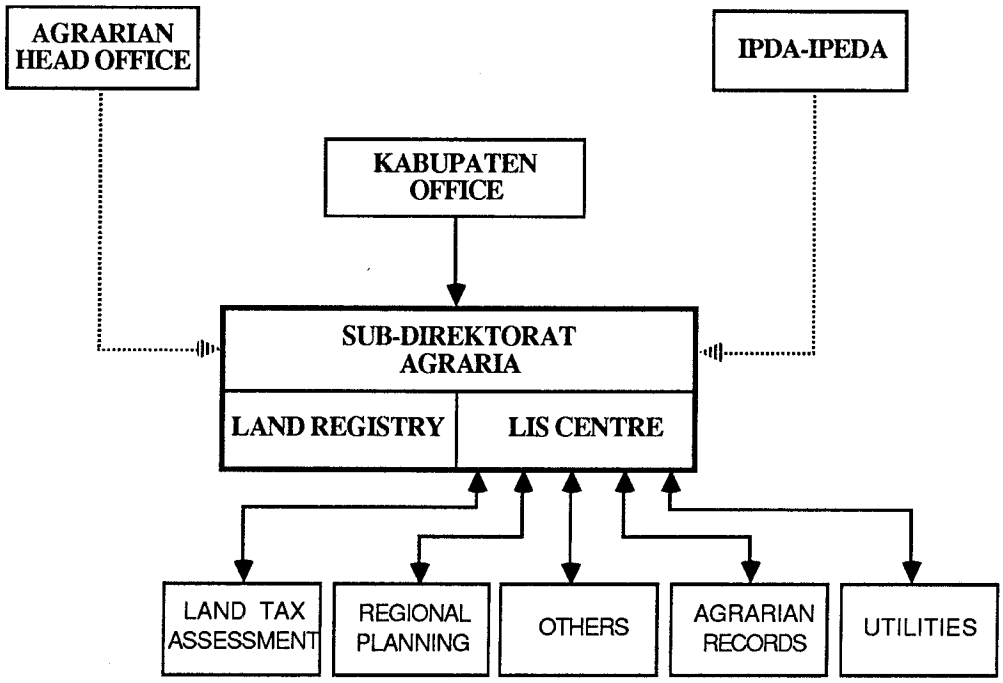


Figure 7.5b. : Second alternative of LIS framework.

7.3 ELEMENTS OF SYSTEM DEVELOPMENT

7.3.1 CADASTRAL DATABASE DEVELOPMENT

The development of a proper parcel-based LIS should be based on a well established cadastral data base. The cadastral data base itself is complex, containing both spatial and attribute data. The complexity is reflected in current computer technology which has yet to successfully solve LIS problems, compared with other data base applications. However some advanced technologies in computer development are still in their early stages of growth and will definitely change in the near future. It is therefore indubitable that database development should be designed in line with expected computerization developments. As Dale (1981) has pointed out that:

"None can however claim to have a computerised land information system. On the other hand the basis is being laid for such development and there seems little doubt that in time even the poorest countries will aspire to computerised systems."

There are eight points which can be summarized dealing with cadastral database design that may be important for Indonesia.

a. The database design should be applicable for computerised and non-computerised database systems particularly for the non- graphic information.

b. A complete database should be achieved within one jurisdiction (or administrative unit) such as kabupaten and propinsi. The database should be based on the best possible available data.

c. Database should be kept up-to-date if possible on a daily basis (for a better public service), or at most on a monthly basis because in practice all land registration transaction processes take more than one month.

d. Since the ownership parcel is the object of the whole system, there are only two contributors to the data base that hold that information, namely Land Registry and IPEDA.

e. There will be at least two classes of records with different quality: non-legal (or unregistered) and legal (there are also provisional registered and fully registered) records. A different identifier should be given to the unregistered records that distinguish them to all users from the registered records.

f. Integrity within the two major elements (cadastral map and the register) in the data base should be maintained through each cadastral survey and land registration process.

g. Data should be correct, complete and as accurate as possible.

h. The database should be accessible to various users, including the public, in order that data can be analysed and examined effectively, efficiently and quickly.

7.3.2 LIS DEVELOPMENT

To use the cadastral database effectively, there are also eight points that should be considered for LIS development.

a. For developing countries, the most appropriate system should be simple, easy to understand and implemented on the existing environment. Consequently, it is likely to be less costly.

b. Minimum changes in the existing procedures, especially land administrative procedures are necessary.

c. The system should be useful immediately to user(s) such as for taxation. Provisions are necessary for it to grow incrementally into a multipurpose system.

d. The LIS centre should be centralized in the regional office under local Agrarian Office and supervised by one central government Committee or the main office.

e. Each regional office should be responsible for the collection, maintenance, distribution of land data. However the procedure for collecting, maintaining and distributing the data should be the responsibility of the main office.

f. The basic land unit should be the ownership parcels, i.e., legal and non-legal parcels.

g. A unique common identifier may be a simple hierarchical administrative numbering system, eg. a numbering system used in the Central Statistical Bureau (Badan Pusat Statistik), plus a numbering system within the smallest administrative unit (desa) available from the Agrarian Office.

h. The system should be flexible, offering several alternative levels of system sophistication and allowing for future expansion. A model system should be developed based on a pilot study which may include a sophisticated computer system. But the feasibility of computerization in each regional office should be independently studied. It should conform to existing systems and be uniform within all regional offices. Preferably turn-key systems should be avoided. Computerisation of attribute data should precede the establishment of a digital map base.

7.4 IMPLEMENTATION

To implement the above proposed system, there are 12 important stages to be followed.

* **Task Group**

1. Establish a Task Group or Committee that involves several agencies. The Land Registry and IPEDA are the most important. The group may for example be led by the Head of Land Research and Development Centre, Department of Internal Affairs.

2. The group should encourage inter-agency seminars on LIS to improve awareness of each other's needs and activities. Seminars should be conducted regularly e.g. annually to allow evaluation of each development stage. Individual members of the group should investigate their respective areas of needs and provide feedback to the group. At this stage, specialist consultancy may be requested to address issues that are beyond the expertise of the group. Otherwise this step may be taken after stage 5.

3. Canvass upper management support on other related fields, particularly in gaining financial and statutory support. It is also important to provide a comprehensive long term plan and to ensure the completion of the plan. Strong commitment from higher levels of management is crucial.

* **General (Preliminary) LIS Study**

4. Re-evaluation and re-assessment of the Land Registry and IPEDA cadastral survey and mapping activities. In particular, the various land related functions and responsibilities of other agencies, especially in relation to their aims, methodologies, organizational structures and staffing requirements need scrutiny.

5. The group should form a preliminary concept of the development plan, how the system should work, the purpose and structure of LIS development that relate to urban and rural constraints.

6. Carry out analyses of requirements, plans, data gathered, alternatives, cost and benefits.

* **Pilot Study**

7. Develop pilot project objectives, stages, specification and implementation. If necessary update the proposed overall system model and approve necessary changes or modifications.

8. Provide guidelines for a LIS pilot study that includes: parcel identifier system, database design and linkages with other database/files. It should allow for a gradual system development and future expansion of the computerized system. If necessary some hardware and software may be selected and purchased in this stage.

9. Set up the pilot project in one regional office, training staff at the same time. The project should be tested and evaluated, with the results and training documents archived for later use. The pilot project can be refined and revised if necessary.

* **Evaluation**

10. Establish, test and improve on the specifications and build a final procedure of each component of the LIS: data collection, up-dating, data transfer, data distribution, and standardization for data exchange.

* **Feasibility Study for Individual Regional Office**

11. Feasibility study for each regional office should be carried out to determine the level of LIS sophistication.

12. System implementation in regional office(s) based on the above results.

One problem in existing government institutions is the lack of expertise for supervision work as well as in system development. Even where expertise is available, it is often found in private institutions. Therefore, specialist consultants for system development may have to be acquired from external sources on contractual basis. However the project Committee must define the expected requirements to ensure that the consultants' report is delivered on schedule. In this regard, supervision of the consultant's work may also be provided by external technical specialists who will be required to monitor, observe, recommend and make incremental tests on parts of the system in order to identify errors and omissions in the development. The consultants should possess the managerial and technical skills and must be capable of communicating effectively to government managers and users. They should fill the gaps in expertise in the Committee. This project would require expertise in the areas of cadastral surveying and mapping, including new technologies in photogrammetry, Doppler and Global Positioning Systems for accelerating and improving efficiency in data capture; Land Information Systems for the formulation, creation and application of land databases; computer hardware and software.

Financial sources for system development are not discussed in this project, nevertheless some major aid organizations have shown their interest in the area concerned.

7.5 CONCLUSION

In the proposed design and implementation of a cadastral database for Indonesia it is theoretically possible to proceed without major modifications in legislation and relatively minor changes to the existing government structure are required. But it has been discussed in chapter 5 and 6 that the overall land administration system can only achieve substantial progress and prove its benefits, if strong legislative action and a better centralization of land related activities in the government structure can be implemented.

A great deal depends on the roles of the Land Registry and IPEDA to cooperate in the cadastral system and LIS developments. A similar attempt in obtaining cooperation of several existing systems is being implemented in LANDATA Project in Victoria, where the underlying foundamental principle for that development is "that the ownership of information belongs to the Government as a whole and not to individual agencies" (Eddington, 1984). Although the separate activities within these two agencies may appear to be cumbersome in many ways, they may accelerate data collection through the two different jurisdictions and budgets.

In the proposed model, much of the work in developing and maintaining the cadastral database will occur at local governments. Therefore coordination of local government activities should be undertaken by central government by a central LIS Committee or similar body, that should be responsible for standardization of procedures, monitoring production and maintenance of base maps and cadastral maps, and creation and maintenance of the land parcel register.

CHAPTER 8

8. GENERAL PROBLEMS AND RECOMMENDATIONS

8.1 INTRODUCTION

It is evident that the basic problem in developing countries is how to collect massive data which are currently not available. Associated with this are the necessary processes needed to provide information to users in the shortest possible time, and by the simplest and cheapest possible methods. In theory, there are a number of established methods and principles that can be adopted by. However the great challenge is how to implement a LIS including the cadastral system, in an existing environment that has numerous practical problems affected by administrative, social and political concerns.

Implementation problems are complex, as noted by Bernstein (1983):

> **"There has been no systematic approach to the design of the land registration and property tax components. The full range of land information needs has not been routinely considered and the components themselves have not been fully responsive to the institutional capacities and land registration and property tax laws in each country (including Indonesia). The execution of the land registration and property tax components has been undermined by technical, legal, and administrative constraints, as well as varying degrees of governmental inertia or resistance. Some of the components were not implemented as planned. Other components were not consistently supervised."**

In this chapter, some general problems of the land data system in Indonesia are summarized. Because of the complexity of the problems, the combination of these problems in the following discussion cannot be avoided.

8.2 PROBLEMS

8.2.1 INEFFICIENCY OF DATA GATHERING

One of the major weakness in many countries is that the government is unable to delineate responsibilities and strictly enforce data flow within the three types of organizations functioning as (1) a customer of information, or (2) a repository of information, or (3) a generator of information. Therefore in general these agencies are functioning in all the roles inefficiently, resulting in extensive duplication of work, time delays, bad planning, poor results etc.

On one hand, data are collected from areas where there is a concentration of several physical developments by a number of departments i.e. duplication. Duplication of records and labour represents a significant waste of resources which could otherwise be used for collecting the enormous volume of data that are

urgently needed. It imposes additional burdens on the limited financial resources and therefore must be avoided especially by developing countries. Developed countries may have larger data repositories, perhaps even greater duplication which may on the other hand be justified by their stronger financial base.

On the other hand, in remote areas where there is hardly any development, land data are not easily available and if available are of generally poor quality. Indonesia likewise suffers from similar problems. These problems are compounded by the limited resources, both financial and human, and the growing pressure on land resources.

* Ownership Records

The Land Registry keeps only the registered land records, and the IPEDA keeps the taxpayer name records as well as ownership records. These records are used mainly by the individual agencies. Flow of information between the two agencies and to other agencies is very limited generally because of incompleteness or obsolescence. Even though the government has stated that the dualism of cadastral system must no longer exist, an attempt to eliminate it would never be successfully executed as long as the progress of a "systematic approach" to land registration is very limited, and the "voluntary approach" for the larger proportion of parcels is still permitted. The dualism of the system therefore always requires two cadastral systems for data collecting, data processing, data presentation as well as data storage and data updating. It cannot be denied that with the existing conditions, complete ownership records within one particular administrative unit will never be assured.

* Large Scale (including Cadastral) Mapping

In the areas of mapping, attempts to densify the control network are in progress, though very slowly. In contrast, the number of ground control points from many ad hoc mapping projects is increasing fairly rapidly particularly in Jawa, the most developed island. Unfortunately most of the control points and the maps from ad hoc projects which are mainly used by the individual departments are unconnected to the National Coordinate System. Their usefulness and accessibility are consequently limited. If these projects were well coordinated, the need to include more horizontal control points for cadastral mapping may be minimised.

Land use policies have not been applied effectively in most parts of the country simply because large scale maps are not available or are incomplete. Usually scattered large scale mapping projects are carried out when a new development project or a crash program is introduced. Moreover, even if the maps are available, they are not easily accessible nor transferable due to bureaucratic problems.

Administrative boundaries exist on the ground only as far as they are traditionally accepted and recognized by the local people. There are very limited maps that show the location of boundaries

between desas, kecamatans, kabupatens or even propinsis, to an accuracy sufficient for users to identify their locations on the ground. Small scale topographic maps are the only available maps that depict administrative boundaries. However only the propinsis and sometimes kabupatens boundaries which are usually natural features such as rivers, roads or catchmen areas, can be shown on such maps because the scale is too small. A reasonably scaled administrative boundary map is one of the basic needs of the government.

* **Cadastral Survey**

A sporadic cadastral survey by the Land Registry will not serve as an efficient maintenance tool on cadastral mapping, although the classical need for accurate survey have been over emphasised, so they are very costly and inefficient. Therefore piece-meal and uncoordinated survey work is of very little use.

An extensive data duplication in the Metropolitan City of Jakarta between the local Land Registry unit and City Planning (Tata Kota) in cadastral survey work has been recognized by many levels of government, but no attempt has been made to reduced such inefficiency. In fact a large fee is paid by land owners for that survey work.

* **Mapping Standard**

In Indonesia, mapping activities are being done by a few agencies, mainly for their individual purposes and to their own specifications. No agency dictates standards or whether the information could be used by other agencies. Other agencies could use the information if they deem the accuracy to be sufficient for their respective purposes. Moreover, several projects have failed to maintain a sufficient level of quality due to difficulties such as shortage of finance, time limitations and lack of professional supervision. Without uniform standards on maps, data exchange is very unlikely, if not impossible.

8.2.2 SOCIAL AND POLITICAL

Social problems in developing countries concern mainly those relating to the improvement of general welfare, such as reducing poverty, the pressure of landless peasants and squatters, problems of unemployment, lack of skilled man power, and improving the standard of living and standard of literacy. A LIS is not a direct tool to overcome these problems. It is only a resource for legal, administrative and economic decision-making. Mapping and land management have very low priorities in the government. Cadastral systems and LIS's serve only as aids for land development, land planning, public administration and private transaction in land. They are not a political issue and are therefore usually considered to be of secondary importance and hence accorded the lowest priority in the overall development plan. In many cases, the mapping project constitutes only a very small part of the whole development project.

In rural areas, it is not easy to replace the existing traditional systems. The benefits of voluntary registration have been recognized by a large number of people but the cost/benefit of the land registration process for the low income people is still questionable.

As discussed in chapter 2 and 3, the land tax system based on customary law has been well understood by most of the population for centuries. It is consequently very difficult to change a system on a population that is mostly illiterate. Voluntary or compulsory registration systems may still be debated. Politically the government is reluctant to enforce the compulsory registration system. Therefore without any action by the government, the land data system will remain as it has been for several decades. Sumartoyo (1986) stated in a discussion for the Development of Transmigration Programme in Indonesia that land ownership, and the use of land as social property are in the same stage of development as they were 50 years ago.

No cadastral system can be claimed to be perfect. Normally, if a land dispute occurs, it easily becomes a strong issue that degrades the titling system. Hence the improvement of most cadastral systems is aimed at avoiding or at least minimise the number of disputes. The change of legal structure of land registration in Indonesia has not been significant since 1960. According to Sumartoyo (1986), the implementation of UUPA in practice is slow and clumsy. Many discussions about land have emphasised more the law and productivity of land and not on relationships between land and people and other land related aspects. Some of the existing legislations have never been amended to reflect changes in the social and physical environment. One reason for this is that continued stable social condition is of primary importance to the government. Confusion caused by the Older Order (former executives government) before 1965 is a living memory that testifies to the disorders caused by improper land reform. Moreover, the procedures of land litigation and disputes require such a long administrative process often taking several years or even decades. The government policy that causes the above situation has been viewed by Sherer (1985) that:

> **"..... Indonesian culture stresses peaceful settlement of disputes by a process of mutual agreement. Thus it was unlikely that an agency would pursue harsh remedies that might lead to confrontation."**

As a political issue, implementation of a project to improve land administration is sometimes considered very sensitive. Foreign consultants have achieved very limited improvements in this regard. For example the Surabaya land registration aimed at introducing an extensive five years registration program for the whole city (as part of the Third Urban project) has failed to be implemented (Bernstein, 1983).

8.2.3 TECHNICAL

The introduction of new progressive technique is necessary to achieve for a breakthrough, though the approach may not always be technically better than the existing one in terms of accuracy. For example the application of small scale (1:50000) photographs for cadastral maps appears to be useful as an ownership inventory map for Land Registry and even for identification of land parcels in rural area for IPEDA (see also 6.3.2.4). However implementation of a new method even if it may be more comprehensive is very slow and not easily accepted. Presumably a general refusal or acceptance of any new method is very often based on political considerations. Bureaucrats, lawyers, land administrators and even surveyors often have vested interests in favour of the existing systems; moreover their political power is often great (Dunkerley, 1986).

Even though new technology for land management at present is still expensive, it will be cheaper and more appropriate for developing countries in the near future. However the rapid growth of technological innovation is generally faster than the rate of introduction of the new technology in developing countries. The issues of the use of high technology versus labour intensive conventional methods is always debated and often presents decision-makers with a dilemma.

Conventional recording systems based on paper media have not been able to facilitate easy access and transfer to the users outside individual agencies. Even within the agency itself, data transfer is time consuming. Computer technology promises better data access but it may be offset by other technical complications especially in the context of developing countries. Some technical problems still exist in interfacing different computers and different data bases.

As discussed in 5.3, the basic definition of a land unit and its identification system required for many land related activities generally vary between agencies. Each has developed its system over many years. It is difficult, if not impossible to change these systems to one unified system. One solution is to introduce another common system eg. parcel identifiers to complement existing systems. The identifier can form a linkage between data bases. In fact, the common basic land unit definition and parcel identification system are the key issues in the design of every LIS. For Indonesia the parcel identification system in each Land Registry and IPEDA is unique only within one desa. However they have completely different numbering systems. Street address systems have not been well established, especially in rural areas.

Modern survey equipment have improved significantly in the last two decades. Techniques evolving from new technology appear to be very promising and could be applied to support the establishment of survey integration (see 6.3.2.5). However some study still should be carried out in order to determine an appropriate technique(s) that can help to accomplish the overall objective at a reasonable quality and cost.

8.2.4 FINANCIAL

For developing countries, financial support for implementing land administrative systems is not forthcoming. This is understandable when considering other more urgent requirements. It is difficult to gain financial support from annual budgets for establishing or improving a system without any immediate tangible benefits. Unfortunately legal cadastre establishments which are charged with the expensive process of collecting, storing and maintaining information, have not been able to quantify the benefits. On the other hand, the fiscal cadastre does provide the local government with direct financial returns. Hence, the IPEDA system is still supported financially for improving its cadastral system. Notwithstanding the above situation, a few world aid organizations have provided significant financial assistance for improving the existing cadastral system. However the need for financial resources not only for LIS development but also for its long term maintenance on a regular basis that causes concern to the experts of world aid organizations.

Normally, an agency given a budget for a project only considers its individual purpose, unaware that the collected data may be important to other agencies. The allocation of budgets comes usually under the jurisdiction of other departments which are not concerned with different problems of the users. Budget coordination is lacking, so efficiency of survey work and duplication as described in 8.2.1 still remains within many agencies. In addition, financial support for teaching, promoting research relevant to the broad land administrative problem are lacking. To gain financial support for hardware purchases may even be simpler than for research on systems, due to fears of changing the overall government policy.

8.2.5 ADMINISTRATION AND COORDINATION OF SURVEY INSTITUTIONS

Of all problems, the main and perhaps the most difficult problem is the coordination on the whole administrative infrastructure. There is no government body that has statutory authority to coordinate the strategy of land administration and development in Indonesia, particularly with regards to the cadastre base. A coordination body for survey and mapping exists namely, BAKOSURTANAL, but its tasks are mainly to carry out small scale topographic mapping, setting up state-wide geodetic networks, managing natural resources inventory which includes remote sensing, national atlas production and establishment of a natural resource information system. Although BAKOSURTANAL has been formed for the last two decades, it has not been able to coordinate other survey institutions. Coordination is a very essential but difficult task for such a complicated land administrative structure. BAKOSURTANAL is supposedly the only one that can carry such a function. But without sufficient statutory support, BAKOSURTANAL would never be able to achieve a reasonable result in the sense of coordination.

Large scale cadastral mapping is required by government regulation for land registration purposes, but there is no clear statute as to who should be responsible for large scale base map production. Therefore as discussed in chapter 4, large scale

mapping can be undertaken by every agency if there is a necessity to do so. Coordination problems in mapping activities are not only confined to agencies in different departments but also within directorates in one department. Surveys are generally not connected to the National Coordinate System. This is a major and difficult problem that is unlikely to be overcome without government intervention. The National Planning Body (BAPPENAS) which controls the annual budget does not impose sufficient control over technical activities aiming to reduce duplication.

The Indonesian Surveyors Association (ISI), a professional body of surveyors which includes geographers and planners, and the Indonesian Geodetic Engineer Association (ISGI), have no power, and cannot act as a coordinator for the government. More surveyors are in private business than in the government office. Most of them benefit from the archaic administration situation and take advantage of the lack of strict specifications and supervision. Very few people realize that if the other professions such as lawyers, planners and geographers are presented with unsolved problems that ought to be solved by surveyors, these professional people may be enforced to find their own ways of solving the problems and the solutions are unlikely to satisfy the surveyors.

The structure of the Land Registry in regional offices is just adequate for a slow pace of land registration and conveyancing. The mapping element is relatively small and inadequate. It is unsuitable for an extension to a multipurpose system or to coordinate the LIS establishment. The two agencies (Land Registry and IPEDA) lack of professional staff to carry out such establishment. Recruitment and intensive training of a large number of skilled personnel, particularly medium-level personnel, for every regional office are necessary.

8.3 RECOMMENDATIONS

The need to develop a LIS for Indonesia has been identified. Enormous land related data are important for various purposes and are urgently required. Several recommendations for Land Registry and IPEDA, the Government, training, and others are presented in order to achieve a unified development and improvement in the land administration system in Indonesia. As for the complexity of the problems discussed in 8.2, they cannot be solved by independent individual institutions, rather, they must be solved by the overall government structure. One basic consideration in policies and approach to LIS is stated by Dunkerley (1986) that:

> **"Integrated is an appropriate word here: more co-ordination of interested parties is essential for the development of long-term strategies and shorter-term viable programmes which identify priority uses and minimum needs in term of technologies, staffing, training and financing."**

The Government in this discussion refers to the government executives including members of parliament.

8.3.1 FOR LAND REGISTRY AND IPEDA

a. The two central components (fiscal and legal) of the cadastral system are important. However, because of the different characteristics between rural and urban highly developed land as discussed in chapter 2 and 3, it is suggested that:

   i. IPEDA should concentrate on cadastral mapping in the rural areas if the registration office has no program for cadastral mapping.

   ii. Land Registry should initiate a clear, long term program for cadastral survey and mapping activities. Urban areas should have higher priority in the program.

b. In order to expedite the completion of the legal register, land registration must be made compulsory in every land dealing. This is more effective than the voluntary approach. Even so, a complete legal register will still take a very long time to achieve.

c. The existing survey records and survey procedures of various survey and mapping agencies should be examined and assessed for their reliability for multipurpose use before attempting to standardize survey records and procedures. This may necessitate some changes to the land registration and cadastral survey and mapping procedures.

d. Both agencies which have important roles in the data base creation should improve the technical standards of staff and employ more skilled staff who are able to supervise the work of in-house development and consultant activities.

e. All cadastral maps and other maps must be preferably connected to the National Geodetic Network, even though the extra effort is of no direct benefit to the particular individual project, but it should be done to ensure that the investment of time and cost is not wasted. (United Nations, 1983). Systematic densification of the National Control Network is suggested throughout the country. Modern surveying methods such as photogrammetry, satellite positioning system should be applied whenever possible.

8.3.2 FOR THE GOVERNMENT

a. The foundation for a successful development must be based on an integration of the survey system and some unified framework, such as uniform guidelines and standards for survey work. The integration of survey systems has to be legislated. A group of experts should be formed to propose the legislation and other necessary regulations. This may include standardization of a coordinate system, control point numbering system, accuracy, parcel definition and parcel numbering system. The formation of the group and the legislation should be enforced by cabinet similar to the strong influence in SLIC (State Land Information Council) in New South Wales.

b. It is undesirable to have the Land Registry and IPEDA operating under different authorities as in the present situation. The merger of these two agencies should be considered.

c. Coordination, integration and communication within different institutions, activities and functions are the most difficult tasks but are the most important aspects that should be considered by the government. Thus a land data system development in isolation should be avoided. An independent mapping coordination authority that can coordinate all mapping and land related activities is necessary.

d. The government should realize that LIS development requires some considerable funds not only for development stages, but also for the maintenance of the system, skilled personnel, modern high technology and equipment, and for ongoing development.

e. As reported by the Ad Hoc Group of Experts on Cadastral Surveying and Land Information System for the United Nations (1983):

> **"With time, the social and physical environment around every society evolves. So must the law. The existing land laws should be analysed, out dated concepts revised or removed and where appropriate, new legislation introduced."**

f. The formation of surveying and mapping standards should be encouraged, primarily in land administrative activities and secondarily in all other surveying and mapping activities.

8.3.3 FOR TRAINING AND EDUCATIONAL INSTITUTIONS

The impact of a LIS will be widespread, consequently the need for more competent staff is increased, as stated by McLaughlin and Wunderlich (1983) that:

> **"More attention is being given to the economic and managerial issues, and more attention is finally being given to developing personnel who are both technically and managerially competent. Much, much more needs to be done and this should rank high on any agenda."**

a. Extensive specialised training for survey and valuation technicians, specialised education on the cadastre and LIS should be implemented in tertiary institutions. Considerable emphasis must be given to developing personnel, both technically and in managerial skills. It should be realized that the complicated nature of land administration is certain to create a significant number new jobs.

b. Short training courses, workshop and seminars on modern cadastral systems should be undertaken for the existing staff in cooperative manner between Land Registry, IPEDA, other land related agencies, educational institutions, and surveying associations.

c. On one side, the bottleneck in the land registration process is likely to be in the cadastral survey, and the training of qualified surveyors for this work that takes several years. On the other side, a large volume of work will be available in land information management. Therefore it should be possible to recruit a number of private practitioner surveyors that may be similar to the deeds officials or notaries that have their individual private functions controlled by the Agrarian Office. For example, by employing surveyor as candidates for a few years in Agrarian Office before they are permitted to independently operate individual business.

8.3.4 FOR OTHERS

a. Accuracy specifications, which can be an integral part of survey legislation have to be introduced in order to allow different users to determine whether data from various agencies are suitable for their use. An acceptable method may be implemented to classify data into "accuracy categories".

b. Every survey project should not be regarded as a separate activity, but should be integrated with other activities for other users. Every major project should be part of an integral development plan for better budgeting. This is a very important role of BAPPENAS. BAPPENAS should cooperate with a "coordinating body" (proposed in point c in 8.3.2) for allocating budget and monitoring activities of overall survey and mapping. Coordinated planning is essential to ensure that all mapping activities financed in whole or in part by the government contribute to the nationwide topographic mapping program.

c. Duties and responsibilities of government agencies pertinent to land should be reviewed and set out as part of the general guidelines for systematic development leading to a more efficient function of the overall land administration.

d. Aerial photographs have already been widely used, but usage of the products (map or photomap, rectified or unrectified photographs) is not optimal. Duplication cannot be avoided. Data transfer methods have to be simplified. For example, once security clearance (issued by BAKOSURTANAL and Defence Department) is given to one government agency, all other government agencies should be able to use the same data.

e. Security procedures and circulation restraints on land data particularly graphical data should be re-examined.

f. The role of World Bank in the development should not be confined to providing financial support. More emphasis is essential in initiating, criticizing and proposing necessary steps to the government. For example, LIS specialists could be employed by the Bank to evaluate every stage of development and ensure that development is kept abreast with developing countries' problems.

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