Assessing the Potential of Land and Building Tax Database as a Basis for Developing Multipurpose Land Information Systems in Indonesia

SUBARYONO and Rochmad MURYAMTO, Indonesia

Key words: land and building tax, database, NOP, SISMIOP, SIGPBB.

SUMMARY

The Land and Building Tax Database in Indonesia has been developed by the Directorate of Land and Building Taxes, Ministry of Finance in two interrelated systems, i.e., SISMIOP (the Property Tax Information Management System) and SIG-PBB (Geographic Information Systems for Land and Building Taxes). SISMIOP was particularly designed to handle attribute data related to land and building taxes which now is managing around 84 million tax objects. On the other hand, SIG-PBB has been designed to manage spatial data of land and building tax objects.

This research was conducted to assess the potential of the database in these systems to develop a Multipurpose Land Information (MLIS) in Indonesia, particularly for urban areas. A database of MLIS was designed involving five other data sets from different institutions/companies such as telephone, electricity, national land agency, water supply, and urban planning. The research found that in principles those data sets can be integrated using NOP (Property Identification Number, the number used as identifier of tax objects, particularly land parcels and buildings). However, efforts need to be performed especially there were little consistency of data available in different databases created by different institutions.

Assessing the Potential of Land and Building Tax Database as a Basis for Developing Multipurpose Land Information Systems in Indonesia

SUBARYONO and Rochmad MURYAMTO, Indonesia

1. INTRODUCTION

The Directorate of Land and Building Taxes, Ministry of Finance (DoLBT), Republic of Indonesia has developed SISMIOP (the Property Tax Information Management System) and SIG-PBB (Geographic Information Systems for Land and Building Taxes). SISMIOP was particularly designed to handle attribute data related to land and building taxes which now is managing around 84 million tax objects. On the other hand, SIG-PBB has been designed to manage spatial data of land and building tax objects. The two systems have been integrated allowing for query about land parcels and their associated attributes. With their magnitude of the data managed in the systems, there should be efforts to enhance the use of the database not only for supporting the land and building tax management activities but also others that require data related to parcels.

Currently, spatial data required for determining tax objects (land parcels and the associated buildings) of almost all big cities in Indonesia are already managed in both SISMIOP and SIGPBB systems. On the other hand, institutions that provide public services such as building permits, infrastructure services (electrical power supply, clean water, telephone) have also developed their databases. The partial databases might be adequate to support each individual institution. However, this situation is inefficient since there are no communication among them while in fact there are common data that can be shared among these different databases. In this case, there is a need to relate the data available in each institutions so that they can provide more comprehensive information required to managed an urban area. Accordingly, research questions can be addressed include (1) How can SISMIOP and SIGPBB databases be used as the main databases to develop a more comprehensive database to form a multipurpose information system to support management of an urban area? (2) What are applications that can be developed using a database generated from SISMIOP, SIGPBB and other databases?, and (3) What are constraints that hinder the integration of the databases?

This research entitled Assessing the Potential of Land and Building Tax Database as a Basis for Developing Multipurpose Land Information Systems in Indonesia, but it focuses on developing for an urban area. This is because an urban area is usually more complicated than a rural area. Therefore if it successful, then it is highly probable that with modification the system can also be applied for rural areas. The study area chosen is Yogyakarta City, Indonesia.

2. LAND AND BUILDING TAX DATABASES

Type text The land and building tax database in Indonesia is centrally designed at the Directorate Land and Building Tax Directorate General of Taxes Ministry of Finance. However, the database is decent rally managed by KPPBB (Local Land and Building Tax Service Office). There are 141 KPPBBs in Indonesia in which each KPPBB has to manage land and building tax objects (property) of at least two Kabupaten (district). A property can be identified as the following (1) a land parcel without buildings, (2) one or more buildings without land (under some special legal arrangements), and (3) a combination of land and buildings. Attribute information related to these tax objects is managed in a database of SISMIOP (the Property Tax Information Management System) while the associated spatial data of the property are managed in a database of SIGPBB (Geographic Information Systems for Land and Building Taxes).

Each tax object is assigned uniquely with a NOP (property identification number). This number has an operational advantage since there will prevent duplication of land and building tax object identity in Indonesia. The NOP structure can be shown as Figure 1.

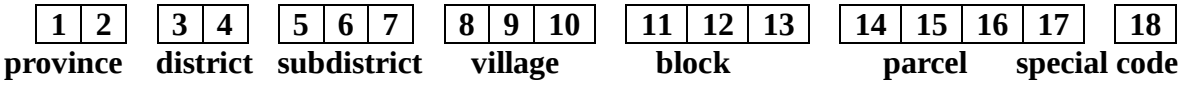

Figure 1: NOP Structure

The first to 10th digits indicate codes of the administrative areas (Province, Kabupaten/District, Kecamatan/sub-district, and Kelurahan/Village/sub-sub district). A block is usually defined by physical boundaries such as streets, canals or other relatively permanent or stable geographic objects. Both the boundaries and the block identifier is important to distinguished a block in a Kelurahan and to maintain and preserve the property identification within a block. The block code is the 11th to 13th digits, a while parcel is the 14th to 17th. The 18th is allocated for a special case such as common property or own by an individual. Spatial data of property tax objects are organized in Block Maps. A block commonly contains approximately 200 or more properties.

In this case, NOP is used as the common identifier to relate the SISMIOP and SIGPBB databases. Figure 2 shows an example of relationship between spatial data managed in SIGPBB and their associated attribute data managed in SISMIOP database using NOP as the common identifier. This NOP has become an essential identity since it has potential to be used as the common identifier to relate data available in different institutions as far as the data related to the property tax.

3. DEVELOPMENT OF A PROTOTYPE OF AN URBAN LAND INFORMATION SYSTEM

The development of a prototype of multipurpose urban land information system has been started by examining the characteristics of SISMIOP and SIGPBB databases, as well as the

relevant data related to urban activities. This study identified five institutions that use data related to land parcel, they are BPN (National land Agency), PDAM (clean water services), IMB (local government, building permit), TELKOM (telephone services), and PLN (electrical services). Once the characteristics are identified, it can be determined the entities, attributes, and the entity relationships.

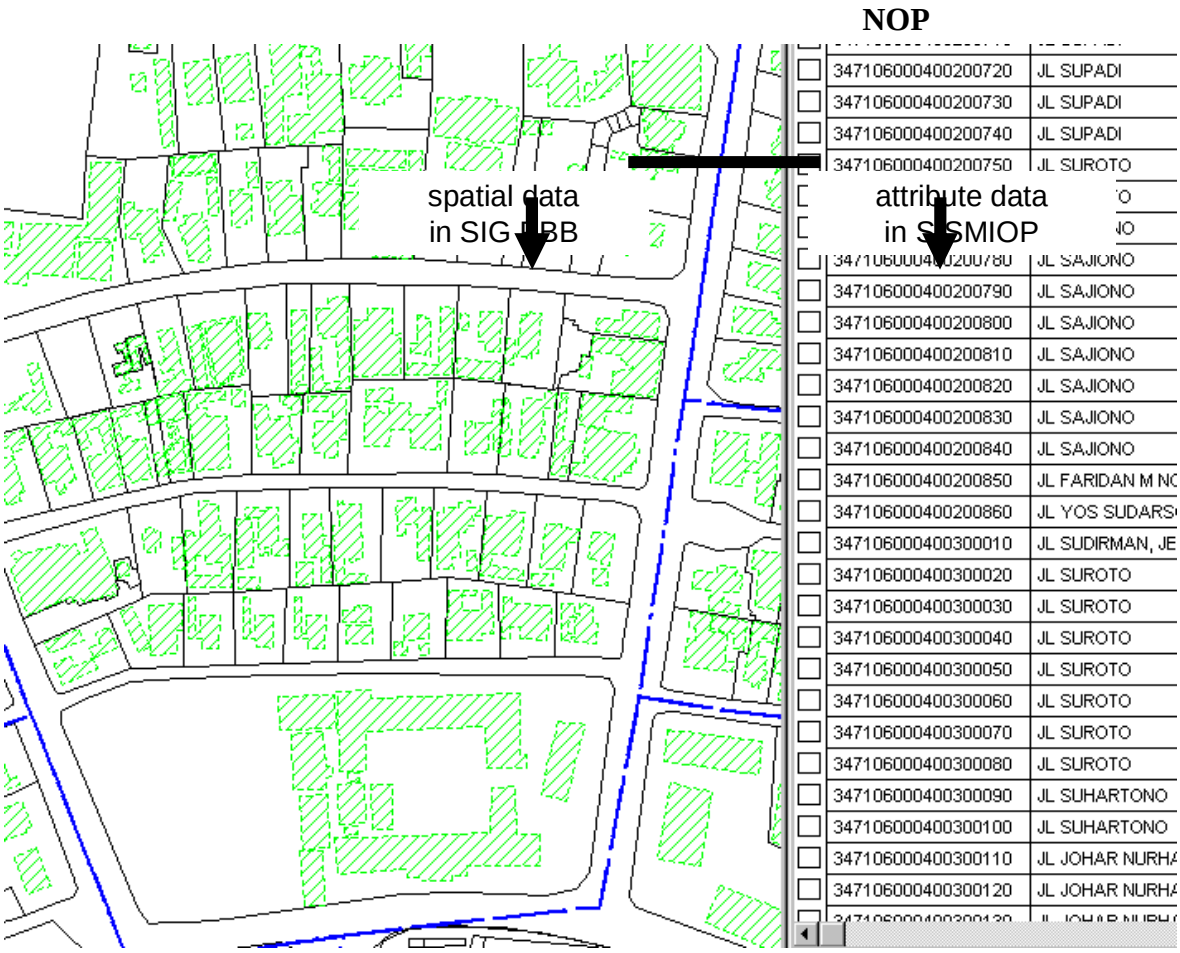

Figure 2: Relationships between Spatial Data in SIGPBB and its associated attribute data in SISMIOP

An entity represents an object, occurrence, or concept of the real world which its existence is stored in a database. An attribute explains or provides facts of an entity. A relationships among entities involves two components. The first is the degree of relationship, i.e., 1: 1 (one-to-one), 1:m (one-to-many), and m:m (many-to-many). The second is the participation which can obligatory or non-obligatory. In this model, the degree of relationship, and the type of participation are defined using an enterprise rule. The modelling was conducted using top-down approach and the model can be presented in a E_R (Entity-Relationships) diagram (Figure 3).

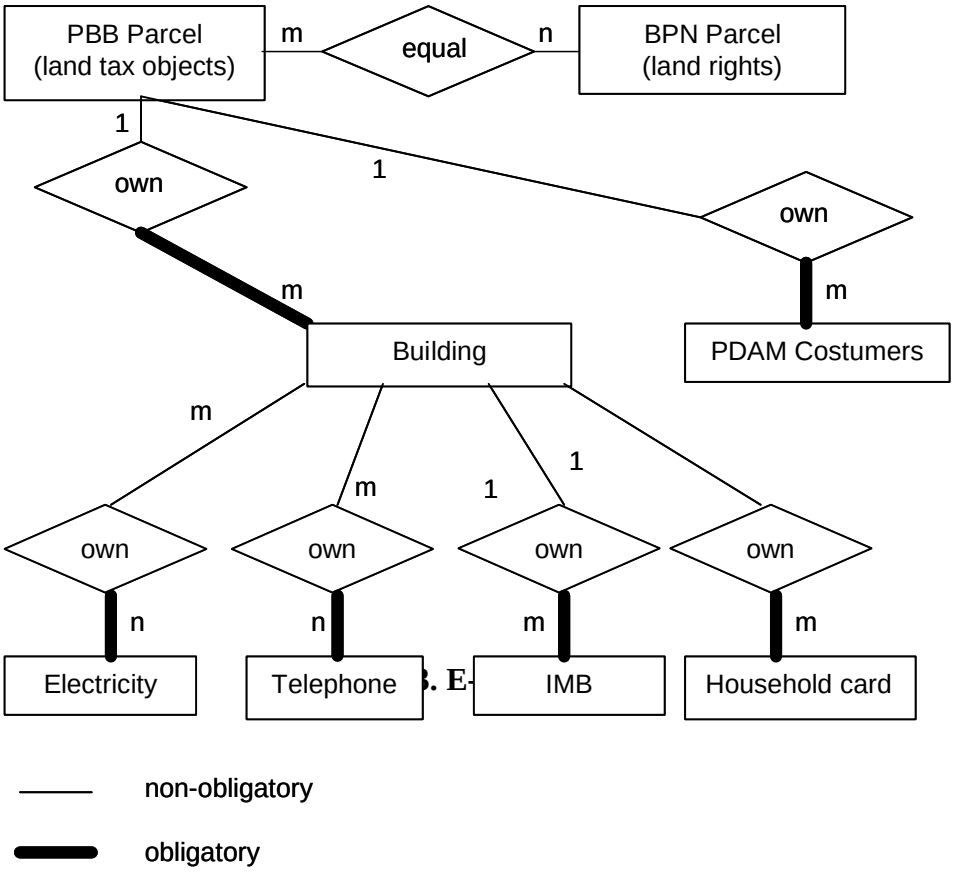

Figure 3: E-R Diagram

Attributes of each entity can be identified and arranged so that it facilitates the selection of attributes to be the candidate of the primary keys. Table 1 presents the entities, the candidate of primary key, and other attributes.

Table 1: The entities, the candidate of primary key, and other attributes

No	Entity	Primary Key	Other attributes
1	PBB land parcel	NOP	name of tax payer, street-no, block, area, ZNT code, etc.
2	Building	Building_id	building coverage, construction types, no of floors, etc.
3	BPN land parcel	NIB_id	owner, types of land rights, area, dates, etc.
4	Water customer	Watercustm_no	name of customer, types of use, region, etc.
5	Electric customer	Elcust_no	name of customer, power, types of use, region, etc.
6	Phone customer	Phone_no	name of customer, address, etc

No	Entity	Primary Key	Other attributes
7	IMB (Building permit)	Buildperm_no	name of owner, dates, location, construction types, etc.
8	Household card	HHcard_no	number of family members, address, etc.

By identifying the entities and their attributes then tables which form a database can be developed. Entity tables are developed so that they became fully normalized tables which are free from redundancy.

4. RESULTS AND DISCUSSION

Various data sets previously were used only for a specific task can be integrated so that their relationships can be more easily understood. Advantages, disadvantages, as well as the opportunities of the use of these databases are as follow:

4.1 Advantages of SISMIOP AND SIGPBB Databases

SISMIOP and SIGPBB are already designed as parcel-based information systems. This has provided great advantages in supporting urban land management. This is because various data required in urban management are related to parcels. In this respect, spatial data managed in SIGPBB are able to visually identify locations and parcel boundaries of tax objects together with other physical features (street, sewerage, telephone lines, etc., while attribute data in SISMIOP can be used as the main database to relate to other databases so that queries can be performed more comprehensively.

In SISMIOP and SIGPBB, each land parcel is encoded uniquely as NOP (property identification number) and can be understood easily, because it indicates its location within certain administrative boundaries. This not only avoid duplication of object codes, but most importantly it facilitates the relations among various databases.

Technically, both SISMIOP and SIGPBB databases already managed in a data model and software compatible with DBMS and GIS software available in a market place. In has facilitated the integration among data set available in different institutions.

4.2 Disadvantages of SISMIOP AND SIGPBB Databases

Disadvantages can be grouped into two main categories: internal and external weaknesses. Internal weaknesses include (1) the geometric accuracy of spatial data managed in SIGPBB has not been consistent, and (2) spatial data available in SIGPBB and its associated attribute managed in SISMIOP have not yet consistently related. The external weaknesses include (1) spatial data available in various databases are not in good geometric accuracy, (2) various data set available were not encoded to ensure the easiness to be integrated or related, and (3) there have not been a formal procedure of data exchange among the institutions.

4.3 Opportunities

Considering that almost all objects in urban environment are related to land parcels, those data sets can be related using land parcels as the primary keys. The study shows that the availability of data in both SISMIOP and SIGPBB and its unique parcel number (NOP) is very effective to be used as the primary key to relate various data sets which refers to land parcels.

5. CONCLUSIONS

A prototype of multipurpose land information system has been successfully developed by taking advantage of the availability SISMIOP and SIGPBB databases. Various sets of data can be integrated to facilitate query of information and to gain a more comprehensive information about conditions in urban area through a parcel based information. The land and building tax databases maintained in SISMIOP and SIGPBB has a great potential to be used as a basis to develop a multipurpose urban land information system in Indonesia. This prototype can be extended not only for urban purposes but also for rural areas since both SISMIOP and SIGPBB have been developed in all administrative areas within Republic of Indonesia. In this case, the NOP structure originally designed for land and building tax purposes has facilitated the integration of various data sets related to land parcels.

However, the study found that there were two main obstacles that need to be removed if the potential is to be realized and operational. The first is directly related to institutional arrangement where procedures of data exchange among institutions are not yet available. The second is mostly technical matters. This includes the differences in spatial data referencing systems and map scales used in different institutions, data inconsistencies in terms of encoding and documentation.

ACKNOWLEDGEMENT

The authors wish to thank the Director of the Directorate Land and Building Tax, Directorate General of Taxes Ministry of Finance, Republic of Indonesia for giving access to the Land and Building Tax database maintained in SISMIOP and SIGPBB. Our special thanks also goes to institutions in Yogyakarta City that provide data needed in this study. Last but not least, to our colleagues at the Department of Geodetic Engineering Gadjah Mada University, Indonesia who support this study with their critics and insights.

REFERENCES

Anonymous (1996). *Manual on GIS for Planners and Decision Makers*. New York: United Nations.

Aronoff, S (1989). *Geographic Information Systems: A Management Perspect4e*. Ottawa: WDL Publications.

Barlowe, Raleigh (1986). *Land Resources Economics: The Economics of Real Estate*. Englewood Cliffs: Prentice Hall.

Burrough, P.A. (1987). *Principles of Geographical Information Systems for Land Resources Assessment*. New York: Oxford University Press.

Dale, Peter F, and McLaughlin, John D. (1988). *Land Information Management: An introduction with special reference to cadastral problem in the Third World Countries*. Oxford: Clarendon Press.

Davis, Bruce E. (2001) *GIS : A Visual Approach***,** New York : Onword Press.

Eckert, Joseph K. (gen. eds) (1990). *Property Appraisal and Assessment Administration*. Chicago: International Association of Assessing Officers.

Huxhold, W.E. (1991). *An Introduction to Urban Geographic Information Systems*. New York: Oxford University Press.

Laurini R. (2001*). Information Systems for Urban Planning: A Hypermedia Cooperative Approach*. London and New York: Taylor and Francis.

Maguire, D.J., Goodchild, M.F., Rhind, D.W. (eds.) (1991). *Geographical Information Systems: Principles and Applications*. New York: Longman Scientific and Technical.

Subaryono (2000). Development of GIS Database for Urban Environmental Management: A Case Study in Yogyakarta, Indonesia. *Jurnal Manusia dan Lingkungan*, Vol. II, No. 1, April 2000. ISSN 0854-5510.

BIOGRAPHICAL NOTES

Subaryono is Lecturer at the Department of Geodetic Engineering, Faculty of Engineering, Gadjah Mada University, Yogyakarta, Indonesia. He received his undergraduate degree Department of Geodetic Engineering, Faculty of Engineering, Gadjah Mada University, Yogyakarta, Indonesia. His MA and PhD were received from the Department of Geography, Faculty of Environmental Studies, University of Waterloo, Canada in 1990 and 1996, respectively. His research interests are in GIS/LIS development, land and environmental management.

Rochmad Muryamto is Lecturer at the Department of Geodetic Engineering, Faculty of Engineering, Gadjah Mada University, Yogyakarta, Indonesia. He received his undergraduate degree Department of Geodetic Engineering, Faculty of Engineering, Gadjah Mada University, Yogyakarta, Indonesia. His M.Eng.Sc was received from School of Geomatic Engineering, The University Of New South Wales, Sydney, Australia in 1997. His research interests are in GIS/LIS, database systems.

CONTACTS

Subaryono
Department of Geodetic Engineering, Faculty of Engineering
Gadjah Mada University
INDONESIA
Tel. + 62 274 520226
Fax + 62 274 520226
Email: sssubar@yahoo.com

Rochmad Muryamto
Department of Geodetic Engineering, Faculty of Engineering
Gadjah Mada University
INDONESIA
Tel. + 62 274 520226
Fax + 62 274 520226
Email: geodugm@idola.net.id