

# MULTIPURPOSE CADASTRE: EFFECTIVENESS AND UPGRADING OF GIS LAYER MANAGEMENT SYSTEM (GLMS)

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## Abstract

DSMM is responsible in providing land related records through the Cadastral Database Management System (CDMS). The system will extract or retrieve cadastral information from the Digital Cadastral Data Base (DCDB) which is the main product of DSMM. In order to comply with the increasing demands from government agencies, private firms and publics, therefore DSMM has took proactive measures in improving the system by introducing GIS Layers Management System (GLMS). With the introduction of GLMS, various layers in GIS ready environment can be provided to the private entities and public usage. GLMS will facilitate the government's vision towards the establishment of modern cadastre in Malaysia. GIS Layer Management System (GLMS) has been introduced under the "SPDK Upgrade" project since 2002 by Department of Survey and Mapping Malaysia. GLMS facilitates the creating, capturing and maintaining of spatial data using layers approach. GLMS will become an important system for land development management because of its functionalities and increasing of demands of land-related datasets. Main objective of this research is to study the effectiveness of the GLMS. New layers (GLMS 2) such as building, gazette area, Malay reserved, railway, hydrographic and election region have been created. Analyses shown that GLMS 2 is an effective mechanism towards the development and realization of multipurpose cadastral and e-Cadastre in Malaysia.

Keywords: e-Cadastre, DCDB, GLMS, Multipurpose Cadastre

## 1.0 INTRODUCTION

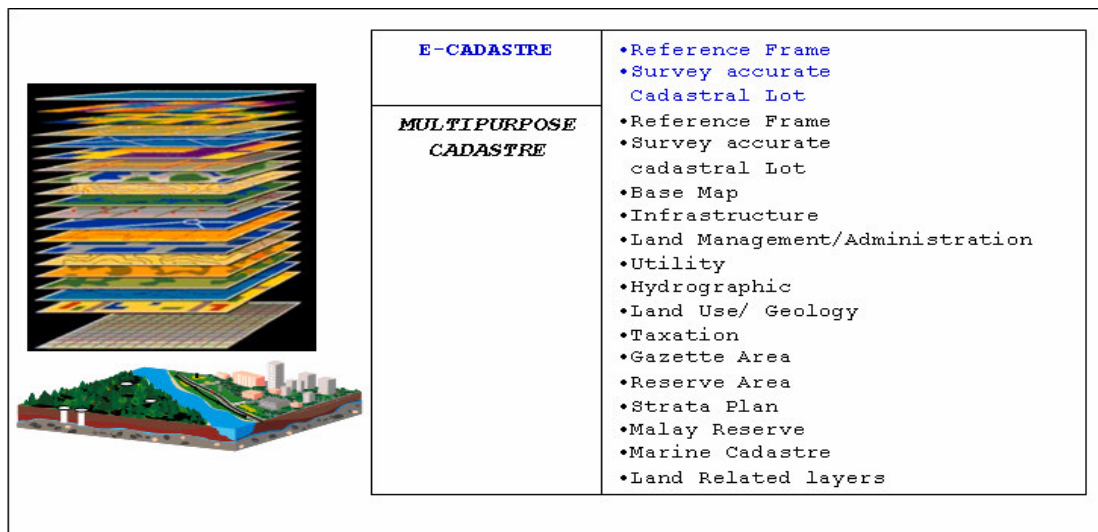
In Malaysia, cadastral survey is a responsibility of the federal government but land is exclusively a state matter. Therefore, the Department of Survey and Mapping Malaysia (DSMM) is a federal department that been given responsibility for carrying out cadastral survey Malaysian's state. DSMM is responsible in providing geospatial data through the Cadastral Database Management System (CDMS). The system will extract or retrieve data from the Digital Cadastral Data Base (DCDB) which is the main product of DSMM.

DCDB consists of lot, boundary and station layers which does not comply to the public demand as well as to the private entities. Therefore DSMM has to take proactive measures in improving the system. With the introduction of GIS Layer Management System (GLMS), various layers in GIS ready environment can be provided to the private entities and public usage. GLMS will facilitate the government's aim towards the establishment of a multipurpose cadastral system. In order to realize the concepts of multipurpose cadastral in Malaysia, improvement of existing GLMS has to be conducted in the next ten years. This study is intends to evaluate the effectiveness of the current GLMS in providing information to the various applications and purposes and recommend the GLMS upgrading exercise for creating Multi Purpose Cadastre in Malaysia.

## 2.0 MULTIPURPOSE CADASTRE

The increasing of difficulty level in planning, development and management of land has introduced the needs for complex geospatial that cannot be handled by conventional procedure. Parallel to the rapid development in this country and the current trends in management of accurate land related records then few optimum management and implementation concepts have been introduced for instances e-cadastre and multipurpose cadastre. The concepts of e-cadastre involved the use of information technology and survey accurate cadastral record for title generation and can be integrated with other land-related information.

E-cadastre is the Basic component towards the development of multipurpose-cadastre. Multipurpose-cadastre involves the integration of land related records with taxation/fiscal, utility, land registration, natural resource record, and other cultural record as shown in Figure 2.0.



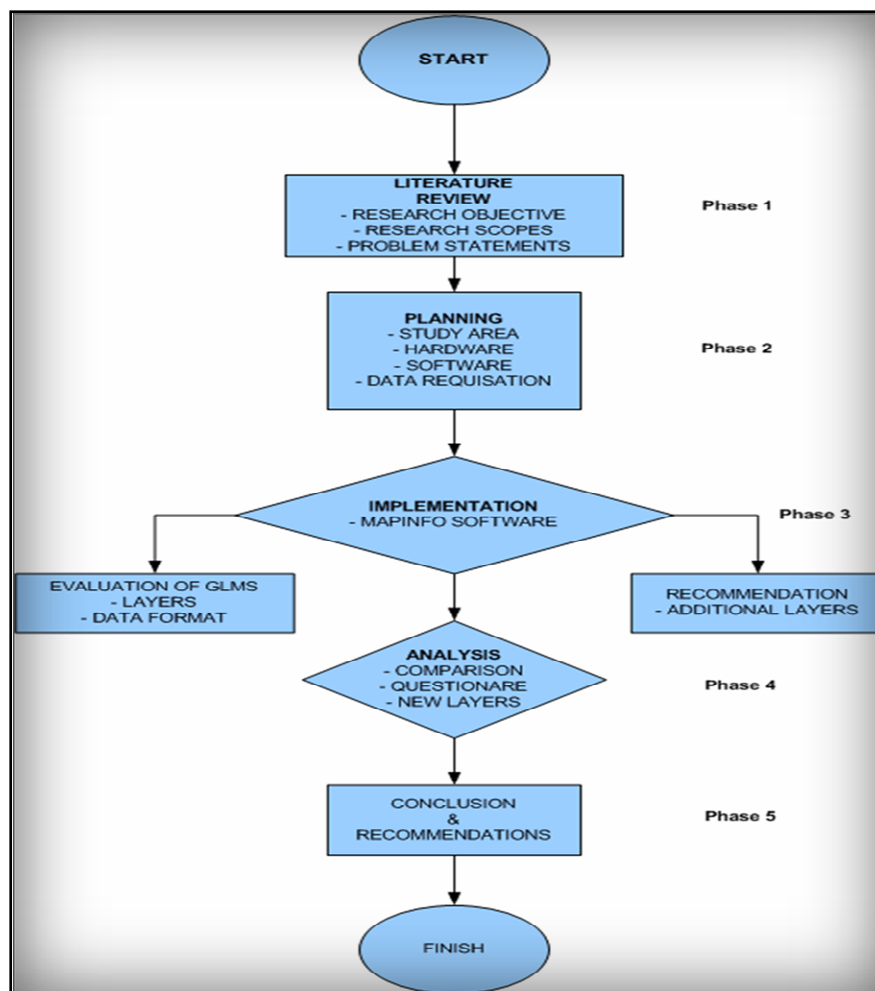
**Figure 2.0:** Multipurpose Cadastre Data Themes

## 2.1 GIS Layer Management System (GLMS)

GIS layer management system (GLMS) has been introduced under the *SPDK upgrade* project since 2002. In GLMS module information like cadastral first class and second class surveys, are stored in CDMS using spatial data layers method. This information can be used to determine boundaries, town/village names and road name. GIS-based GLMS is an important tool for planning, natural resources, efficient land management, government administration and executive decision making processes.

## 3.0 IMPLEMENTATION OF RESEARCH APPROACH

The research methodology is basically a series of research activities in order to complete the research. Figure 2 shows the research flow in graphic representation.



**Figure 4.0:** Research Methodology

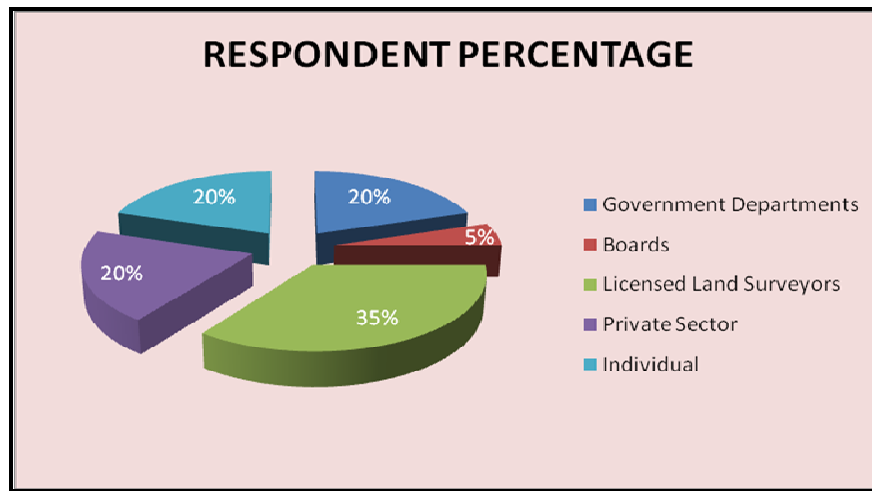
#### 4.0 ANALYSES OF STUDY

The effectiveness of the existing GLMS and the upgrading process of GLMS (GLMS 2) have been evaluated and developed. Analysis will be based on few aspects such as:

- i. Questionnaires to government agencies, privates and public users.
- ii. Recommended of upgrading existing GLMS to GLMS 2.

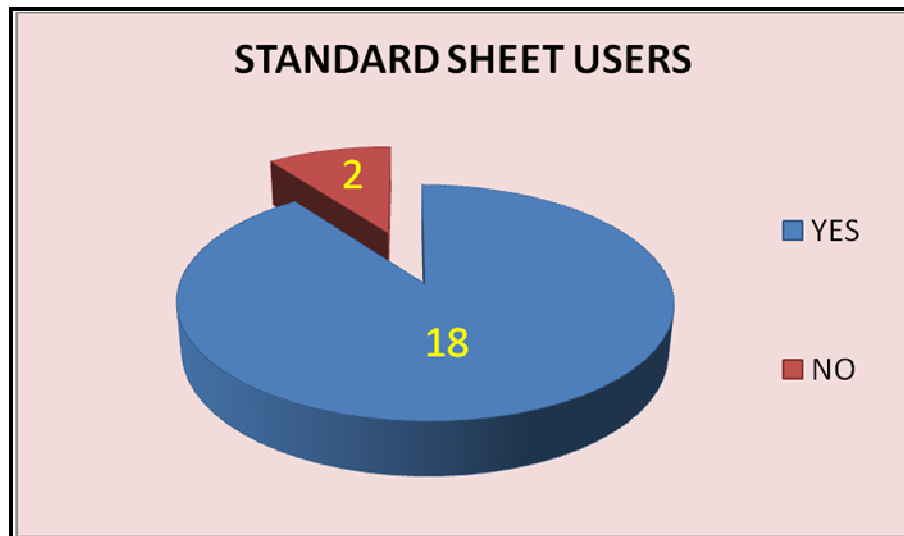
#### 4.1 GLMS Questionnaire Statistic

Questionnaires have been conducted to 20 samples which comprises of government agencies, land office, local authority (DBKL), licensed land surveyor firms and public users. Feedbacks from above mentioned agencies and firms are tabulated in Table 4.2 .



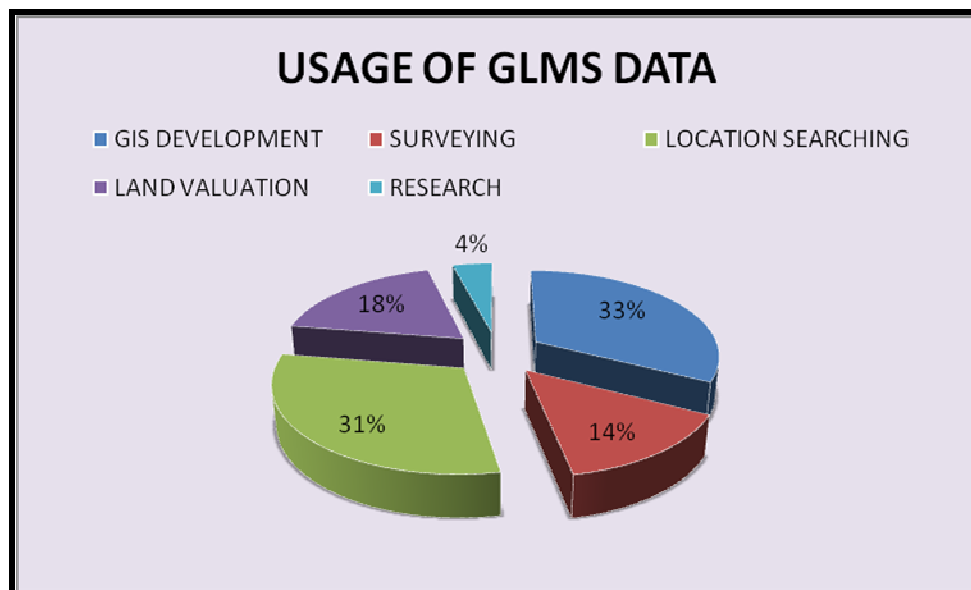
**Figure 4.1** Respondent Percentage

Based from Table 4.2, it shows that 20 respondent feedback questionnaires from Government department, Boards, Licensed Land surveyors, Private sector and Personals in charts format. Contents of Questionnaire cover few aspects of existing development of GLMS, the use of digital data, usage and recommendation of new layers in GLMS upgrading process.



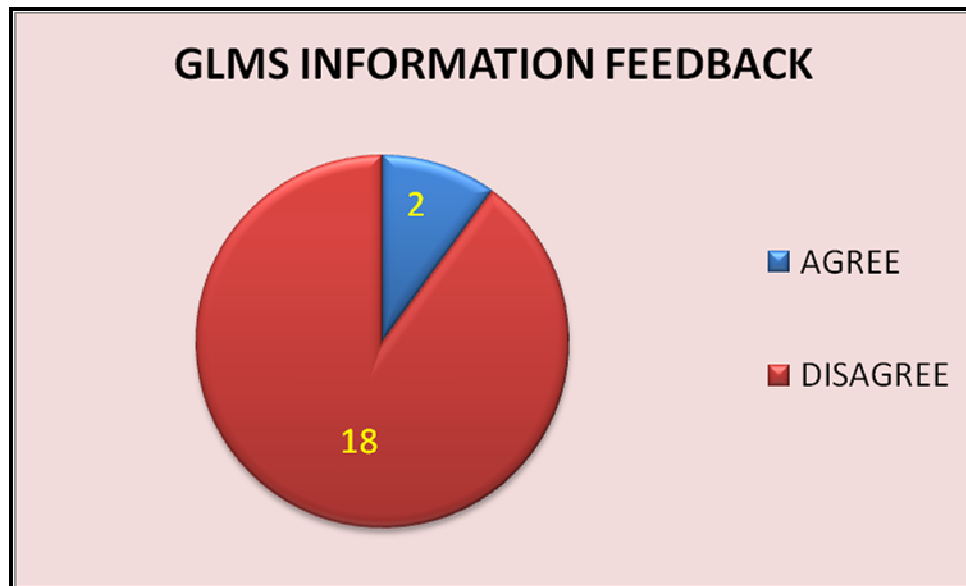
**Figure 4.2:** Standard sheet users

Based from the information on Figure 4.2, 18 respondent use to acquire standard sheet issued by JUPEM and 2 respondent never use standard sheet in their applications.



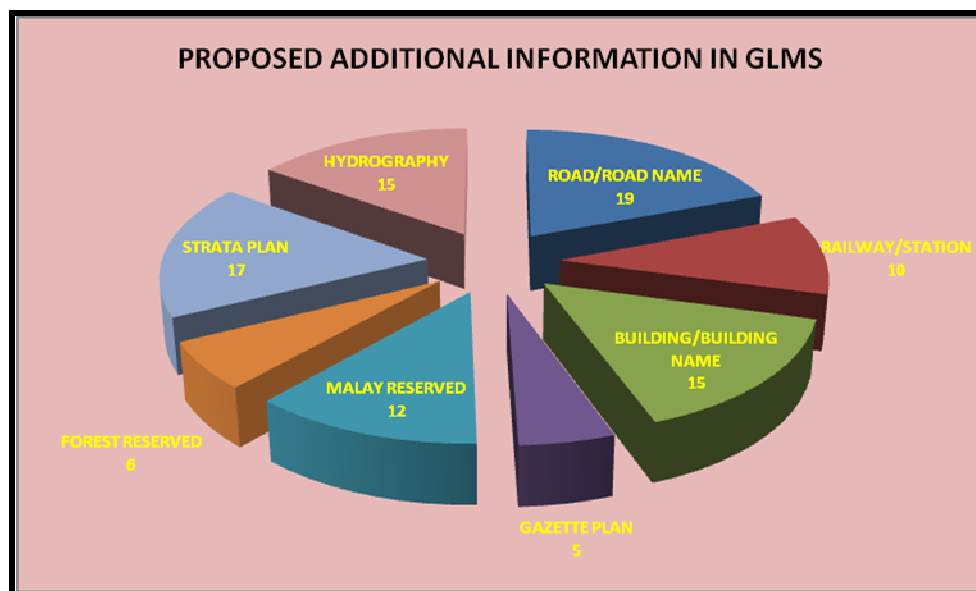
**Figure 4.3:** Usage of GLMS Data/Standard Sheet

Based on the information visualized Figure 4.3, it shows that GIS application is the main driven factor for upgrading the existing standard sheet followed by location finding purpose. Land Valuation discipline also used standard sheet for land appraisal purpose. Surveying firms use standard sheet to identify the location of the particular land parcel and standard sheet also been used for academic research purposes.



**Figure 4.4:** Respondent feedback

According to the respondents, layers information in GLMS did not 100% satisfied the users requirements. Almost 90% ( Figure 4.4) users need more information attached with the layers.



**Figure 4.5:** Additional information from respondent

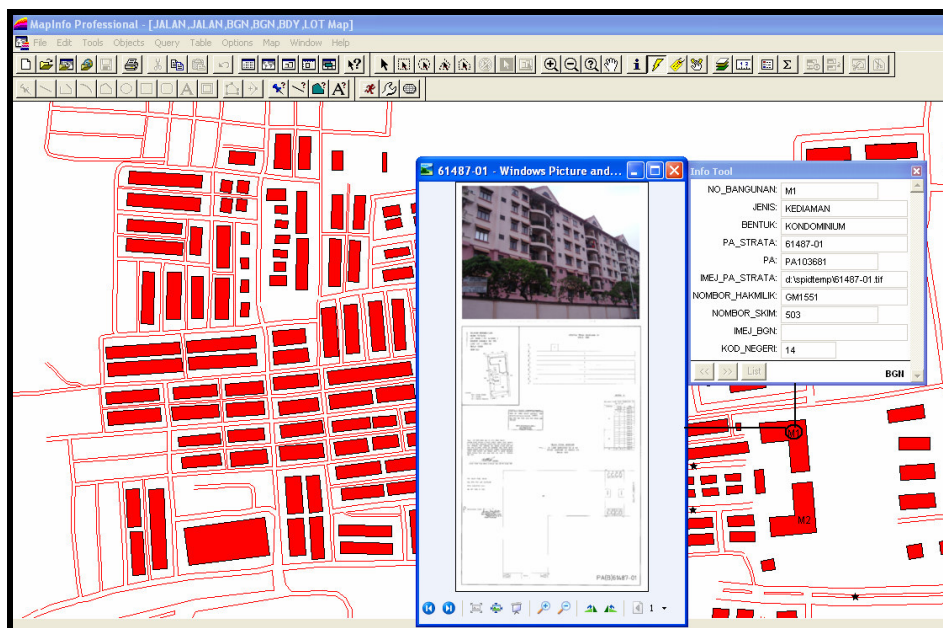
According to respondents, 8 primary new layers has been suggested in order to improve existing GLMS. New suggestions are road layers and certified plan (building) PA(B), which get 17 respond out of 20 respondent. JUPEM WPKL/PUTRAJAYA is one of the state's JUPEM to produce more PA(B) than other state. Table 4.6 shows 8 new additional layers recommended by the respondents.

## 4.2 Analysis of New Layers (GLMS)

Newly upgraded layers and updated data created a new system that easy to browse and read by users. It is because attribute data in layers can be browsed in table format. Users can view information in Table and also can view plans at same time. It makes easier to users, to view spatial data and attribute data at same time. New road layers, building layers, election boundary layers and including other layers are added in GLMS database (Figure 4.5) .

### 4.2.1 Building Layer

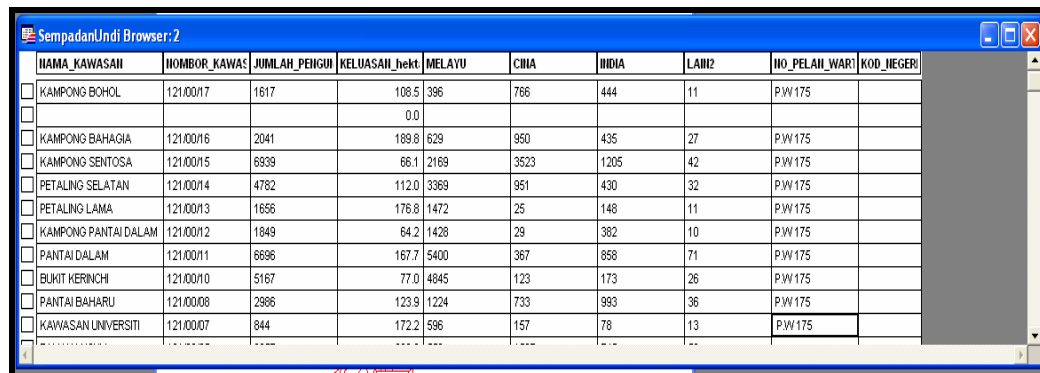
The following figure are the examples of spatial data and attribute for building layer through GLMS 2 Upgrade using MapInfo professional software ( Figure 4.6).



**Figure 4.6:** Building Layer with attribute data and image display

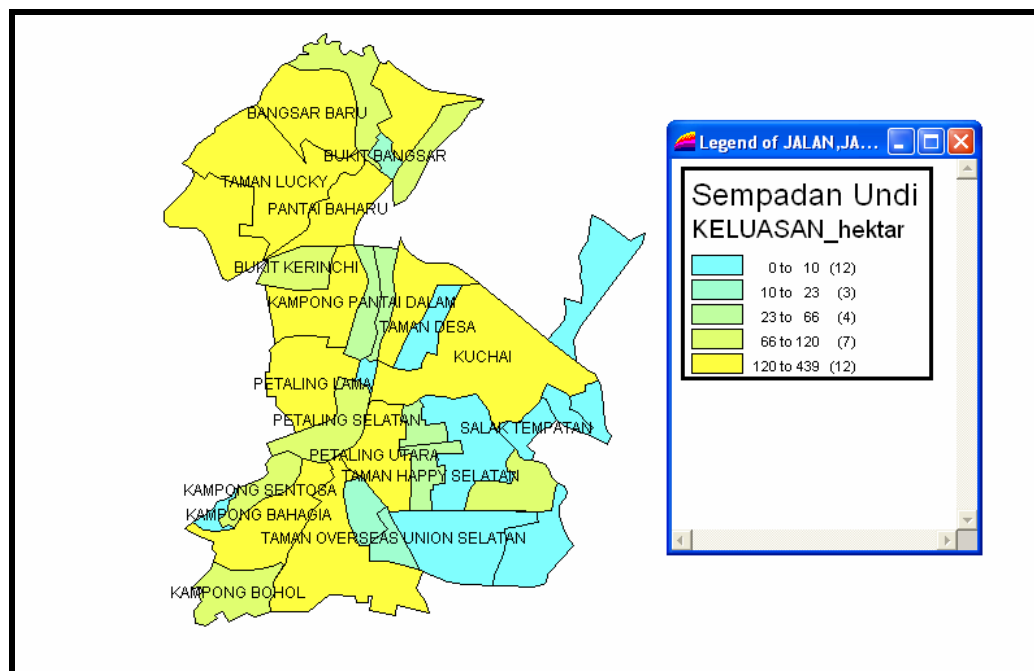
#### 4.2.2 Election Boundary Layer

Due to the high demand in additional layer purposely for political application, GLMS 2 will provided election boundary layer as shown in the following figures below ( Figure 4.17 and Figure 4.18).



IKAMA_KAWASAN	NOMBOR_KAWAS	JUMLAH_PENGUN	KELUASAN_hekt	MELAYU	CINA	INDIA	LANI2	NO_PELAN_WAR!	KOD_NEGERI
<input type="checkbox"/> KAMPONG BOHOL	121/00/17	1617	108.5	396	766	444	11	PW175	
<input type="checkbox"/>			0.0						
<input type="checkbox"/> KAMPONG BAHAGIA	121/00/16	2041	189.8	629	950	435	27	PW175	
<input type="checkbox"/> KAMPONG SENTOSA	121/00/15	6939	66.1	2169	3523	1205	42	PW175	
<input type="checkbox"/> PETALING SELATAN	121/00/14	4782	112.0	3369	951	430	32	PW175	
<input type="checkbox"/> PETALING LAMA	121/00/13	1656	176.8	1472	25	148	11	PW175	
<input type="checkbox"/> KAMPONG PANTAI DALAM	121/00/12	1849	64.2	1428	29	382	10	PW175	
<input type="checkbox"/> PANTAI DALAM	121/00/11	6696	167.7	5400	367	858	71	PW175	
<input type="checkbox"/> BUKIT KERINCHI	121/00/10	5167	77.0	4845	123	173	26	PW175	
<input type="checkbox"/> PANTAI BAHARU	121/00/08	2986	123.9	1224	733	993	36	PW175	
<input type="checkbox"/> KAWASAN UNIVERSITI	121/00/07	844	172.2	596	157	78	13	PW175	

**Figure 4.17:** Attribute data for election boundary layer



**Figure 4.18:** Display of name and areas election location



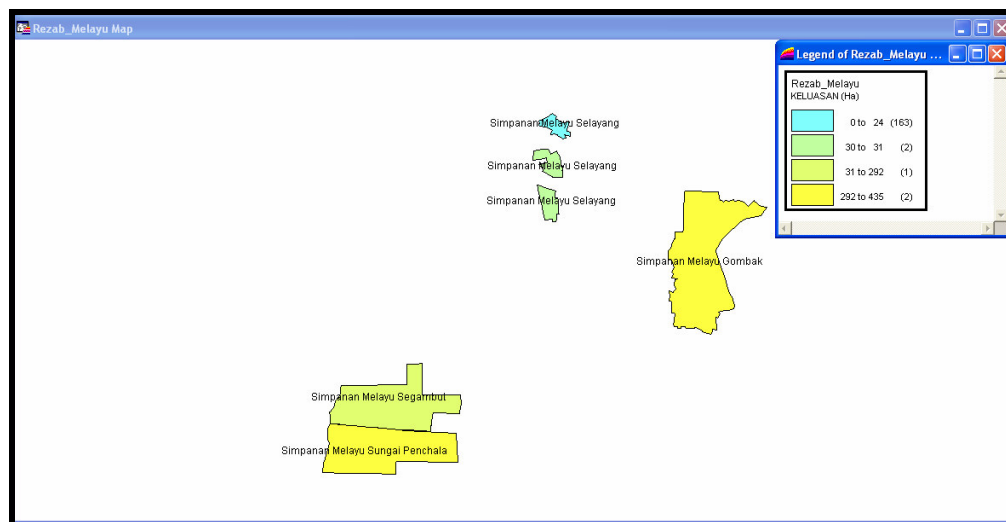
### 4.2.3 Malay Reserved Layer

A lot of development have been conducted on malay reserved parcel. As a result, a systematic management of this entity should be implemented (Figure 4.19 – 4.20).



IIAMA	KELUASAN	Ilo_PELAI_WARTA	PART_REVOKED	KOD_NIEGERI
<input type="checkbox"/> Simpanan Melayu Sungai Penchala	301.100	P.W 313	GN 1061-27, GN 6387-24	14
<input type="checkbox"/> Simpanan Melayu Segambut	291.600	P.W 265		14

**Figure 4.19:** Attribute data for malay reserved layer



**Figure 4.20:** Display of name and areas of malay reserved

### 4.2.4 Pejabat Tanah dan Galian (PTG) Gazette Layer

Gazette areas are bound by government laws. Gazette are cannot be demolished or developed without permissions from the government therefore gazette area should be maintained and managed consistently. GLMS 2 provide the gazette layer for that purpose (Figure 4.21 – 4.22).

Warta_dari_PTG Browser							
NO_PW	TUJUAN_WARTA	NO_WARTA	TARIKH_WART	KELUASAH	FAIL_UKUR	RUJ_FAIL_PEMOHON	NO_PELAN
<input type="checkbox"/> 14	00	07	000	6,386.000			27354
<input type="checkbox"/> 14	00	06	000	14,450.000			29273
<input type="checkbox"/> P.W.34	KWS LARANGAN_PEJABAT CAWANGAN ANTI DADAI		30/11/19	13,593.000	PUMP 39/90	PTG WMP2-24169-88	PA104054
<input type="checkbox"/> P.W.57	KWS LARANGAN_LEMBAGA PEPERIKSAAN JALAN DI			27,810.000			PA21700
<input type="checkbox"/> P.W.57	KWS LARANGAN_LEMBAGA PEPERIKSAAN JALAN DI			21,776.132			PA21700
<input type="checkbox"/> P.W.37	KWS LARANGAN_JABATAN ARKIB NEGARA JLN DUT		16/04/19	16,585.000	PUMP 13/76	PT PTG WP 9-157-74	PA100739
<input type="checkbox"/> P.W.37	KWS LARANGAN_JABATAN ARKIB NEGARA JALAN I		16/04/19	15,696.000	PUMP 13/76	PT PTG WP 9-157-74	PA100739
<input type="checkbox"/> P.W.43	KWS LARANGAN_KAWASAN KEMENTERIAN PERTAH.		28/06/19	2,905.000	JU WMP 09-28		PA100550
<input type="checkbox"/> P.W.46	KWS LARANGAN_JABATAN PERDANA MENTERI		09/03/19	113,300.000	PUMP 1/1993	PTG WMP 2/29214/91	PA111466
<input type="checkbox"/> P.W.46	KWS LARANGAN_SERI PERDANA KL		08/02/19	18,615.538	SEL SVY 195-50	D.O.K.L 618-48	PA20349
<input type="checkbox"/> P.W.65	KWS LARANGAN_JBU PEJABAT KONTIGEN POLIS		06/11/19	87,430.000	PUMP 44/85	PTG WMP2-1582-74	PA102062
<input type="checkbox"/> P.W.114	KWS LARANGAN_PUSAT REMOTE SENSING		14/05/19	272,815.000	PUMP 110/87	PTG WMP-2-21852-84	PA103249
<input type="checkbox"/> P.W.100	KWS LARANGAN_BILIK KAWALAN PUSAT (MCR)		17/01/19	2,127.000	PUBLWMP 51/87	PTG WMP-6/2652-80	PA101161

Figure 4.21: Attribute data for Warta\_PTG Layer

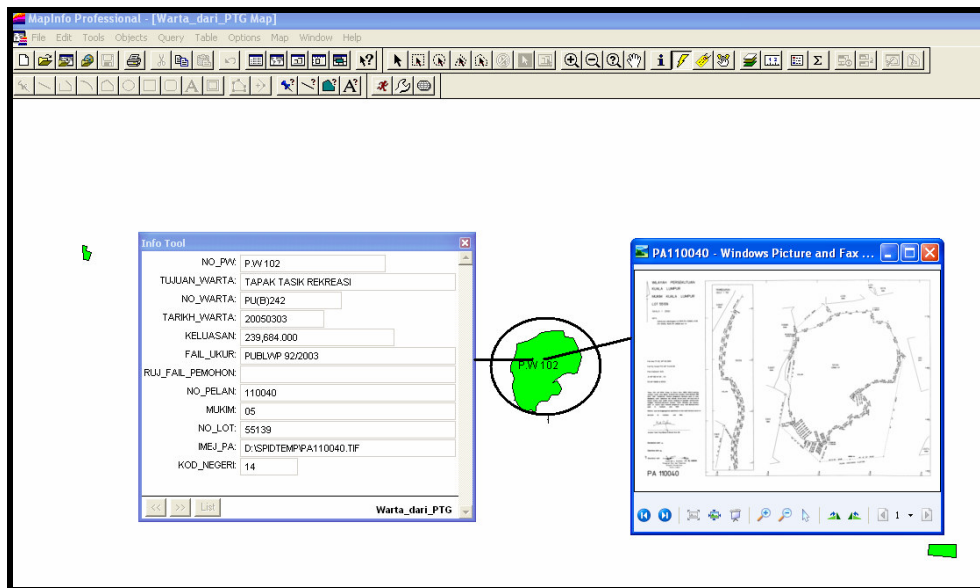


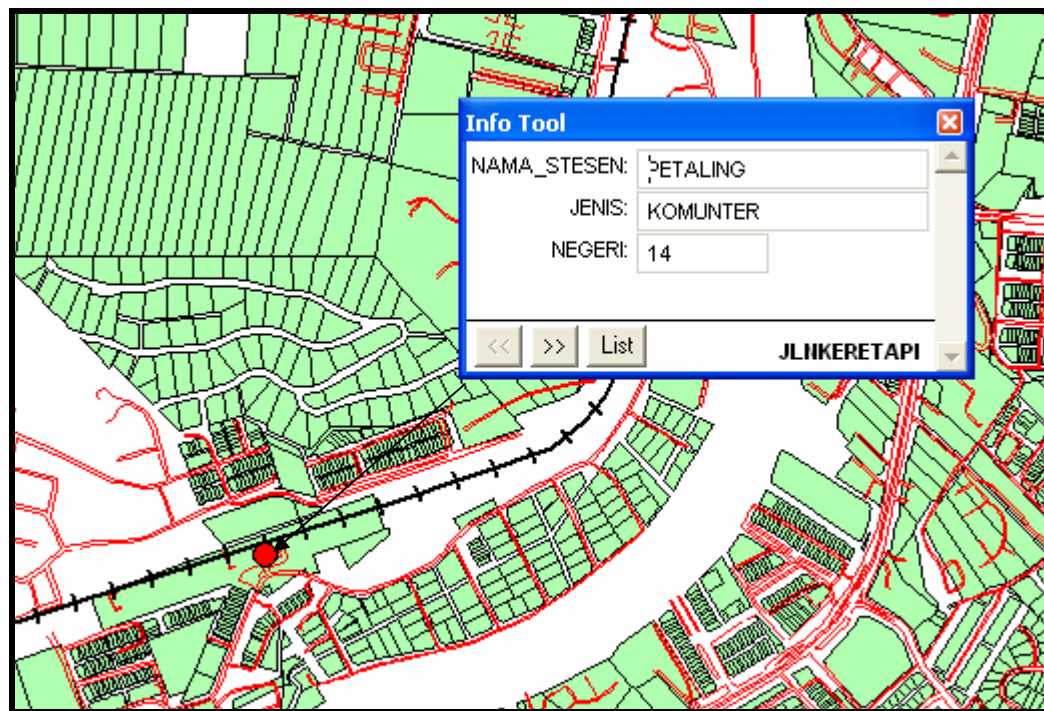
Figure 4.22: Display of gazette lot with attribute data and image of CP

#### 4.2.5 Railway Layer

Figure 4.23 – Figure 4.24 show additional information included in new GLMS 2 System Transportation layer (Railway) is needed for few government agencies and utility firm for future land development and construction planning.

JLNKERETAPI Browser		
HAMA_STESEN	JENIS	NEGERI
<input type="checkbox"/>		
<input type="checkbox"/> PETALING	KOMUNTER	14
<input type="checkbox"/> PANTAI DALAM	KOMUNTER	14

Figure 4.23: Attribute data for Railway layer



**Figure 4.24:** Display of railway information

### 4.3 Data Quality

All new layers are based on the existing plans; gazette plan and standard sheet in 1:8 scale (chain) or 1:6336 scale (chain). The digitizing process shows the RMS of control point (reference point) is acceptable (below 0.05 pixel).

## 5.0 CONCLUSION AND RECOMMENDATION

GLMS concepts is one initiative towards the development of Multipurpose Cadastral in Malaysia. The integration between Digital Cadastral Database and GLMS has provided a good infrastructure for many Geomatic and GIS Communities. Due to the high demands and request from public users, GLMS has been improved in this study with additional layers. The new layers are :

- i) Building Layer
- ii) Hydrographic layer
- iii) Road layer
- iv) Railway layer
- v) Gazetted layer
- vi) Political layer
- vii) Malay reserved layer

Evaluation of the GLMS has been executed based on few aspects such comparative study, questionnaire, and spatial database. Analyses show that the new GLMS is able to satisfy public requirements and demands. GLMS can be a model for government authority to enhance the existing GLMS towards the realization of Multipurpose Cadastre in Malaysia.

## **6.0 REFERENCES AND BIBLIOGRAPHIES**

- Abd. Majid Kadir, Ghazali Desa dan Chandrasekhar (1998). Cadastral Database Design For Coordinated Cadastral System. B.Sc Thesis. Universiti Teknologi Malaysia.
- Abdul Majid Mohamed (1988). Cadastral Reforms in Malaysia, Seminar Paper. Jabatan Ukur dan Pemetaan Malaysia.
- Abdullah Hisam Omar (2005). A friendly Introduction to Geographic Information Systems, Nota Kuliah. Universiti Teknologi Malaysia.
- Azhari Husin dan Mohamad Nor Said (1992). Geographic Information System And It's Application To Local Authority : A Pilot Study Of Majlis Daerah Kulai. CPD Talk : Information Technology – It's Role On Property Development, Inспен. 4.
- Burrough, P.A. (1986). Principles of Geographic Information Systems for Land Resources Assessment. Oxford : Clarden Press
- Department of Survy and Mapping, Malaysia (1998). Cadastral Management System – user Manual. Imatera Digital Image Services Sdn. Bhd.
- Department of Survy and Mapping, Malaysia (2002). SPDK Upgrade – User Guide. Map Information Solutions Sdn. Bhd.
- Norliza Binti A.Patah (2001). Feasibility study of Digital Cadastral Database For Development of National Digital Cadastral Database. B.Sc Thesis. Universiti Teknologi Malaysia.
- Peter Rob and Carlos Coronel (1997). Database System : Design, Implementation And Management. A Division Of International Thomson Publishing.
- Rohayu Binti Yahaya (2001). Development of Digital Cadastral Database. B.Sc Thesis. Universiti Teknologi Malaysia.