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MAPPING SPECIES IN BIODIVERSITY INFORMATICS DATABASE

DEVELOPING A NEW CADASTRAL REGISTRATION APPROACH

KE ARAH BANDAR SELAMAT

ESTABLISHING QUANTUM GIS AS THE PRINCIPAL GIS IN THE PUBLIC SECTOR

GIS Sana Sini

PERSIDANGAN DAN PAMERAN
Sistem Maklumat Geografi

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BULETIN Geospatial SEKTOR AWAM

dari meja **Ketua Editor**

Assalamualaikum dan Salam 1 Malaysia.

Buletin Geospatial Edisi 2/2010 kali ini antara lain, memaparkan berkenaan penggunaan teknologi GIS dalam bidang biodiversiti. Sejak berkurun lamanya manusia bergantung kepada kepelbagaian biodiversiti dan sumber-sumber biologi yang membekalkan manusia dengan keperluan makanan, perubatan, produk-produk industri dan juga berperanan penting untuk mengimbangi alam sekitar. Pada masa kini, maklumat biodiversiti boleh dicapai melalui *Global Biodiversity Information Facility* (GBIF), *Fishbase*, *Encyclopedia of Life* (EOL) dan sumber-sumber lain. Kesemua pangkalan data ini direka bentuk untuk memberikan maklumat taksonomi (iaitu kajian tentang prinsip, peraturan, dan amalan dalam pengkelasan organisma hidup berdasarkan persamaan dan perbezaan sifat organisma itu) dan diselenggarakan dalam beberapa pangkalan data yang saling berhubungan (*relational*). Walaupun mudah untuk mendapatkan data mentah (*raw data*), namun data spatial sukar untuk divisualisasikan memandangkan pangkalan data yang dihasilkan diperoleh daripada *flat file* yang tidak dapat menampung *trend* dan corak geospatial. Dalam hubungan ini, GIS dapat membantu dalam memvisualisasikan hubungan antara spesis hidupan dan kedudukan geografi serta mengkaji karakter spesis hidupan tersebut.

Selain itu, Jabatan Perancang Bandar dan Desa (JPBD) Semenanjung Malaysia, atas inisiatif sendiri telah mengkaji penggunaan *open source software* (OSS) yang dikenali sebagai *Quantum GIS* (QGIS). Ia bertindak sebagai aplikasi *multi-platform* dan menjalankan operasi dengan sistem operasi yang berlainan seperti Mac OS X, GNU/Linux, Unix dan Microsoft Windows XP. Ini memudahkan aplikasi GIS dapat dijalankan untuk Windows dan OSS, yang mana ia dapat disesuaikan dengan aplikasi GIS yang dibangunkan menggunakan perisian ArcView, ArcGIS dan MapInfo.

Seterusnya, sumbangan aplikasi GIS dalam mewujudkan bandar yang lebih selamat melalui pemetaan GIS Hotspot Jenayah. Melalui kaedah ini, rekod kawasan-kawasan tinggi jenayah dapat dikenalpasti dan pihak berkuasa tempatan dapat mengambil langkah-langkah pencegahan yang lebih berkesan. Sehubungan itu, peranan dan kerjasama semua pihak yang terlibat dalam merealisasikan projek ini turut diperjelaskan.

Dalam pada itu, peranan teknologi GIS juga tidak kurang pentingnya dalam bidang Kadaster iaitu dalam proses pemodenan budaya kerja dalam bidang berkenaan. Sebelum ini, sistem kadaster 2D hanya berurusan dengan pemilikan di atas tanah sahaja. Namun, sejajar dengan arus kemodenan pada masa kini, pemilikan turut melibatkan bawah tanah dan bangunan bertingkat. Untuk itu, faktor vertikal (z) juga diperlukan dalam memastikan urusan pendaftaran berjalan lancar. Justeru, pendekatan sistem pendaftaran 3D telah diwujudkan dan ia diperincikan menerusi artikel *Developing a New Cadastral Registration Approach*.

Saya berharap artikel-artikel yang dimuatkan dalam buletin pada kali ini dapat memberikan manfaat kepada semua. Akhir kata, saya bagi pihak BGSA merakamkan setinggi-tinggi ucapan terima kasih kepada pihak-pihak yang telah memberikan kerjasama dalam menerbitkan buletin edisi 2/2010 ini.

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MAPPING SPECIES IN BIODIVERSITY INFORMATICS DATABASE : ISSUES AND CHALLENGES

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INRODUCTION

Biodiversity according to the Convention of Biological Diversity (CBD) is defined as the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems. The broad knowledge jurisdiction of which biodiversity is accountable and the increasing recognition of the role of biodiversity in economic, scientific and educational aspects of life have increased its importance and are considered as key issues in sustainable development policies. The recent growth in biodiversity data available through digital archives has necessitated the creation of a biodiversity databases and information management systems. The interconnectivity of the Internet has also act as an effective tool for disseminating information for the global audience. Such phenomenon combined with the increasing emphasis on biodiversity has created a demand for biodiversity knowledge (Bisby 2000; Oliver et al. 2000; Edwards et al. 2000). The increase in demand and amount of biodiversity data has created a need for structured information domain accessible through the web. Various databases for biodiversity and conservation research have been created to cater for this increasing demand. However, early databases were not robust and lack many functionalities that is required for advanced biodiversity research. Queries were limited to basic keyword based search focusing on taxonomic data. The types of data collected on species and their relationships vary greatly in accuracy, and the methods used to accumulate and compile these data are almost as diverse as the natural world they document. Furthermore, the range of datasets includes geographical, meteorological, geological, chemical, physical, and genomic sources. Therefore, databases have an unusual need to accommodate differences in data quality and types within a democratized community information infrastructure that is both formal and informal (Schnase et al., 2007).

MALAYSIAN BIODIVERSITY INFORMATICS DATABASES AND GEOGRPHICAL INFORMATION SYSTEM (GIS)

The increase in demand and amount of biodiversity data has created a global need for structured information domain by various institutional and national databases for biodiversity and conservation research. However, there is a conspicuous scarcity of Malaysian biodiversity databases with only a few robust and notable examples. Among the leading examples is the Systematic Marine Biodiversity Information System (Symbiosis: http://symbiosis.nre.gov.my) SyMBiosIS is a searchable database for the

marine organisms which can be found in Malaysia; Flora of Peninsular Malaysia Online (FPM: http://www.tfbc.frim.gov.my), a searchable flora that includes ancillary data such as habit, habitat, taxonomic synonymy, distribution within Peninsular Malaysia and Singapore. There are agriculturally focused databases such as AgrobIS (http://agrobis.mardi.gov.my/), an information system developed by MARDI to provide the public direct access to data of more than 40,000 accessions of Plant Genetic Resource for Food and Agriculture (PGRFA) which includes fruits, rice, vegetables, and medicinal plants. The system also consists of information on 2,500 isolates of microbial genetic resources and about 30,000 specimens of arthropods. The Department of Agriculture is also developing Agriculture Information System Geodatabase Portal (AgrIS) http://www.agris.doa.gov.my, a Web-based system integrates agricultural data in all the States of Malaysia into a single unified system where one can access up-to-date information about soil, rainfall, pests, land use etc. AgrIS is currently in development and is expected to be launched in May 2010. There are smaller institutional, state and research group databases such as Johor Biodiversity Database http://www.jbiotech.gov.my/jbiodi/, Amphibian and Reptiles of Peninsular Malaysia Database http://www.amphibia.my and Malaysian Indigenous Microbial Online Database System (MIMODS) that consists of a collection of data on indigenous microorganisms isolated by Malaysian Microbiologists (http://www.bioinformatik.um.edu.my). However, such commendable effort is dis-proportionate to the existing untapped biodiversity data and the present research community in Malaysia. Among the 14 contributing institutions in the Global Biodiversity Information Facility (GBIF: www.gbif.org), there are no databases originating from Malaysia. This is further compounded in the Malaysian biodiversity scene as there is a conspicuous absence of GIS enabled biodiversity databases catering for the scientific community.

GIS IN BIODIVERSITY

Currently, biodiversity information is accessible through the web through global databases such as Global Biodiversity Information Facility (GBIF), Fishbase, Encyclopedia of Life (EOL), Zipcode-Zoo and Biodiversity Heritage Library (BHL) (Gwinn et al., 2009). These databases are designed to deliver taxonomic information about organisms, providing a broad taxonomic scope and are maintained in large distributed federated relational databases. Although it is deceptively easy to access raw information, it is difficult to visualise the spatial data within these datasets. Earlier versions of these databases that originated from flat file sources are usually not robust and lack much functionality that is required to infer geospatial trends and pattern. Initially, queries were limited to basic keyword based search focusing on descriptive taxonomic data. Earlier versions of these databases originated from flat file sources are usually not robust and lack much functionality that is required to infer geospatial trends and pattern.

The more recent additions such as GBIF-Mapping and Analysis Portal Application (GBIF-MAPA) (Flemons et al., 2007), Australian Virtual Herbarium (AVH), ASEAN Centre of Biodiversity (ACB), Israel Biodiversity Information System (BioGIS) or related tools (GBD-Explorer, Bio-Geomancer (Guralnick et al., 2006) Diva-GIS (http://www.diva-gis.org) have been enhanced by incorporating geographical, spatial and temporal visualisation capabilities. Following the adage “a picture is worth a thousand words” the use of GIS will add a geographical dimension to the database thus providing a novel perspective to the data using the integration of information in spatial overlays or geographical “picture” for analysis and interpretation, and visualisation. GIS will create a unique reference base (geographic location and maps), i.e. natural vegetation, soil, land use, topography, hydrology that enables biodiversity data to be combined and analysed to produce novel associations between environmental features and relationships between different species. Using GIS will facilitate visualizing the relationship between species and geographical locations, inter and intra species locations and their relationships and examining distribution characteristics of species (Oberlies et al., 2009).

CHALLENGES

Building online GIS web services to support biodiversity mapping has many major developmental challenges and we attempt to elaborate the crucial ones that need to be answered.

Retrospective Georeferencing

A retrospective georeference is a concept where the textual descriptions of places where data and specimens were collected (locality descriptions such as “Sungai Johor, Kampung Teluk Intan, etc”) are converted into their corresponding geographic coordinates - especially from legacy or archival data that are descriptive in nature This will create quantitative map

coordinates and generate new usability of the legacy data by making it amenable to spatial and numerical analysis. Retrospectively georeferencing is a daunting task given the biodiversity data itself are legacy in nature and almost all biodiversity data records in Malaysia are in printed form. An automated workflow that harvests, simplifies and improves the efficiency is desirable given the large amount of data available in Malaysia. Several georeferencing tools and services have been developed; Google Maps, Google Earth, Bing Maps and a few are specifically designed to perform multiple and repeated retrospective georeferencing of biodiversity data (GEOLocate, http://www.museum.tulane.edu/geolocate/BioGeomancer, http://biogeomancer.org/. A dedicated tool for Bahasa Malaysia will also be useful to analyse Malaysian large corpus of biodiversity text.

Digitizing Historical Data

The biodiversity literature has extreme longevity and given its inherent 'legal status' as nomenclature representative, current taxonomic literature still relies on texts and specimens that are more than 100 years old (Godfray et al.,2007; Minelli, 2003). Digitization of the large Malaysian corpus will catalyse retrospective georeferencing and increase its usability and visibility. Exemplar effort such as Biodiversity Heritage Library (BHL); www.biodiversitylibrary.org that performs large scale digitization to provide open access to core published literature of biodiversity for scientists is an effort worthy for Malaysian research community to emulate. BHL is the key component of the Encyclopedia of Life http://www.eol.org (EOL) as conceived by E. O. Wilson and collaborates with major natural history, botanical garden & research libraries & museums in the US, Europe, and China. However, issue of digitizing biodiversity data have shown to be commercially and politically sensitive, especially when it concerns bio-prospecting. The competitive nature of research has also raise concerns on the lack of sharing cultures among biodiversity researchers (Fonseca et al., 2003).

Integrative GIS Education

Given the increase usage of GIS in biodiversity and ecological research, the time is ripe for the education establishment to imbed a structured and comprehensive GIS training in the curricula. Early introduction to the basics of creating basic maps by adding layers, using web based tools, projections and coordinate systems within a thematically based curriculum would create students that is aware on how biodiversity are spatially oriented. This will also enable greater availability, reliability and quality of georeferenced biodiversity data. The training will also seed the scientific community with sufficient knowledge and possibly create new avenues and knowledge opportunities in biodiversity research such as participatory GIS and collaborative mapping.

CONCLUSIONS

Biodiversity informatics is a currently at a nascent stage in Malaysia and the implementation of GIS in a structured manner is critical in elevating the quality and quantity of biodiversity, ecology and environmental research in Malaysia. Bioinformatics informatics is a field that contributes to the management of the biodiversity and ecosystem by providing decision making cues to researchers, environmental managers and policymakers. It brings together ecologist, environmentalist and computer scientists to solve real-world conservation challenges while developing the underlying ecological, bioinformatics, and information sciences. Therefore, a serious and concerted effort must be initiated to ensure new biologist being adequately trained in universities, with parallel nationwide effort to digitise and georeference our biodiversity wealth.

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DEVELOPING A NEW CADASTRAL REGISTRATION APPROACH

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ABSTRACT

The urban population in Asia has increased by 550 million people during 1960-1990 and are expected to increase by 1,286 million people by year 2020 (Ji, 2007). Since late 1990s, the population of Malaysia has increased from approximately 21.80 million to 27.73 million in 2008 (Statistic, 2008) and it is predicted to reach 31 million by 2020. Cities in State of Penang, Selangor, Kuala Lumpur and Johore have so far absorbed their growing numbers in settlements with a varying quality of living and the complexities of the extreme modern buildings are expected to be designed and built in the near future. Unfortunately, the existing Malaysian Cadastral System and legislation for 2D parcel is unsuitable for representing the land rights in 3D situations for those rapid increases for development and technical purposes. Hence, an efficient 3D land use in real estate property especially for multilayer objects is directly linked to the socio economic and environmental development in Malaysia.

This paper describes the overview of Malaysian Cadastral System for 3D purpose and the situation in Malaysia. We explain the current practice of cadastral registration in Malaysia and elaborate more about Malaysian Cadastral Data Model. The Malaysian Digital Cadastral Database (DCDB), Computerised Land Registration System (CLRS) and Cadastral Data Management System (CDMS), the development of 3D Cadastre registration and the integration of CLRS and CDMS are illustrates respectively. Throughout the paper it is hope that this new approach can bring to planning and construction sustainability in Malaysia.

KEYWORDS
Land administration, 3D, legislation, cadastre, property rights.

INTRODUCTION

A systematic record of lands matters involving registration of the details of transaction, such as transfer of land and interest, lease, charge, releasing of easement and change of condition of the land is very important in land administration, planning and development. As stated in UN-ECE (1996), land administration consists of a Cadastral Survey and Mapping Registration System, and a Land Registration System. These two systems are very important for the formation of a good Land Administration System. A cadastral system is an information system consisting of a series of maps or plans showing the size and location of all land parcels together with text records that describe the attributes of the land. This 2D Cadastre system is adopted by many countries in the world including Malaysia because the system provides essential information about land and property such as ownership of the lot and land parcel for the country.

> *"The development above and below ground surface can be facilitated by guaranteeing the property rights of owners."*

OBJECTIVES

In view of the Malaysian Cadastral System that is based on the 2D cadastre, the purpose of this paper is to give an introduction onto limitation on private and public properties. Here, we identified some problems and constraints in current Malaysia Cadastral System for registration of 3D cadastral parcel. We explain the development, cadastral map and land title situation in Malaysia. This paper also shows the current cadastre registration system in Malaysia, the Malaysian Cadastral Data Model and Database. Finally, 3D cadastre registration development and the possibility of integration of Computerised Land Registration System (CLRS) and Cadastral Data Management System (CDMS) will be illustrated here.

PROBLEMS AND CONSTRAINTS IN CURRENT MALAYSIA CADASTRAL SYSTEM FOR MULTI-LEVEL BUILDING

In the last couple of decades, there has been a demand in urban areas for dividing ownership in buildings so that different owners can own different parts or can own a delimited space on, above or below ground surface. When regular utilisation of space above surface started for high rise constructions and aviation, it brought forth the question regarding whether such space could be subdivided into separate units for ownership had to be discussed (Sandberg, 2003). There are many complex situations in urban society in which there are multiple uses of space (Stoter and Ploeger, 2002). This has caused an emergence of situations where the vertical dimension is an important factor for real property objects. It has also resulted in the pressure of extending human activity on the lands that are densely populated areas, resulting in competition for space and creating environmental problems (Paulsson, 2007).

The development above and below ground surface can be facilitated by guaranteeing the property rights of owners. It is also believed that 3D registration of proprietary rights promotes investment in such development projects (Doytsher, Forrai and Kirschner, 2001). The interest in urban areas for using land above and below ground is often connected with investors who are interested in making rights more secure and transferable (Paulsson, 2007). This is similar to Malaysia land tenure title registration system where the register contains rights, restrictions and responsibilities about the proprietor. As a result, different rights, restrictions and responsibilities may exist in an integrated 3D property objects, hence resulting in the difficultly of any decision making on a lot. However, not all restrictions and imposed conditions are stated clearly in the register as there are some that are provided by law and have to be complied by the proprietor.

In Malaysia, there is a lack of proper legislation regarding 3D property in land and cadastral law to cater for the registration of any related legal and technical aspects. Many conflicts seem to exist between laws and statutes with the current cadastral status. Therefore, the rights associated with this registration should be clear in the registry titles issued. For example, Strata Title Act 1985 (Act 318) & Rules and Order allows land to be subdivided into parcels or land parcels based on the area occupied, and National Land Code

1965 (Act 56 of 1965) & Regulations allow air space rights above ground surface up to a maximum of 21 years in form ranging from an absolute conveyance to splitting off individual rights associated with the air space parcel. This is always used in a complication urban multilevel mix development, or in the allocation of property rights concerning underground facilities in large urban areas (Mitrofanova, 2002). There are currently many arguments about the surface under different categories of land use, subdivision, partition and amalgamation; these arguments would evidently be different if 3D property rights are used. Without the possibility of using 3D properties, other legal rights have to be used to allow separate parties to use different parts of one building or property. To make such rights possible, different and new legal institutions have to be created, such as mineral and air rights (Sandberg, 2003). Again, 3D property rights can take on different forms and can vary from full ownership to rights of different extents (Paulsson, 2007).

The Malaysian property market has not been operated accordingly with the value of real property depending on its location and parcel area (length x wide) without volume (height). Hence, the price of the parcel unit is based on the specific area and not the volumetric areas as well. The parcel areas in the Final Titles are based on the area given in Certified Plan after the final survey has been completed, this is exemplified by the calculation of share unit in strata title for strata and stratum objects. Low cost flats and medium cost flats are usually lower in cost and height than apartments and condominiums; however, if the parcel areas are same, it means that the apartment and condominium owners are paying less money on the assessment, quit rent and maintenance fee which reflects the cost for low and medium cost flat owners.

> *"Land administration consists of Cadastral Survey and Mapping Registration System and Land Registration System where both of them contain a set of records about land."*

In conclusion, there are many aspects to consider in implementing the 3D property rights of a legal and technical nature. Among these aspects, the core of this research attempt to investigate problems occurs in the Malaysia cadastral system on the legal aspect which can be seen as a foundation for 3D property and its technical aspect. The main legal documents involved are National Land Code 1965 (Act 56 of 1965) & Regulations; Strata Title Act 1985 (Act318) & Rules and Order; and Building and Common Property (Maintenance and Management) Act 2007 (Act 663). Without proper land and cadastral legislation, such property cannot be formed at all. As a result of this, it has also been necessary to look into the legal systems of other countries, where 3D property formation is already possible by law, and to gain information about what kind of problems are faced there and how they have handled; this is so as to better understand the problems that may occur for countries introducing 3D property rights into their legislation. For this reason, the Swedish Land and Cadastral Legislation is used as the legislation model in this research. In regards to the technical aspects, the references above were used for designing appropriate methods as they would be the fundamental principles applied to cadastral survey and mapping practices.

CADASTRAL MAP AND LAND TITLE

Cadastre is a technical term for a set of records showing the value and ownership of land parcel. It provides precise description and identification of particular pieces of land and its acts as a continuous record of rights in land. Meanwhile, a modern cadastre normally consists of series of large scale cadastral map and corresponding register. Both the maps and registers may be stored in computers, such as Cadastral Database Management System (CDMS) and Computerised Land Registration System (CLRS) in Malaysian Cadastral System.

After final survey of an individual parcel of land or a number of lands, a cadastral map, so-called Certified Plan in Malaysia will be produced for those plot/plots of land. Certified plan is prepared following the format determined by the Department of Survey and Mapping Malaysia (DSMM). It shows the lot boundary in various scales with a given Certified Plan number. Information pertaining to the lot location, number, area, bearing and distance are also displayed. Immediate after the approval of Certified Plan, the document of title, such as Registry Title and Land Office Title in Malaysia will be prepared, approved and issued to the owner. Registry

Title means title evidenced by a grant or State lease or by any document of title registered in a registry under the provisions of any previous land law while Land Office Title means title evidenced by a Mukim grant or Mukim lease or by any document of title registered in a registry under the provisions of any previous land law. The digital Registry Title and Land Office Title can be obtained in B1.tiff format.

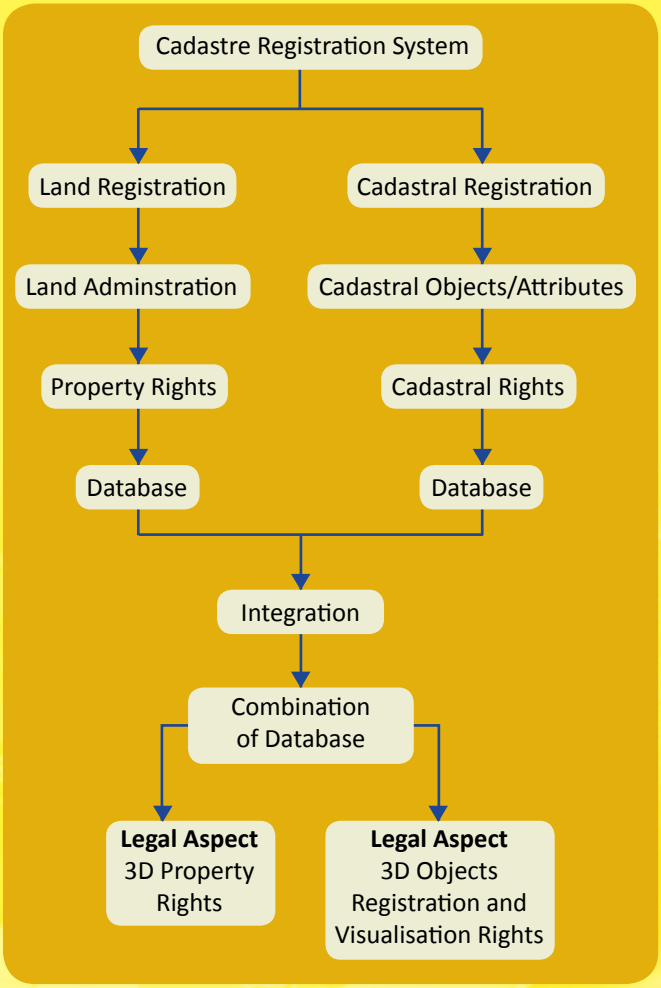
Unfortunately, these Certified Plan, Registry Title and Land Office Title mostly only represents the surface level of ground with individual land parcels by 2D boundaries, descriptions, rights, restrictions and responsibilities. These conventional 2D map and title display geographical data and is vital for revealing spatial relationships and patterns (Ji, 2007). However, it has difficulties to record and display the multiple uses of lands with the construction above and below the ground surface.

CADASTRE REGISTRATION SYSTEM IN MALAYSIA

The traditional cadastre registration system that is practiced in Malaysia are parcel bounded system with 2D nature and provide essential lands and properties information of the lots and land parcels (Hassan, 2008). Furthermore, Valstad (2006) points to the fact that traditionally land has been described and registered into 2D and all cadastral systems of the world are in fact 2D nature.

The current Malaysia Cadastral Registration System does not consist and includes 3D objects registration and 3D rights as well, but this current system is more similar to land administration system. As stated in (Tan, Hussin and Ernest Khoo, 2009), land administration consists of Cadastral Survey and Mapping Registration System and Land Registration System where both of them contain a set of records about land. This type of 2D Cadastre system being practice in Malaysia for a period of one hundred years and it provides essential information about land and property like ownerships of the lots and land parcels for the country. In Malaysia, the cadastral system is managed by three main authorities namely Department of Survey and Mapping Malaysia (DSMM), State Land and Mines Office (PTG) and District Land Office (PTD). In general, cadastral survey and mapping is under the jurisdiction of DSMM where it responsible for carrying out land survey and mapping, then follow by registration of cadastral objects there are lots and land parcel boundaries while PTG and PTD are responsible for the land title registration (Registry Titles and Land Office Titles).

In Malaysian Cadastral System, there are two systems namely Cadastral Database Management System (CDMS) and Computerised Land Registration System (CLRS) which operated by DSMM and PTG as well as PTD. The CDMS database stored land attributes, spatial objects and other things while the CLRS database stored land ownerships, land tenures and so on, but these two systems works separately in each organisation with difference legal aspect and still in nature of 2D. This mean, there are no 3D object property rights as well as 3D cadastral rights. These two systems later on can be incorporated in the registration form with the present advance and modern technologies such as GIS, internet, web based and e-commerce applications. Figure 1 shows the current system with the proposed concept of legal aspect for 3D objects registration and visualisation rights as well as 3D property rights. For more discussion and detail on 3D property rights, see (Paulsson, 2007).

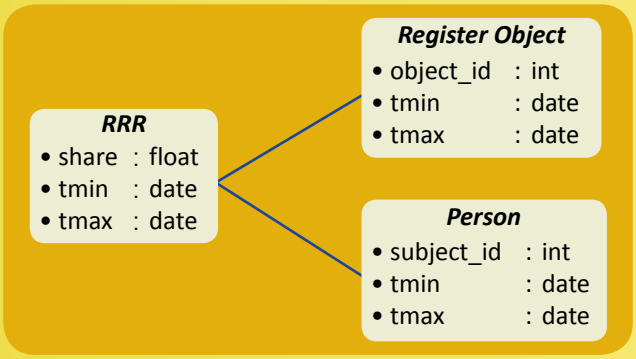


▲ Figure 1 : Current cadastral system with proposed concept of rights

MALAYSIAN CADASTRAL DATA MODEL

The CCDM which introduced in the current version of model (Van-Oosterom et al., 2006) mentioned that this data model is the foundation of most land administration. Which means that, this foundation of core cadastral data model is designed for various land registration system and cadastral system all over the world and as a base for all cadastral registration, therefore, in other words, the relationship between the three core classes in the UML diagram as in Figure 2, there are Person (subject), RRR (right, restriction, responsibility) and Register Object (real property objects), can be used to illustrate Malaysia Cadastral Data Model.

> *"Malaysia land administration are based on the Torrens system where Cadastral Map and legal document with spatial and textual information as a legal evident under the rules and regulations are needed in order to have fully institutional coordination."*



▲ Figure 2 : UML class diagram of CCDM: Adapted from stoter, 2004; Van-Oostream et al., 2006 and Chong, 2006)

MALAYSIA CADASTRAL DATABASE

The arrival of computer and the rapid development of Information Communication Technology (ICT) has resulted widespread technological reforms in the field of cadastral system and in line with the government objective of providing efficient and quality land administration services to the public. Realising the importance and potential of this new technology, DSMM and PTG had initiated their computerisation programme in the early 1980's and 1990's respectively. The most significant change that ICT has brought about is that the shift from conventional analogue data to digital data and consequently the introduction of the concept of digital database which forms the base component of a Land Information System (LIS) which in turn has been identified as having an indispensable role in the process of decision making in resource management and planning. For example, PTG has computerised two of its main operations in land administration named Computerised Land Registration System (CLRS) and Land Revenue Collection System (LRCS) to cater the land registration and revenue collection activities. On the other hand, DSMM has implemented a data collection and processing facility named Cadastral Data Management System (CDMS) for cadastral activity, the Computer Assisted Topographic Mapping System (CATMAPS) for mapping activity and also the Automated District Survey Office System (ADSS) for district survey office activity, and then both CLRS and CDMS enabled the process of land registration and measurement of ownership to be accelerated (Chong, 2006).

The Cadastral Data Management System (CDMS) will provides a network for the survey department to access the DCDB and the digital image library from any personal computer within the network, with a single window and single point of access. DCDB holds digital cadastral base maps that are used for building up GIS and land related applications, while the image library holds scanned and indexed certified plans stored in the disk arrays at every state survey departments. CDMS is also capable of receiving orders from clients through remote access, e-mail, dial-up and other things as well as providing an automatic invoicing, billing and accounting system and it also cater for remote access to and from the District Survey offices (JUD). A system which forms part of the CDMS that is Quality Assurance System (SPEK) is a module to preserve the integrity, and accuracy of the DCDB.

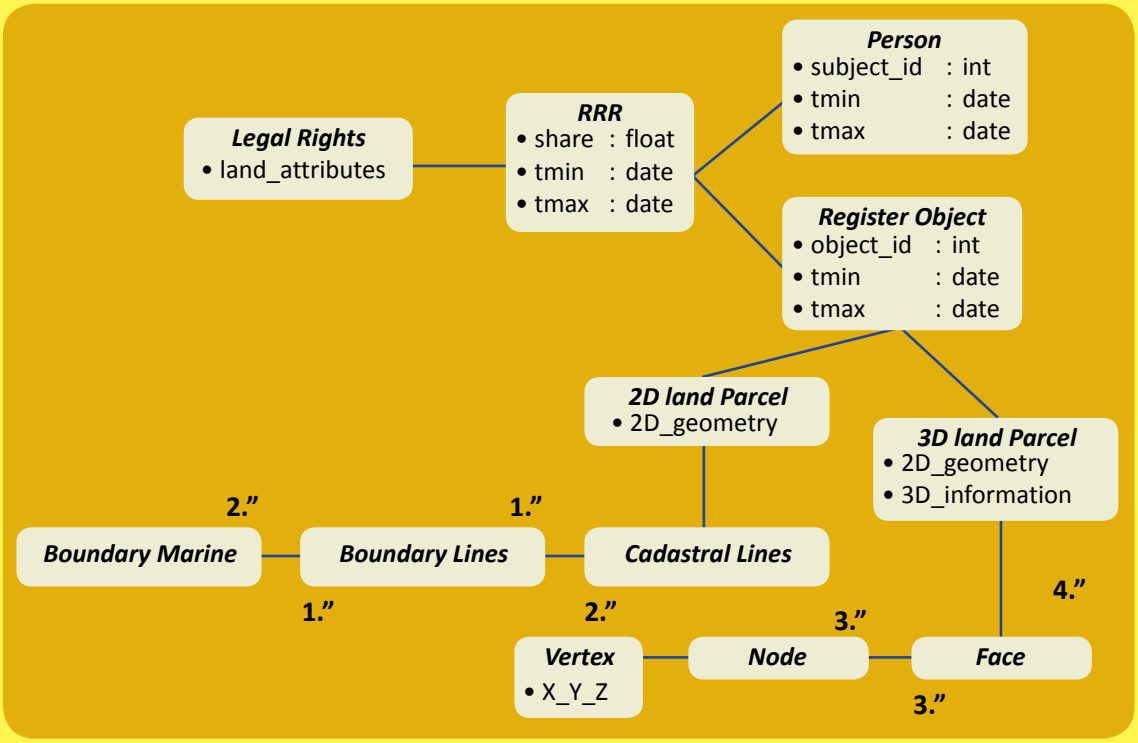
With the implementation of the CLRS, a system to modernise and to facilitate the registration of land title and dealings, data are extracted from both the documents of title and other land related documents. Meanwhile, the information in the CLRS database are based on the records

kept in the land registers and relevant files with include information on ownership (Person), land identification (Register Object), restriction (RRR) and record of dealings. As mentioned by (Chong, 2006), the register furnishes all information pertaining to the ownership (person), the land (object, through description of area and location and boundary limits from the Certified Plan and rights (details of encumbrance, expressed conditions, caveats and prohibitory orders and other things). However, not all restrictions are stated in the register, some are implied by law for example National Land Code 1965 (Act 56), planning control and so on.

3D CADASTRE REGISTRATION DEVELOPMENT IN MALAYSIA

The development of 3D Cadastre registration are more on technical part where researchers study on the process of adding 3D Cadastre objects in the current cadastre data model and information accessible among DSMM, PTG and PTD, unfortunately the two state database which are DCDB and CLRS database works separately in different authorities and still in 2D situation. As mentioned in this research previously, Malaysia land administration are based on the Torrens system where Cadastral Map and legal document with spatial and textual information as a legal evident under the rules and regulations are needed in order to have fully institutional coordination.

The 3D Cadastre objects such as strata building, construction on, above and below the ground surface, i.e. underground tunnel, metro station, skywalk and other things is a real property object that being built on the 2D land parcel, which are the responsible by PTG, PTD and DSMM on the ownership registration and object registration respectively. Apart from this 2D land parcel, there is also a 3D land parcel, which is similar to 3D physical object based on the hybrid solution by (Stoter 2004), together form from the Register Object, where the 2D land parcel is represented as a 2D geometry while 3D land parcel is form with 2D geometry and 3D information. Furthermore, the 2D land parcel is inherited from the current registration system that is the cadastral lot that consists of boundary lines and boundary marks. On the other hand, 3D land parcel is projected with the 3D bounded space that consists of face, node and vertex with list of coordinates that form flat faces and forming of 3D objects which so-called 3D Cadastre object later. The combination of this concept data model can be shown in Figure 3.

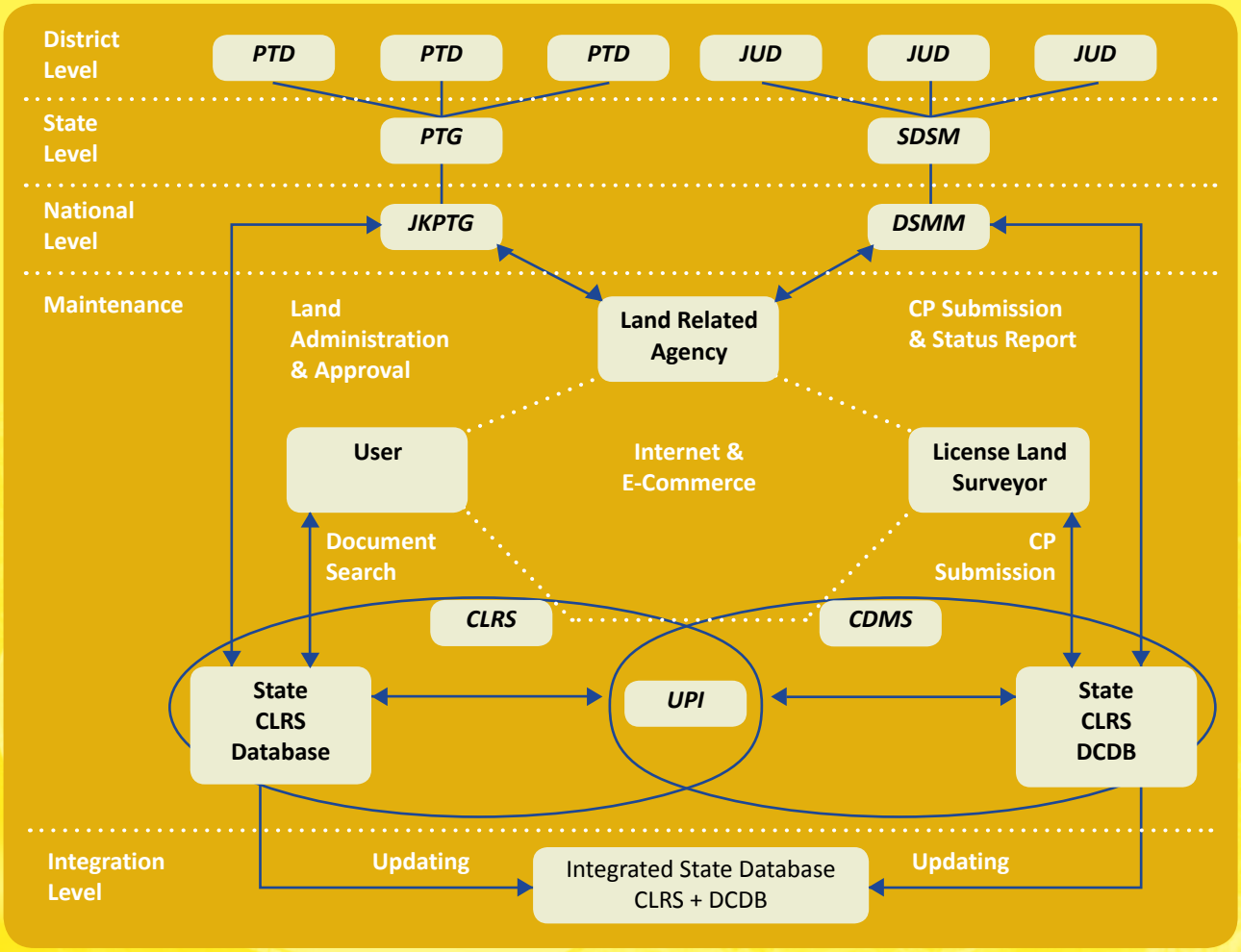


▲ Figure 3 : UML class diagram of 3D cadastre registration concept data model (Partly adapted from (Ahmad-Nasruddin and Abdul-Rahman, 2006)

INTEGRATION OF COMPUTERISED LAND REGISTRATION SYSTEM (CLRS) AND CADASTRAL DATA MANAGEMENT SYSTEM (CDMS)

There could be extensive benefits if these two systems, which are CLRS of PTG and CDMS of DSMM, are linked together. For that reason, a pilot project being started in Kuala Lumpur in 1st April 1995 to electronically connect and integrate the CLRS with the CDMS for the whole Kuala Lumpur then to develop the operational systems that can subsequently be implemented throughout the country in Peninsular Malaysia. Therefore, with the integration of attribute data from CLRS and spatial data from CDMS and through identified application, efficiency of land administration can be greatly improved. Nordin (2001) stated that the envisaged applications include on-line registration for survey and preparation of title, extending DCDB enquiry module to the land administrators and on the other hand, linking the Qualified Title (QT) information to the DCDB. Although conceptually tenable, the eventual implementation would need substantial negotiation and compromising in between PTG and DSMM.

With the vast changing in the ICT, such as GIS, internet and web based application and together with the initiative of Malaysian Geospatial Data Infrastructure (MyGDI) (National Spatial Data Infrastructure (NSDI)), e-Tanah of Ministry of Natural Resources and Environment (NRE) and e-Cadastre, Electronic Strata Module of DSMM, CLRS and CDMS database could be integrated electronically. In order to achieve the goal of comprehensive Land Information System from district level up to state and eventually at the national level, the integration of spatial CDMS database with the textual CLRS database play a preliminary requirement of all these. Moreover, Mariappan (2005) introduced a mechanism to integrate these two stand-alone databases. Coordination among DSMM, PTG and PTD can be provided by the installation of centralised server or distributed server at each of their office which act as the transporters and bridges in exchanging data between CLRS and CDMS. Figure 4 illustrates the conceptual integration of cadastral survey and title registration databases. Although there are a lot of benefits from an integrated textual title registration database and the graphic as well as spatial cadastral database, but there are still many hurdles to solve at this stage.



▲ Figure 4 : Conceptual model to integrate CLRS and DCDB (Partly adapted from Mariappan, 2005)

CONCLUSIONS

Most traditional cadastral systems are based on two-dimensional (2D) registers that deal only with properties on the land surface. These systems are unsuitable for today's multi-level reality. To cater to both above and below surface constructions and to enable the registration of real properties that are not limited to the land surface, it is necessary to amend the legislation. A three-dimensional (3D) approach for Cadastral System and Land Registration System can provide a better means to manage our modern world. The existing Cadastral Systems do have a number of inherent advantages like responsibility for proprietary rights, up to date information coverage and good mapping (Benhamu and Doystsher, 2003). These advantages notwithstanding, they suffer from a number of weaknesses arising from their 2D limitations that result in their dealing only with properties on the land surface.

This paper is part of the research on developing a 3D property registration system in Malaysia. As mentioned earlier, besides this technical aspect, legal and organisational aspects also play an essential role and cannot be ignored or separated from the cadastre main body, therefore, all of these aspects should work together and concurrently. In short, this paper can be an initial start for research on the legal and organisational aspects for developing Malaysian 3D Property Registration System.

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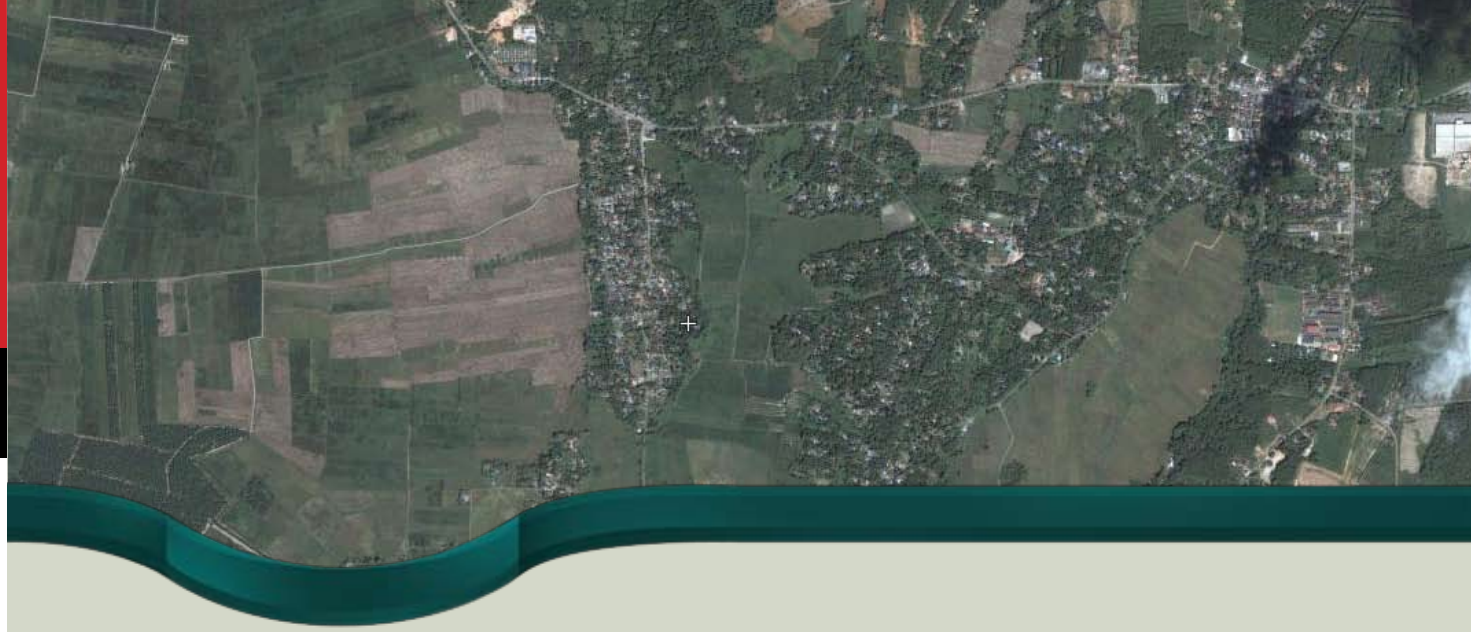


KE ARAH BANDAR SELAMAT : PENCEGAHAN JENAYAH BANDAR MELALUI PERKONGSIAN PEMETAAN GIS HOTSPOT JENAYAH

Disediakan Oleh:
Zaini Nordin [1], Nor Shah Mohd Saad [2].

ABSTRAK

Program Bandar Selamat adalah inisiatif oleh Kementerian Perumahan dan Kerajaan Tempatan Malaysia dengan kerjasama Jabatan Perancang Bandar dan Desa Semenanjung Malaysia (JPBDSM), Polis Di Raja Malaysia (PDRM), Pihak Berkuasa Tempatan (PBT) dan Yayasan Pencegahan Jenayah Malaysia (MCPF). Inisiatif yang bermula sejak Januari 2004 dan dipantau oleh JPBD Semenanjung Malaysia ini mengandungi 3 teras strategi yang terdiri daripada 23 langkah pencegahan khusus untuk mencegah jenayah bandar dengan matlamat untuk menjadikan bandar-bandar di Malaysia selamat dan sejahtera.

Salah satu daripada 23 strategi tersebut ialah 'Perkongsian maklumat jenayah melalui 'GIS-Based Crime Mapping.' Kertas kerja ini akan menggariskan panduan untuk membangunkan pemetaan jenayah bandar menggunakan Sistem Maklumat Geografi (GIS) untuk mengenal pasti kawasan-kawasan kerap berlaku jenayah (Crime Prone Area) atau disebut kawasan 'hotspot' jenayah dan seterusnya berkongsi maklumat pemetaan jenayah ini dalam strategi membenteras jenayah oleh PDRM dan PBT.

Bahagian Pertama menerangkan pendahuluan dan proses perolehan data-data jenayah dari PDRM. Jenis-jenis data jenayah yang diperlukan untuk tujuan analisis jenayah diterangkan di Bahagian ketiga nanti. Bahagian kedua menerangkan proses 'Geocoding', iaitu peringkat penting dalam menspatialkan data-data jenayah PDRM untuk membentuk 'peta alamat' jenayah bandar. Di sini diterangkan proses 'Geocoding' dan limitasi-limitasi yang dihadapi. Bahagian ketiga adalah proses analisis spatial GIS untuk menghasilkan pemetaan hotspot jenayah bandar. Bahagian ini akan menerangkan dengan terperinci hasil pemetaan hotspot mengikut jenis jenayah dan analisa tentang waktu-waktu jenayah kerap berlaku. Bahagian keempat dan terakhir akan menerangkan faedah dan bagaimana pemetaan jenayah bandar ini dapat membantu mencegah jenayah bandar di masa hadapan dan seterusnya panduan untuk berkongsi maklumat jenayah antara PBT, PDRM dan masyarakat setempat.

Kata kunci : Pemetaan Jenayah Bandar, Hotspot, Geocoding, Sistem Maklumat Geografi (GIS), Web Based Crime Mapping, Program Bandar Selamat.

PENGENALAN

Jenayah biasanya berkaitan dengan tempat dan masa. Di manakah kejadian jenayah berlaku dan bila? Kejadian jenayah boleh berlaku di tempat dan masa yang sama berulang-ulang kali. Jenayah juga boleh berlaku semula berhampiran dengan kawasan kejadian yang lepas.

Pengumpulan data jenayah dari segi tempat dan masa kejadian membolehkan kita mengenalpasti kawasan dan masa tumpuan jenayah. Kawasan manakah jenayah sering berlaku? Waktu bilakah banyak kes jenayah? Maklumat-maklumat ini banyak membantu pihak keselamatan dalam mengenal pasti modus operandi jenayah. Ini memudahkan tindakan keselamatan dibuat seperti mempertingkatkan rondaan, menyediakan pos keselamatan atau meletakkan CCTV. Kawasan sering berlaku jenayah ini dipanggil sebagai *hotspot* jenayah.

Terdapat beberapa perisian GIS yang boleh digunakan untuk menjana analisis *hotspot.* Namun data-data jenayah hendaklah terlebih dahulu dibangunkan dalam format GIS dan dipetakan lokasi jenayah mengikut kedudukan geografi yang betul sebelum analisis tersebut dijalankan. Peringkat-peringkat perolehan data, *geocoding* dan penganalisisan pemetaan jenayah adalah seperti diterangkan dalam proses pemetaan jenayah di bawah.

PROSES PEMETAAN JENAYAH

Proses pemetaan jenayah melibatkan 4 peringkat seperti yang ditunjukkan di dalam Rajah 1.0 di bawah.

Peringkat 1	• **PEROLEHAN DATA JENAYAH BANDAR DARI SUMBER POLIS** • **PEROLEHAN DAN PEMBANGUNAN PETA ALAMAT**

Peringkat 2	• **KEMASKINI REKOD JENAYAH**
	  • Kemaskini maklumat lokasi kejadian
	  • Membina medan untuk rekod tarikh mula & tarikh akhir kejadian jenayah
	  • Membina medan untuk rekod masa mula & masa akhir kejadian jenayah

Peringkat 3	• **PROSES GEOCODING**
	  • *Auto Geocoding*
	  • *Manual Geocoding*

Peringkat 4	• **PENGANALISISAN PEMETAAN JENAYAH BANDAR**
	  • Analisis Pemetaan *Hotspot* Jenayah
	  • Analisis *Time Hotspot* (Time Line Graph)
	  • Analisis *Time Hotspot* (Time Chart Aoristic)
	  • Analisis *Time Hotspot* (Week Chart Aoristic)

▲ Rajah 1.0 : Proses Pemetaan GIS Jenayah Bandar

KEPERLUAN DATA UNTUK PEMETAAN JENAYAH

PEROLEHAN DATA DAN DATA UTAMA

Terdapat beberapa lapisan data yang perlu disediakan sebelum pemetaan jenayah dibuat. Oleh kerana pangkalan data GIS telah disediakan oleh Pihak Berkuasa Tempatan (PBT), maka pemetaan jenayah lebih mudah dilaksanakan. Lapisan data seperti jaringan jalan, sempadan pentadbiran, lot dan lain-lain sangat diperlukan untuk menentukan lokasi jenayah.

Pangkalan data GIS sedia ada di PBT memudahkan proses penentuan lokasi jenayah dibuat. Bagaimanapun, dua data asas yang diperlukan adalah seperti berikut :

i. Data Jenayah (Borang Pol.55) dari Ibu Pejabat Polis Daerah (IPD)
ii. Peta Jalan dan Alamat dari Pihak Berkuasa Tempatan (PBT)

JENIS-JENIS DATA JENAYAH

Data jenayah yang diperolehi daripada sumber Ibu Pejabat Polis Daerah (IPD) perlu disisih terlebih dahulu. Ini kerana terdapat perbezaan sempadan pentadbiran di antara PBT dan IPD. Di PBT (A) contohnya, perolehan data jenayah diambil dari dua IPD iaitu IPD (A) dan IPD (B). Kerja-kerja suntingan (sorting) data perlu dijalankan untuk memilih kejadian jenayah di kawasan PBT (A) sahaja, sedangkan IPD (B) membekalkan rekod jenayah di kawasan pentadbiran IPD(B). Jadual 1.0 menunjukkan sumber data jenayah dan bilangannya bagi kawasan PBT (A).

NO	JENIS JENAYAH	IPD (A)	IPD (B)	JUMLAH
1	Curi Kereta 2007	280	14	294
2	Curi Motor 2007	2058	159	2217
3	Curi Van Lori 2007	130	25	155
4	Lain-lain Curi 2007	1048	32	1080
5	Pecah Rumah Malam 2007	314	8	322
6	Pecah Rumah Siang 2007	274	4	278
7	Ragut 2007	124	2	126
8	Samun berkawan tanpa senjata	235	0	235
9	Samun tanpa senjata	431	0	431
JUMLAH KESELURUHAN		**4894**	**244**	**5138**

Sumber : Laporan Kajian Pemetaan Jenayah Bandar PBT (A), Januari 2009.

▲ Jadual 1.0 : Data Jenayah Dari Dua IPD Untuk Kawasan PBT (A)

NO	KATEGORI	JENIS JENAYAH	PBT (A) (2007)	PBT (B) (2007)
1.0	Jenayah Keganasan	1.1 Bunuh.	-	-
		1.2 Cuba bunuh.	-	-
		1.3 Samun berkawan bersenjata api.	-	-
		1.4 Samun berkawan tanpa bersenjata api.	235	-
		1.5 Samun bersenjata api.	-	-
		1.6 Samun tanpa senjata api.	430	-
		1.7 Rogol.	-	-
		1.8 Mencederakan manusia.	-	-
2.0	Jenayah Harta Benda	2.1 Pecah rumah dan curi (siang)	274	282
		2.2 Pecah rumah dan curi (malam)	314	788
		2.3 Curi motor lori / van	130	353
		2.4 Curi motokar	280	884
		2.5 Curi motosikal	2057	2447
		2.6 Curi ragut	124	348
		2.7 Lain-lain curi.	1047	1189
JUMLAH KESELURUHAN			**4891**	**6291**

Sumber : Laporan Kajian Pemetaan Jenayah Bandar PBT (A) dan PBT (B), Januari 2009.

▲ Jadual 2.0 : Kategori dan Jenis Jenayah

Kedua-dua kategori jenayah di atas mempunyai maklumat alamat dan lokasi jenayah di mana jenayah tersebut berlaku. Namun bagi kes jenayah tertentu, lokasi kejadian mungkin bukan tempat kejadian sebenar.

Data-data jenayah yang diperolehi daripada IPD ini adalah seperti yang terdapat di dalam Borang POL.55. Borang POL.55 mengandungi berbagai data mengenai sesuatu laporan Polis oleh pengadu. Bagaimanapun hanya beberapa maklumat umum sahaja diperlukan untuk tujuan pemetaan jenayah. Manakala maklumat-maklumat peribadi tidak diperlukan untuk tujuan pemetaan jenayah. Maklumat-maklumat yang mesti ada ialah :

i. Jenis Jenayah
ii. Tarikh / Masa Laporan
iii. Tarikh / Masa Kejadian
iv. Alamat kejadian
v. Kerugian

Kelima-lima maklumat ini sudah cukup untuk proses pemetaan dan analisis *hotspot* jenayah. Setiap kes jenayah yang dipetakan nanti akan diletakkan unik ID. Dengan unik ID ini, IPD atau PBT boleh membuat *linking* data sendiri di antara peta jenayah dengan *database* jenayah. Proses ini akan membentuk peta jenayah yang mempunyai maklumat jenayah yang lebih lengkap seperti maklumat mangsa dan suspek.

Disyorkan supaya data yang perlu dibekalkan oleh IPD kepada PBT dalam bentuk digital (softcopy). Serahan data jenayah dalam bentuk cetakan (hardcopy) memerlukan pembangunan semula pangkalan data digital tersebut.

ISU BERKAITAN DATA JENAYAH

Terdapat beberapa isu berkaitan perolehan dan data jenayah dan tindakan yang perlu diambil untuk melancarkan proses pembangunan pemetaan jenayah di PBT.

i. Masalah alamat tidak lengkap. Terdapat alamat kejadian yang tidak lengkap atau terlalu umum direkodkan di dalam laporan jenayah seperti di Jalan Utama atau Shah Alam sahaja. Alamat kejadian yang terlalu umum tidak dapat di*geocode* kemudian. Kaedah terbaik untuk mengatasi masalah ini ialah dengan memetakan terus lokasi jenayah semasa laporan dibuat. Pihak polis boleh dibantu dengan aplikasi *mapbrowser* untuk mencerap lokasi jenayah semasa laporan mangsa dibuat.

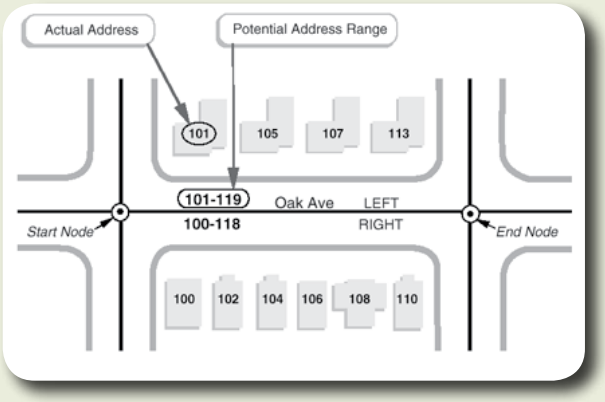
ii. IPD menyerahkan data-data rekod jenayah kepada PBT dalam bentuk digital bagi memudahkan proses *geocoding* dibuat. Data polis yang diterima dalam bentuk *hardcopy* menyebabkan perlunya membangunkan semula pangkalan data digital jenayah tersebut.

iii. Sempadan pentadbiran yang berbeza antara jabatan polis dan PBT menyebabkan pengumpulan maklumat terpaksa dibuat di beberapa IPD untuk pemetaan jenayah di sesebuah PBT. Oleh kerana terdapat data dari sumber IPD berlainan, proses *geocoding* perlu dibuat dengan berhati-hati.

PEMBENTUKAN PETA ALAMAT

Sebelum proses *geocoding* dibuat, suatu peta alamat yang lengkap perlu disediakan untuk menghubungkan data rekod jenayah di IPD menggunakan *field* alamat dari pangkalan data dengan lokasi di tapak kejadian.

Peta alamat boleh dibangunkan di atas poligon bangunan atau mengikut segmen jalanraya. Peta alamat yang tepat adalah mengikut poligon bangunan manakala di atas segmen jalanraya lebih kepada 'potential address range' sahaja. Contoh peta alamat di atas segmen jalan adalah seperti dibangunkan oleh U.S. Census Bureau dipanggil *TIGER Map* (*Topological Integrated Geographic Encoding and Referencing*).



▲ Rajah 2.0 : Contoh peta alamat di atas segmen jalan berbanding peta alamat sebenar di atas poligon bangunan.

PETA ALAMAT DI ATAS SEGMEN JALAN RAYA

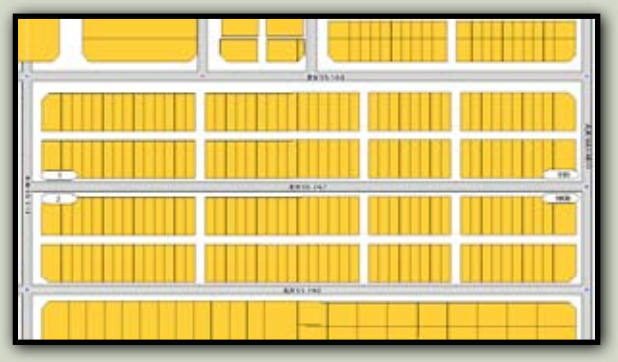
Kaedah paling cepat dalam membina peta alamat adalah dengan memecahkan segmen jalan mengikut nombor bangunan/rumah yang terdapat di sepanjang jalan tersebut.

Bagi pemetaan jenayah di PBT (A) dan PBT (B), perunding membangunkan peta alamat di atas segmen jalanraya. Ciri-ciri peta alamat di atas lapisan jalanraya tersebut ialah :

i. Mengenalpasti *line direction* bagi jalanraya yang dirujuk.

ii. Memasukkan nilai mula dan nilai akhir nombor bangunan/rumah di sebelah kiri dan kanan jalanraya. Sistem ini memerlukan kita menetapkan kedudukan nombor genap dan ganjil sama ada di sebelah kiri atau kanan jalan.

Rajah 3.0 menunjukkan nombor rumah dari 1 hingga 999 (nombor ganjil) di sebelah atas Jalan SS3/62 manakala nombor 2 hingga 1000 (nombor genap) dimasukkan di sebelah bawah jalan. Walau bagaimanapun, peta jalan raya hendaklah lengkap dan sedia ada di atas format GIS.



▲
Rajah 3.0 : Contoh Peta Alamat Atas Jalan Untuk PBT (B)

KELEMAHAN PETA ALAMAT DI ATAS SEGMEN JALANRAYA

Hasil daripada pemetaan jenayah yang dijalankan di PBT (A) dan PBT (B), beberapa kelemahan penggunaan peta alamat di atas segmen jalan raya telah dikesan. Kelemahan-kelemahan tersebut ialah :

i. Lokasi tidak tepat di atas poligon rumah yang dirujuk terutama untuk cerapan kejadian jenayah pecah rumah. Ini kerana proses *geocode* menggunakan peta alamat di atas jalan bergantung kepada jarak *offset* dari *centerline* jalan raya. Kebanyakan hasil *geocoding* ini tidak jatuh tepat ke atas poligon rumah tersebut.

ii. Tidak semua alamat boleh dibina di atas lapisan jalan raya terutama alamat untuk pangsapuri atau bangunan pejabat. Alamat kediaman yang tidak berbentuk nombor atau campuran nombor dan abjad juga tidak dapat di*geocode* seperti No.145B atau No.20C.

iii. Kesilapan menentukan kedudukan nombor genap dan ganjil mengikut *line direction* menyebabkan lokasi jenayah di*geocode* ke bahagian jalan yang bertentangan. Lokasi sepatutnya di sebelah kanan tapi telah di*geocode* ke sebelah kiri jalan.

PROSES *GEOCODING*

Geocoding adalah proses untuk membentuk pemetaan spatial data-data jenayah di dalam GIS. Pada masa ini, rekod jenayah hanya menyimpan maklumat tempat kejadian tanpa merujuk kepada koordinat geografi tempat kejadian di tanah. Salah satu kaedah untuk mendapatkan koordinat geografi kejadian jenayah adalah dengan mencerap semula koordinat di tempat kejadian dengan menggunakan GPS.

Setiap kes jenayah dari rekod Polis akan ditandakan di atas peta GIS tersebut melalui kaedah *on-screen digitizing*. Kaedah lain adalah dengan cara padanan alamat kejadian (address-matching) dengan alamat di dalam peta GIS. Pelbagai pendekatan atau aplikasi GIS boleh dibangunkan bagi memudahkan proses *geocoding* jenayah dibuat.

KAEDAH-KAEDAH *GEOCODING*

Geocoding boleh dibuat sama ada di atas segmen jalan, poligon blok bangunan atau pada titik tengah (centroid) sempadan kawasan seperti blok banci, poskod, taman perumahan dan lain-lain. Semua proses *geocoding* ini adalah bergantung kepada alamat dan kejituan peta yang ada. Sekiranya peta alamat yang dibangunkan menunjukkan perincian sehingga ke peringkat poligon bangunan, peta jenayah (terutama jenayah pecah rumah) akan tepat sehingga ke unit bangunan.

Bagi kajian pemetaan jenayah di PBT (A) dan PBT (B), proses *geocoding* dijana menggunakan peta alamat di atas segmen jalan raya. Terdapat dua kaedah *geocoding* yang dijalankan iaitu :

i. *Auto Geocoding* Menggunakan MapInfo berdasarkan Peta Alamat

Auto geocoding yang dijalankan di peringkat ini adalah menggunakan perisian GIS *MapInfo Professional* berdasarkan kepada peta alamat yang telah dibangunkan di atas. Proses *geocoding* dibuat secara automatik menggunakan keupayaan GIS. Data rekod jenayah cuba dipadankan secara terus ke peta alamat berdasarkan kepada maklumat nombor bangunan/rumah dan nama jalan yang sama (*address-matching*).

Untuk memastikan proses ini berjalan lancar, perunding perlu memastikan kemasukan maklumat terutama nama jalan adalah sama di dalam kedua-dua pangkalan data tersebut iaitu data rekod jenayah dan peta alamat. Kesilapan ejaan atau singkatan perkataan akan menyebabkan proses padanan ini tidak dapat dijalankan secara automatik.

ii. Manual *Geocoding*

Manual geocoding dibuat melalui pemerhatian dan semakan ke atas peta, gambar satelit dan pemahaman berkaitan lokasi di mana jenayah berlaku. Kaedah yang digunakan di sini adalah *on-screen digitizing* di mana perunding akan mendigit kedudukan jenayah apabila tempat kejadian telah ditemui semasa semakan peta dibuat tadi. Terdapat pelbagai sumber peta yang boleh dirujuk di internet seperti Google Earth, Google Maps, laman Wikimapia.Org, Yellow Pages untuk memudahkan pengesanan lokasi jenayah secara manual.

MASALAH *AUTO GEOCODING*

Semasa menjalankan proses *auto geocoding* terdapat beberapa isu dan masalah telah dikenal pasti. Masalah ini menyebabkan proses *auto geocoding* tidak dapat dibuat sepenuhnya. Isu-isu tersebut ialah :

i. Masalah berkaitan *abbreviations*

Masalah ini biasanya berkaitan dengan ejaan ringkas nama tempat atau jalan. Sebagai contoh untuk perkataan 'Jalan' kepada 'Jln' atau 'Lorong' kepada 'Lrg'. GIS tidak dapat *geocode* kedua-dua data ini kerana berbeza. Bagi kes-kes begini, proses manual *geocode* dijalankan dalam *interactive mode* di mana perunding berperanan menentukan *address-matching* tersebut.

ii. Nama tempat mengikut gelaran orang tempatan

Nama tempat berbeza dengan panggilan yang diberi oleh penduduk tempatan. Walaupun ia merujuk kepada lokasi yang sama, tetapi disebabkan nama yang berbeza, proses *auto geocode* tidak boleh dijalankan. Sebagai contoh seperti 'Up Town' sedangkan pada alamat ia merujuk kepada 'Pusat Bandar Damansara Utama'.

iii. Silap ejaan

Kesilapan yang biasa dibuat ialah silap ejaan pada nama jalan. Kesilapan ejaan ini juga mungkin disebabkan nama tersebut boleh dieja dalam dua cara. Contohnya seperti nama tempat 'Air' dengan 'Ayer' atau 'Alor Star' dengan 'Alor Setar'. Kesilapan ejaan begini banyak berlaku dan proses *auto geocode* tidak dapat dijalankan.

iv. Alamat penuh dimasukkan pada ruang data yang salah

Masalah ini adalah berkaitan dengan kesilapan memasukkan maklumat pada ruang data yang disediakan. Masalah ini memerlukan kerja-kerja kemaskini dan semakan data dibuat dan diperbetulkan mengikut ruang data yang betul. Contoh kesilapan ini adalah seperti mencampurkan nama jalan dengan nama taman di dalam satu ruang data. Contohnya seperti 'Jalan Harmoni 3, Tmn Harmoni' dimasukkan pada ruang data 'Nama Jalan'.

v. Alamat tidak lengkap

Alamat tidak lengkap merupakan masalah data yang paling banyak ditemui di dalam data jenayah PBT (B) dan PBT (A). Terdapat maklumat alamat yang terlalu umum seperti 'di depan Jalan Besar' dan lain-lain. Alamat kejadian tidak menyatakan nombor bangunan/rumah dan proses *geocode* dengan peta alamat tidak dapat dibuat.

vi. Alamat merujuk kepada kawasan lapang atau tempat awam

Terdapat juga kes jenayah yang dilaporkan terjadi di tempat-tempat awam yang tidak beralamat seperti di tempat letak kereta, taman kanak-kanak atau di laluan penjalan kaki. Tempat-tempat kejadian jenayah seperti ini memerlukan proses *manual geocoding.*

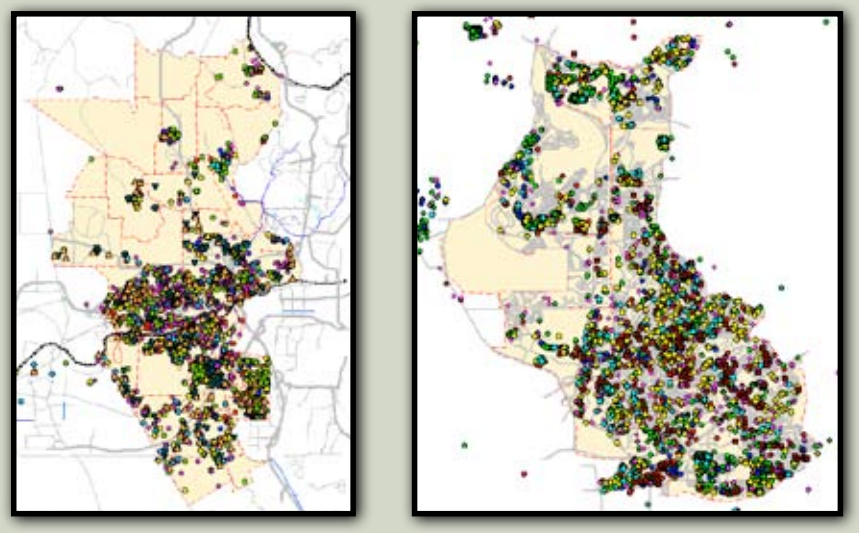
vii. Alamat tidak wujud atau peta alamat tidak *up to date*

Perkara yang biasa berlaku ialah peta alamat tidak *up-to-date.* Maklumat-maklumat jalan baru tidak dimasukkan di atas lapisan data peta alamat. Ini menyebabkan terdapat rekod jenayah tidak dapat di*geocode*.

PENGHASILAN PETA JENAYAH

Hasil akhir daripada proses *geocode* adalah suatu peta digital pin jenayah. Peta ini menunjukkan taburan jenayah di dalam kawasan pentadbiran yang dirujuk dalam bentuk *point*. Dari peta ini, kita sebenarnya telah boleh mengenal pasti kawasan *hotspot* jenayah dengan melihat intensiti tompok pin jenayah.

Rajah 4.0 menunjukkan peta jenayah untuk kawasan PBT (A) dan PBT (B) pada tahun 2007.



▲ Rajah 4.0 : Peta Jenayah Kawasan PBT (A) dan PBT (B) 2007.

ANALISIS DATA JENAYAH

Peringkat seterusnya ialah menjalankan analisis berdasarkan peta jenayah yang telah disediakan itu. Peta jenayah digital dalam format GIS lebih mudah untuk dianalisis. Analisis jenayah utama adalah untuk mengenal pasti kawasan dan masa *hotspot* jenayah. Di manakah kawasan yang selalu berlaku jenayah dan bilakah masanya.

Analisis data jenayah ini, terbahagi kepada dua iaitu Analisis *Spatial Hotspot* dan Analisis *Timeline Graf Hotspot*.

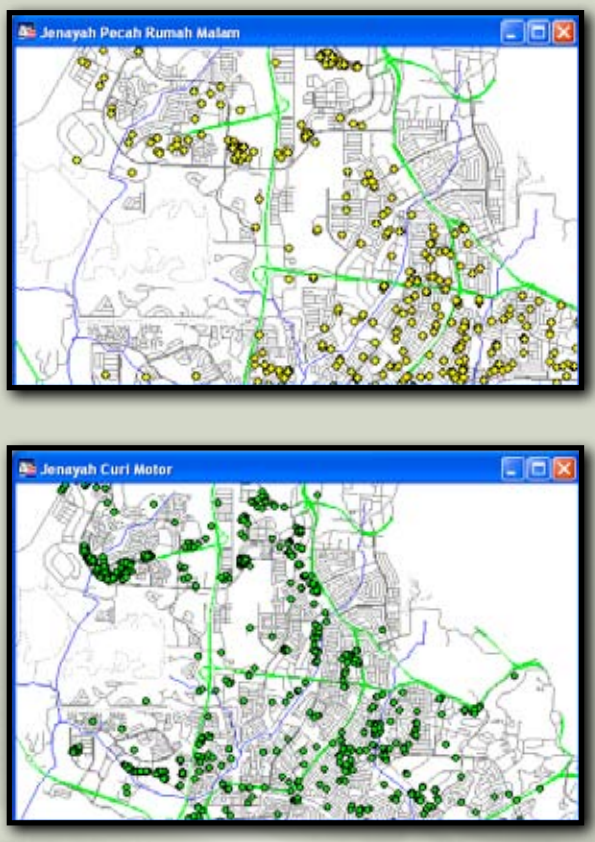
ANALISIS SPATIAL TOMPOK JENAYAH (*HOTSPOT*)

Analisis spatial akan menunjukkan peta-peta hotspot jenayah hasil daripada teknik-teknik penganalisisan yang dibuat. Terdapat beberapa teknik dan kaedah analisis kawasan *hotspot* yang biasa dibuat. Ada teknik-teknik yang boleh dibuat secara manual dan ada yang memerlukan bantuan aplikasi atau perisian GIS tertentu untuk memprosesnya. Teknik-teknik analisis *hotspot* tersebut adalah seperti yang diterangkan di bawah.

PETA HOTSPOT JENAYAH DARI *POINT MAPS*

Proses *geocode* akan menghasilkan peta jenayah dalam bentuk titik di mana setiap satu titik akan mewakili satu kes jenayah. Ini merupakan teknik yang paling asas dan tradisi dalam pemetaan jenayah.

Rajah 5.0 di bawah menunjukkan peta pin jenayah curi motor dan pecah rumah malam di kawasan PBT (B). Menggunakan teknik ini, kita dengan mudah dapat mengenalpasti kawasan *hotspot* berdasarkan tumpuan titik-titik jenayah di atas peta.



▲ Rajah 5.0 : Peta Pin Jenayah

Namun begitu, interpretasi *hotspot* mungkin berbeza dengan orang lain dari segi lokasi, saiz dan bentuk. Setiap orang akan menterjemahkan *hotspot* masing-masing dan sukar untuk menentukan *hotspot* mana yang betul.

Masalah lain dari teknik ini adalah untuk mengesan titik-titik jenayah yang bertindih atau kes berulang pada tempat yang sama. Ini disebabkan lokasi jenayah dipaparkan dalam bentuk *point*. Di samping itu, apabila terlalu banyak kes jenayah, kita mungkin tidak dapat mengenal pasti kawasan *hotspot* langsung atau mengkategorikan semua kawasan adalah *hotspot.*

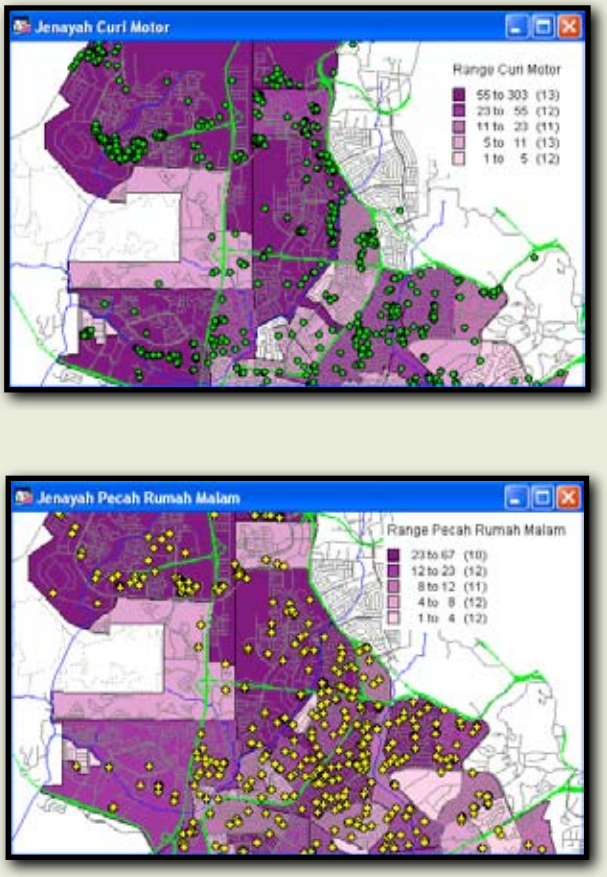
'*THEMATIC MAPPING*' SEBAGAI HOTSPOT JENAYAH

Teknik ini juga selalu digunakan dengan membuat *thematic mapping* berdasarkan kepada bilangan *point* jenayah di dalam sesuatu sempadan kawasan. Disebabkan kes jenayah dipetakan dalam bentuk *point*, ia boleh diagregatkan di dalam GIS mengikut sempadan kawasan seperti Poskod, Sempadan Mukim, Sempadan Seksyen, Sempadan DUN, Blok Banci dan lain-lain. *Thematic Mapping* yang dibina akan menunjukkan *range* kawasan yang paling tinggi bilangan jenayah hingga yang terendah.

Rajah 6.0 menunjukkan *thematic mapping* kawasan jenayah. Daripada *tone* warna yang ditunjukkan, kita dapat mengenal pasti kawasan *hotspot.* Namun terdapat beberapa kelemahan daripada teknik ini. Saiz dan bentuk sempadan kawasan yang berbeza mempengaruhi kawasan *hotspot*. Di samping itu, taburan jenayah mungkin pada satu sudut di sempadan kawasan sahaja tetapi *hotspot* merangkumi keseluruhan kawasan sempadan tersebut. Di samping itu juga, sempadan kawasan yang berbeza akan menunjukkan kawasan *hotspot* yang berbeza walaupun menggunakan peta pin jenayah yang sama. Cuba bandingkan *thematic mapping* menggunakan sempadan seksyen dan satu lagi menggunakan sempadan Blok Banci.

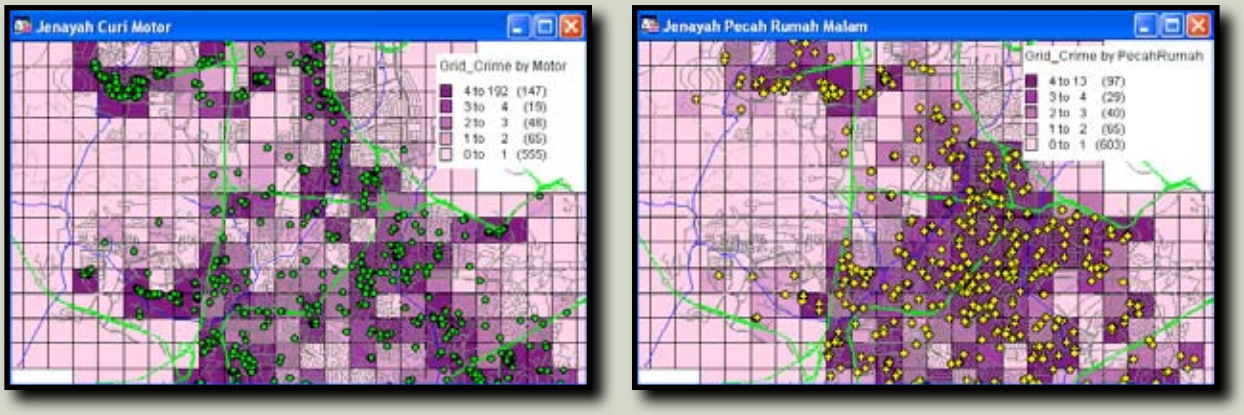
GRID *THEMATIC MAPPING* SEBAGAI *HOTSPOT* JENAYAH

Teknik yang boleh digunakan untuk mengatasi masalah saiz dan bentuk kawasan yang berbeza adalah dengan menggunakan grid yang seragam. Setiap sel grid mempunyai saiz yang sama. Jumlah point jenayah yang terdapat di dalam grid tersebut akan digunakan untuk membina *thematic mapping*. Paparan peta akan menunjukkan *density* jenayah di dalam grid seperti ditunjukkan di dalam Rajah 7.0.



▲
Rajah 6.0 : *Thematic Mapping Hotspot* Jenayah

Bagaimanapun, adalah sukar untuk menetapkan saiz grid yang sesuai digunakan. Panduan yang digunakan untuk membina grid adalah dengan mengambil jarak kawasan dan dibahagi dengan 50. Teknik ini banyak bergantung kepada saiz grid. Grid yang besar dapat menunjukkan kawasan *hotspot* dengan lebih banyak tetapi sempadan spatial yang umum manakala grid yang terlalu kecil pula tidak dapat menunjukkan kawasan *hotspot* dengan jelas atau tiada *hotspot* langsung.



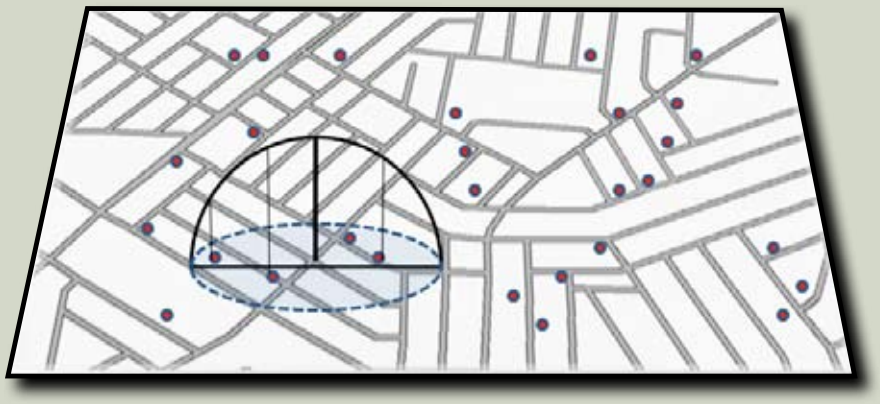
▲ Rajah 7.0 : *Grid Thematic Mapping*

CONTINUOUS SURFACE SMOOTHING METHODS

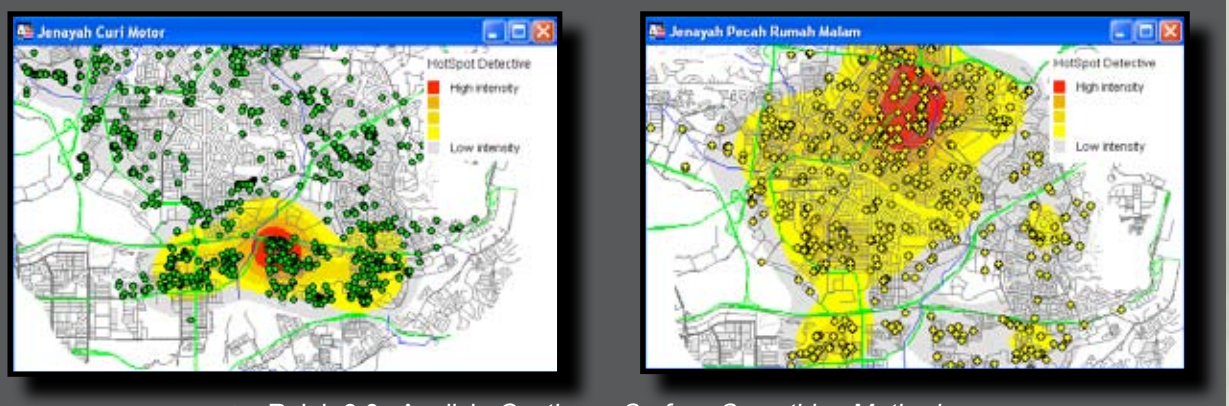
Teknik ini lebih tepat dan sangat popular digunakan. Teknik ini menggunakan nilai intensiti atau populasi dari satu sampel lokasi untuk mengandaikan nilai bagi semua sampel lokasi yang berhampirannya. Teknik ini juga dikenali sebagai Teknik *Quadratic Kernel Density Estimation*. Teknik ini telah digunakan dalam membangunkan pemetaan jenayah PBT (A) dan PBT (B).

Biasanya dua parameter utama perlu dimasukkan semasa menjana analisis ini iaitu saiz sel dan *bandwith. Bandwith* akan menjadi parameter utama untuk menentukan hasil *hotspot* tersebut.

Rajah 9.0 : *Bandwidth Hotspot* Jenayah



▲ Hasil analisis adalah seperti di dalam Rajah 9.0.



▲ Rajah 9.0 : Analisis *Continous Surface Smoothing Methods*

Antara perisian GIS yang menggunakan model *quadratic kernel density estimation* adalah seperti *Hotspot Detective* dan *Vertical Mapper* di dalam perisian GIS *MapInfo Professional*.

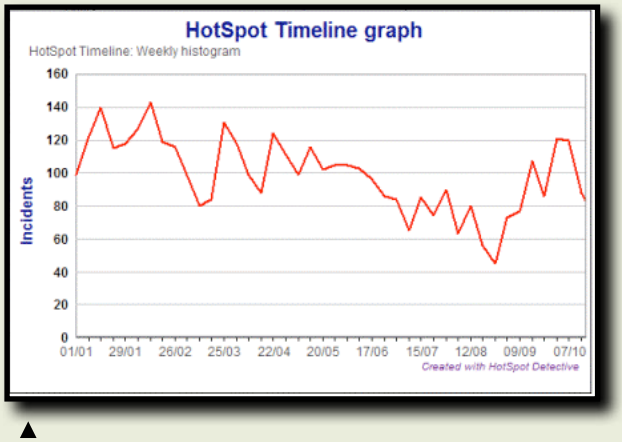
ANALISIS *TIMELINE* GRAF TOMPOK JENAYAH (*TIME HOTSPOT*)

Analisis tompok jenayah juga boleh ditunjukkan dalam bentuk *timeline graph*. Tompok jenayah mengikut *timeline* ditunjukkan mengikut bulan, minggu, hari dan jam. Pengesanan masa panas (*time hotspot*) ini memudahkan jadual pemantauan dan rondaan pihak keselamatan dibuat mengikut *trend* kejadian jenayah dari segi waktu kejadian.

Terdapat dua teknik pengiraan masa kejadian jenayah yang digunakan untuk mengenal pasti *time hotspot*. Teknik *timeline* tersebut adalah seperti disebutkan di bawah:

KES JENAYAH MASA KEJADIAN YANG SPESIFIK (*SIMPLE COUNT*)

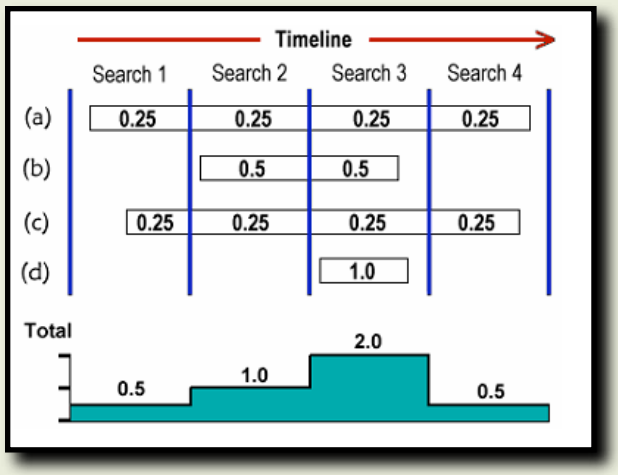
Teknik ini lebih mudah untuk mengenal pasti *time hotspot* iaitu dengan mengambil masa mula dan masa tamat kejadian sahaja. Kes-kes jenayah yang diketahui masa kejadian dengan tepat sesuai menggunakan teknik ini untuk mengenal pasti *time hotspot.*



▲ Rajah 10.0 : *Timeline Graph - Weekly Histogram*

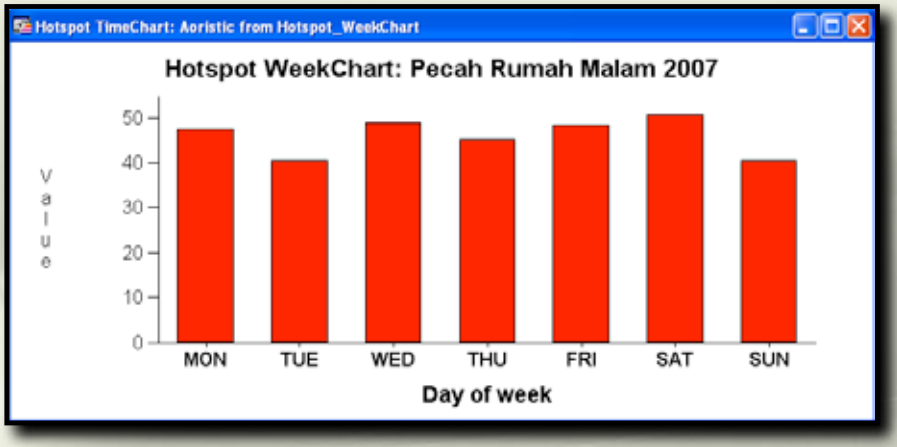
KES JENAYAH MASA KEJADIAN TIDAK SPESIFIK (*AORISTIC ANALYSIS*)

Istilah *aoristic* diambil daripada perkataan Greek yang membawa maksud '*without defined occurrence in time*'. Istilah ini digunakan sebagai satu teknik analisis *hotspot* bagi masa kejadian jenayah yang tidak tepat (*unspecific time*). Contoh jenayah yang mempunyai masa kejadian yang tidak tepat adalah seperti jenayah pecah rumah yang pemiliknya tiada di rumah semasa kejadian berlaku. Biasanya masa kejadian kes seperti ini dilaporkan di dalam sela masa tertentu. Contohnya seperti antara pukul 10 malam hingga pukul 3 pagi hari esok.

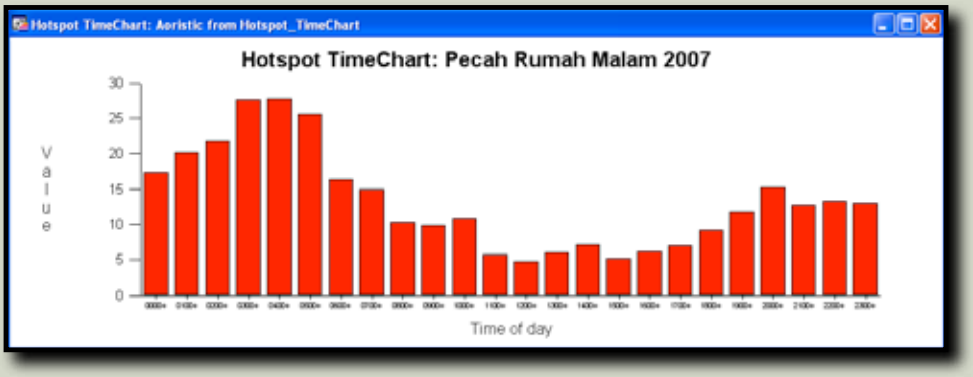


▲ Rajah 11.0 : Rajah Analisis *Aoristik*

Rajah 11.0 menunjukkan rajah bagaimana analisis *aoristic* dibuat. (a-d) adalah jenis jenayah manakala *search* 1 – 4 adalah sela masa 1 jam. Jenayah (a) berlaku antara jam 1 hingga 4 jadi nilai pemberat jenayah (a) dipecahkan kepada 0.25. Nilai pemberat dibahagikan sama bagi setiap jam. Jumlah pemberat akan ditambah dan kita akan dapat mengenal pasti waktu *hotspot*. Contoh hasil analisis adalah seperti di dalam rajah di bawah.



▲ Rajah 12.0 : *Hotspot Weekchart* Pecah Rumah Malam 2007 di PBT (A)



▲ Rajah 13.0 : *Hotspot Timechart* Pecah Rumah Malam 2007 di PBT (A)

PERKONGSIAN DATA

PERKONGSIAN LAPORAN DAN PETA *HOTSPOT*

Kaedah perkongsian data yang paling mudah adalah dengan menyediakan laporan dan peta *hotspot* secara bulanan atau tahunan. Dengan perkongsian peta *hotspot* ini, Pihak Berkuasa boleh membincangkan strategi untuk mencegah kejadian jenayah bagi bulan selanjutnya.

PERKONGSIAN SECARA *WEB BASED CRIME MAPPING*

Data jenayah yang dipetakan boleh dikongsi oleh Pihak Berkuasa untuk mengenalpasti kawasan tompok jenayah.Perkongsian secara *Web Based* Pemetaan Jenayah ini juga membolehkan '*Community Policing*' boleh dilaksanakan di mana pihak NGO atau Persatuan Penduduk mengetahui status jenayah di tempat mereka.

PENUTUP

Artikel ini menunjukkan pemetaan jenayah *hotspot* melalui aplikasi GIS mampu untuk membantu Pihak Berkuasa untuk menangani kes-kes jenayah di negara ini. Dengan penghasilan pemetaan *Hotspot* Jenayah ia diharap mampu mengenal pasti kawasan-kawasan jenayah untuk membolehkan Pihak Berkuasa melaksanakan langkah-langkah pencegahan jenayah yang terkandung dalam Program Bandar Selamat. KPKT. Bagaimanapun terdapat beberapa cabaran dalam melaksanakan pemetaan jenayah bandar adalah seperti berikut :

i. Kesediaan IPD untuk berkongsi data jenayah dengan PBT masih lagi melalui proses birokratik dan kebenaran daripada pihak atasan.Data-data jenayah yang diperolehi telah pun ketinggalan masa (*out of date*). Adalah lebih berkesan jika pemetaan jenayah ini dilaksanakan setiap bulan untuk membolehkan pencegahan dibuat pada bulan hadapannya.
ii. Inisiatif IPD untuk membangunkan laman *web* di peringkat bandar dan daerah bagi memaklumkan kawasan tompok jenayah dalam bandar atau daerah adalah sangat dialu-alukan.
iii. Kesediaan IPD untuk melaksanakan pemetaan jenayah secara intensif dengan menempatkan pegawai geomatik untuk mengendalikan pemetaan jenayah di peringkat bandar dan daerah.
iv. Kesediaan IPD mula mencerap koordinat lokasi jenayah dalam setiap laporan kes jenayah yang diterima bagi memudahkan pemetaan jenayah dibuat.

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[1,2] Integrated Geoplanning Sdn Bhd
Kuala Lumpur

ESTABLISHING QUANTUM GIS AS THE PRINCIPAL GIS IN THE PUBLIC SECTOR

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ABSTRACT

The Federal Department of Town and Country Planning, Peninsular Malaysia (JPBD) aware of the Ministry of Housing and Local Government's (KPKT) effort to implement the Malaysian Public Sector Open Source Master Plan decided in 2009 to research on the availability of Open Source Software (OSS) Geographical Information System (GIS) which could meet the requirements of currently used proprietary GIS because it is a heavy user of GIS. This eventually led to Quantum GIS (QGIS) which JPBD promotes nationwide throughout the department and hopes will extend to other public agencies that use a GIS.

QGIS is a multi-platform application available on different operating systems including Mac, Linux, Unix and Windows. It was established in 2002 and matured with the stable QGIS 1.0 Kore in January 2009. Community support is vital for Open Source and to channel this support, QGIS has a blog, forum, user mailing list and an Internet relay chat (IRC) channel. Being available in many languages also led to its fast growth. The current version launched in January 2010 is QGIS 1.4 Enceladus.

In effort to be thrifty, JPBD, like other government departments sees funds being substantially squeezed annually. Thus, it is timely to exploit OSS and JPBD sees QGIS as a viable option that can still help achieve its mission under the OSS umbrella. JPBD also wants to contribute towards the betterment of other government agencies via OSS. To capitalize on this, the public sector is encouraged to exploit QGIS. To give added value, JPBD is currently embarking on a pilot project to implement a QGIS analytical plugin for hilly areas and highlands. Other plugins are waiting in queue. As the success of any OSS multiplies itself when more parties use the same application, it is hoped a common interest in QGIS will eventually benefit the public sector particularly in the sphere of GIS, education, collaboration and public spending.

BACKGROUND

The Federal Department of Town and Country Planning, Peninsular Malaysia (JPBD) had long acknowledged the importance of capitalizing on the benefits of Open Source Software (OSS) as far as 2002 and fully established its own server farm based on OSS by 2004. The Malaysian Public Sector Open Source Master Plan came second and was launched on 16.7.2004. It compliments the pioneer efforts made by JPBD.

When JPBD migrated to a digitized environment in the 80s, the use of proprietary software was a norm as also with other public agencies. In the world of town and country planning, the Geographical Information System (GIS) is the most effective digital tool to transform hard copies of geo-spatial work on town and country planning into a digital format. In this respect, GIS with town and country planning go hand-in-hand. Thus, it was common practice for JPBD to use proprietary GIS in the preparation of development plans for local planning authorities whom subsequently also chose the similar GIS because it was convenient to retrieve or analyse that GIS data.

As the majority of GIS applications throughout the world at the desktop level run on Microsoft Windows, JPBD traditionally uses ESRI and MapInfo products. To compliment that, digital information sourced from key agencies such as local planning agencies, state planning departments and the Survey and Mapping Department (JUPEM) often came as shape or tab files. Although it would be ideal, JPBD did not set any policy when choosing a proprietary GIS because that could be misconstrued as having ulterior motives. Thus, it was left to users to decide which they prefer. As GIS is a complex tool to master, more often than not, GIS procurement was based on familiarity of use. Here, it was found that users usually preferred MapInfo when mapping was emphasized and the more established ESRI products when analysis was concerned though from a cost point-of-view, MapInfo was more popular.

In early 2009, the department was told the Ministry of Housing and Local Government (KPKT) in line with MAMPU's Malaysian Public Sector Master Plan, was desirous of giving OSS priority over proprietary software for all departments under its wing. KPKT's seriousness of adopting this policy saw OpenOffice.org installed as the office suite for new computers throughout the Ministry beginning 2009. In the anticipation this move may eventually extend to the operating system, JPBD made a decision to research on OSS GIS.

OBJECTIVES

1. To find a GIS application, if possible, that works on both Windows and the OSS platform. This would help ease the transition from Windows to the Open Source operating system;

2. To find an OSS GIS that is user-friendly with functions and features similar to proprietary GIS currently used by JPBD;

3. To establish a de facto GIS for JPBD and hopefully extend it to relevant public agencies; and

4. To reduce the spending of public funds for ICT infrastructure in the Public Sector.

QUANTUM GIS (QGIS)

The Wikipedia list of GIS software found as many as 14 OSS GIS. The best OSS GIS is arguably the Geographic Resources Analysis Support System (GRASS) developed by the U.S. Survey Department for the U.S. Military. While GRASS displays the real world situation through a 3-D GIS format, GIS applications used by JPBD use a 2 ½ D format. This means integration of JPBD's GIS data with GRASS would be messy and require a GRASS interface to synergize between the different formats. To start fresh JPBD's GIS data with GRASS would be tedious, time-consuming and expensive. Another minus point for GRASS is that it is heavy on script commands, therefore, not user-friendly for JPBD users whom are mainly non-programmers.

QGIS is a multi-platform application available on different operating systems including Mac, Linux, Unix and Windows. It aims to be and users will agree it is easy to install and use. It has a small file size, requires less RAM or processing power which makes it appropriate on older hardwares or running simultaneous other applications where CPUs power may be limited. QGIS variety of analytical tools is growing with the development and enhancement of user-contributed plugins since QGIS is a volunteer driven project of the Open Source Geo-spatial Foundation (OSGeo). QGIS was established in 2002 and matured with the

release of the stable QGIS 1.0 Kore in January 2009. Community support is vital for Open Source and to channel this support, QGIS has a blog, forum, user mailing list and Internet relay chat (IRC) channel to provide access to help and advice. Being available in over 30 different languages also led to its fast growth. The current version launched in Jan 2010 is QGIS 1.4 Enceladus. The choice of OSS GIS eventually came down to QGIS because:

1. QGIS is available in both Windows and OSS platform. This makes it an excellent choice to encourage a gradual transition from Windows to the OSS operating system;

2. QGIS looks alike and operates similarly in both Windows and OSS versions. This reduces the need to re-learn the ropes when migrating QGIS from Windows to the OSS operating system;

3. QGIS web site offers fast, reliable and easily accessible downloads;

4. QGIS has an active and responsive community support;

5. QGIS actively updates to improve versions and this is a promising sign;

6. QGIS is available for the Linux Ubuntu operating system already installed on a number of office computers. This means better integration between the two;

7. GRASS modules are inter-changeable with QGIS. There are over 300 GRASS modules available to choose from; and

8. QGIS is easy, simple to use and user-friendly.

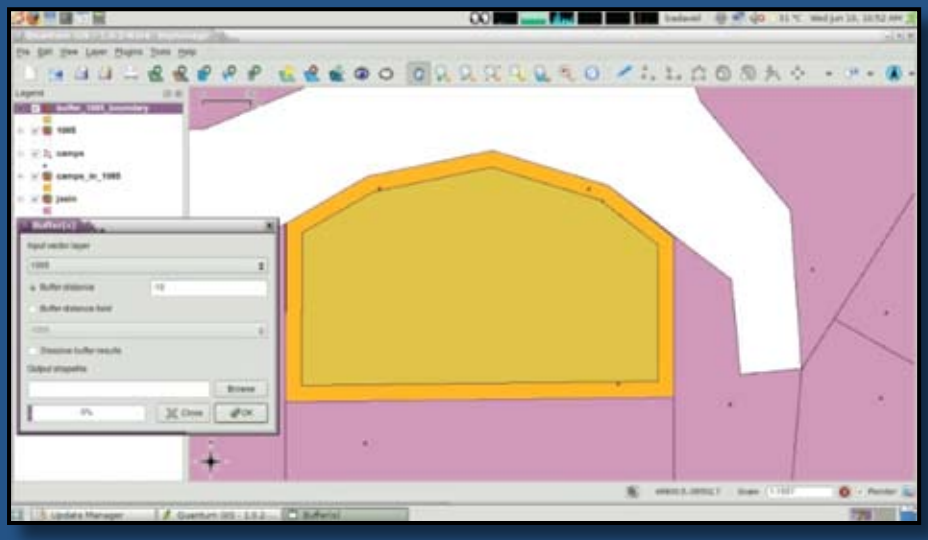
http://en.wikipedia.org/wiki/List_of_geographic_information_systems_software

JPBD research and development on QGIS showed that:

1. The installation of QGIS 1.0.1 on an Ubuntu 8.0.4 Pentium IV computer proved successful inclusive of downloading plugins from external repositories with the aid of the QGIS Python Package Installer. The installation of QGIS 1.0.1 on a Windows XP Pentium IV computer proved successful but faced problems in uploading the QGIS Python Package Installer. That made it difficult, if not impossible to download plugins.

2. A change for the better came when QGIS 1.0.2 was released on 13.5.2009. The installation of both versions of QGIS 1.0.2 proved successfully on the Ubuntu 8.0.4 Pentium IV computer and the Windows XP Pentium IV computer. The QGIS Python Package Installer came as a default package and now made possible the downloading of plugins. On the Windows platform, the additional installation of Microsoft C++ Runtime Libraries 2005 and 2008 are required.

3. As MIMOS Prisma computers and MIMOS CL-51 notebooks are used by the staff, tests were carried on spare units to determine whether QGIS could run on these hardware. It was found that the MIMOS Prisma computer was incompatible with both Ubuntu 8.0.4 and Ubuntu 9.0.4. Nevertheless, QGIS ran smoothly on the MIMOS CL-51 notebook installed with Ubuntu 8.0.4.



◄ The buffering tool can be a useful tool for land acquisition.

▲ The identification of a specific lot with the attribute table works well.

FINDINGS

1. QGIS being available in both Windows and Linux platform gives users more confidence and ease to migrate from Windows to the OSS operating system.

2. QGIS installation is fast, easy and does not require much hard disk space.

3. QGIS is simple to use as claimed. ArcGIS users will be more at home with QGIS because it operates closer to ArcGIS than MapInfo where files are only saved as shape files.

4. The default Coordinate Reference System (CRS) is WGS 84. Malaysian CRS namely, Kertau (RSO), Kertau 1968 and Cassini GDM2000 for all states grid in Peninsular Malaysia are incorporated in QGIS but customize CRS is available.

5. Unlike proprietary GIS, QGIS has the ability to simultaneously view shape and tab files. There is no hassle in file conversion or lost of data accuracy as no data conversion is needed. This saves a lot of time in work.

6. Data analysis and editing as, with MapInfo and ArcGIS, is only possible when a file is saved in its default file extension and in the case of QGIS, a shape file.

7. Retrieving a multi-coloured tab file such as a landuse plan with QGIS is not perfect. This is similar when retrieving converted tab files for ArcGIS and converted shp files for Mapinfo. All colours in that landuse plan are replaced by a default colour. However, the colour codes in the attribute table are not affected. Colour recovery is possible and only takes a few minutes.

8. Previous complaints of the Plugin Installer is a non-issue since it became a default package with QGIS 1.0.2.

9. Plugins are regularly being upgraded. This shows QGIS developers actively improve plugins.

10. Plugins for town planning needs are available but there is still room for improvement.

11. The QGIS User Guide based on QGIS 1.4 is comprehensive and easy to understand.

12. Installation of plugins is simple under Linux but difficult for some under Windows probably because they were developed under Open Source.

13. The community at QGIS Forum is helpful in giving advice but the User Mailing List is better for fast replies and takes less than a day. Developers regularly give advice and personal experience showed that Master Developers take pains to reply private messages.

USE

QGIS was never deployed in JPBD any earlier than 2009. In a way, that is good since the

period before 2009 was a teething period for QGIS. A stable QGIS only arrived with QGIS 1.0.0 Kore in January 2009. JPBD ICT Steering Committee was introduced to QGIS in June 2009 and acknowledged the benefits of QGIS. The Committee in January 2010, impressed by a live demonstration of the Ubuntu operating system and how this could make more efficient OSS such as QGIS requested this knowledge be shared through a training session. That session was held in February 2010 to educate Project Office and State Planning Department representatives how to install Ubuntu and QGIS 1.4 on a Windows and Ubuntu platform in a dual boot concept. This was because government agencies have to use eGovernment applications dependent on Active X. All the same, it gave users hands-on experience of the more efficient Open Source operating system and let them decide for themselves, without prejudice, which operating system is better suited for QGIS.

BENEFITS

1. Savings on Government Expenditure

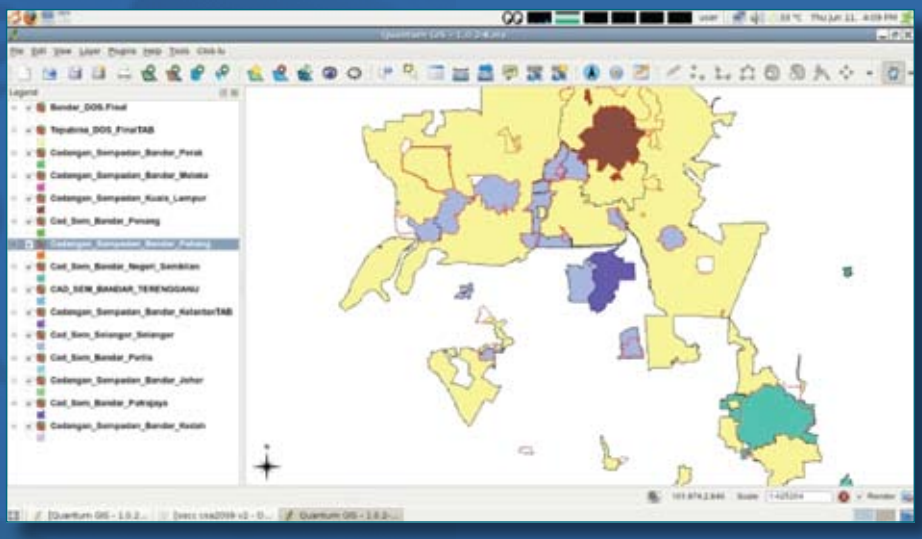
   Based on a desktop ArcGIS that retails for RM10,000/pax, a department that requires 100 desktop ArcGIS needs to spend RM1,000,000. This does not include annual support fee per license to obtain patch-up files and after-sales support. That amount could be put to better use if QGIS was chosen instead. The development of a custom QGIS plugin also brings further financial benefits to the public sector. On the assumption that a custom plugin costs RM50,000 and if a similar proprietary plugin retails at RM10,000, the break-even is achieved after installation by the fifth user. When the Terms of Reference to develop that plugin states it can be distributed and installed freely to all users then the government makes a saving of RM10,000 per user after that break-even. When more people use it, the government saves more. This translates into much saving of public money which the government can divert to other areas of need e.g. education, medical.

2. Standardized GIS application

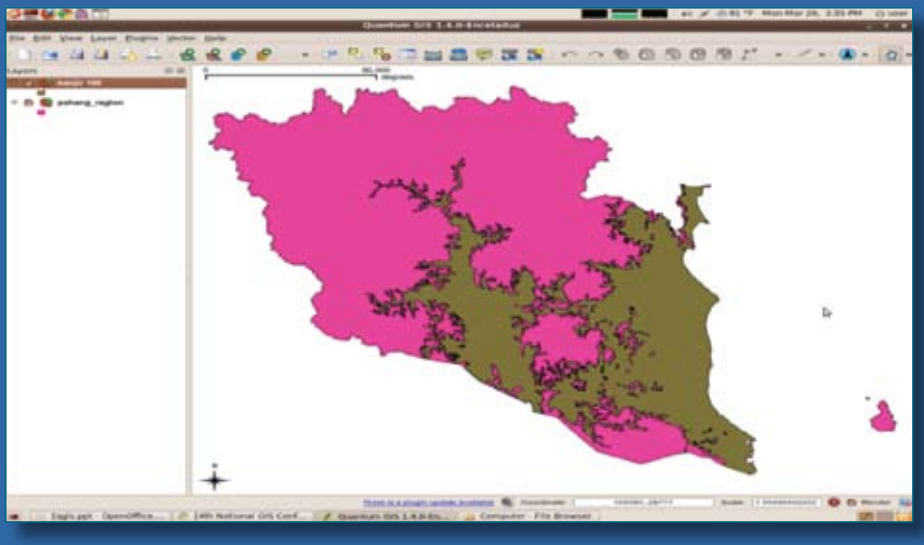
   A standardized GIS such as QGIS through out the public sector would enrich GIS knowledge as knowledge sharing is of the same marque. Training and the printing of user manuals become easier as users only need to be familiar in one make. Installation issues, mapping, data processing and analysis are more fruitful when different agencies use the same GIS. This sharing of common “GIS-ware” will definitely foster closer friendship between departments because related issues and knowledge-sharing can be easily cross-referenced.

3. Ease of use

   No time is wasted from file conversion when different types of file format are used. When proprietary GIS are used for data conversion, chances are that the computer used cannot be used for other works because it may easily hang/crash being over-exerted with extra tasks. This implies that acquiring analytical results by QGIS could be made available faster.



▲ Overlays help identify spatial differences of towns as defined by JPBD and Department of Statistic (DOS).



▲ QGIS simultaneously retrieves shape and tab files without the need for data conversion between flood and administrative maps.

SECOND OPINION

Eva Dodsworths in her review on the usability of QGIS 0.11.0, July 2008 concluded "The features of QGIS are easy to work with and a simple map can be generated quickly. Some of the more complex features such as thematic mapping and querying take more time to understand, and learn to successfully apply it. Some of the more basic features that GIS users would expect are surprisingly not available, such as text or graphic insertion, custom labeling and any image-related manipulation (clipping) or high resolution image export. However, for a free program it is remarkably sophisticated with some very valuable GIS tools. What stands out the most about this program is its editing tools - the ability to easily create, edit and delete shape files and files within it. The raster geo-referencing plug-in is also a remarkable feature. QGIS would satisfy any GIS user who is in need of viewing and manipulating geo-spatial files in a variety of formats, and is interested in creating simple maps with these datasets."

Much of these shortcomings have been addressed with the release of QGIS 1.0.2.

PROMOTION

Some efforts carried by JPBD to promote QGIS are as follow:

1. An article entitled "Towards Open Source at the Desktop" was published in the OSCC Newsletter and the Townplan Journal to promote the use of the Ubuntu operating system, OpenOffice.org and QGIS at the desktop level.

2. A slide presentation entitled "Establishing Quantum GIS as the principal GIS for the Public Sector" was presented at the Malaysian Open Source Conference (MyGOSCCON) 2009 to introduce QGIS to the local Open Source community.

3. The article "Establishing Quantum GIS as the principal GIS for the Public Sector" won the OSCC MAMPU Case Study Awards 2009. This recognition by MAMPU endorses the point that QGIS is a viable OSS against proprietary GIS.

4. The same article "Establishing Quantum GIS as the principal GIS for the Public Sector" has been approved for publication in the Survey and Mapping Department's first quarterly GIS Bulletin 2010 as efforts to disseminate GIS knowledge sharing.

CURRENT PROJECTS

1. QGIS Plugin

   JPBD is currently embarking on a pilot project to implement a hill analysis module in the form of a plugin based on the Planning Guideline for Hilly Areas and Highlands. This will assist local planning authorities at processing planning applications around hilly areas and JPBD Project Offices identify for development plans such as a

local plan hilly, the sensitive areas around hilly areas and highlands which require special attention. Currently, there is no such free module which the department can capitalize on. JPBD is confident the custom plugin can be developed and hopes to distribute it to local planning authorities in an effort to intensify inter-government agency collaboration, share knowledge and help each other to save cost.

2. QGIS User Manual
   The preparation of a User Manual is the starting point to train users and get them to appreciate and understand how to use QGIS. Since the launch of QGIS 1.4 in January 2010, JPBD had been experimenting on the new capabilities of this version. A sketch QGIS User Manual tailored for the preparation of landuse plan was prepared in April 2010.

3. QGIS training course
   With the completion of the QGIS User Manual, it is expected in-house training will be conducted from the 3rd quarter of the year to JPBD Project Offices whom are given the task to prepare development plans, later, to state planning departments. In future, training course may be extended to other government agencies.

LOOKING AHEAD

The department plans to simplify in the distribution of that plugin or upgrades by uploading it at the QGIS User-Contributed Repository. Through this approach, JPBD hopes to attract other public agencies to follow suit, develop their own plugins then share with other public agencies where as a team, can help others reduce their spending on analytical modules based on the plugins they uploaded. JPBD would like to implement a QGIS planning colour plugin so that landuse shape or tab files will automatically display colours according to the landuse planning colour code as specified in JPBD's GIS Manual. This will put QGIS ahead of proprietary GIS since they do not provide that feature. If the QGIS plugin for hilly areas and highlands materializes, the Research and Development Division is also keen extending the development of new plugins to other Planning Guidelines.

CONCLUSION

The path towards Open Source is the innovative way to problem-solving issues that offers freedom over proprietary software. It also offers benefits in cost saving. QGIS represents a fine example where public agencies can capitalize on a basic GIS without having to spend a cent and where it is easy for the public sector to break-even overheads for custom plugins. It may be argued that the current QGIS has limited functions and features in comparison to proprietary GIS. This is true. Then again, QGIS is still in its youth and must be given due time to improve just as proprietary GIS had. Unlike volunteer driven QGIS, proprietary GIS have the advantage of a healthy bank account to finance themselves and in favour of QGIS, it can be counter-argued that it is really unethical to question something for one acquired free. It was gracious enough of the GIS developer to provide it free in the first place. Many people are also reluctant to support a particular application when there is a substitute they are familiar with as exemplified in the reluctant use of OpenOffice.org among public agencies. Adoption is also psychological because some people perceive free items as second class or inferior quality. At the end of the day, the matter of want or want not QGIS depends on whether people can change from an individualistic to a sharing mind-set because there lies the strength of an OSS GIS.

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PERSIDANGAN DAN PAMERAN SISTEM MAKLUMAT GEOGRAFI (GIS) KEBANGSAAN (NGIS) 28 - 29 JUN 2010

PERSIDANGAN DAN PAMERAN SISTEM MAKLUMAT GEOGRAFI (GIS) atau dengan singkatan NGIS merupakan salah satu aktiviti dwi tahunan anjuran Pusat Infrastruktur Data Geospatial Negara (MaCGDI), Kementerian Sumber Asli dan Alam Sekitar (NRE) yang telah dianjurkan bermula penganjuran pertama pada tahun 2004.

Justeru, sehingga sekarang NGIS telah diadakan untuk kali yang ke-4 (NGIS ke-4). Matlamat utama penganjurannya sebagai salah satu usaha membantu kerajaan dalam memantapkan lagi sistem penyampaian perkhidmatan dengan menggunakan teknologi GIS.

Buat julung kalinya penganjuran NGIS ke-4 ini NRE adalah secara bersama dengan Unit Pemodenan Tadbiran dan Perancangan Pengurusan Malaysia (MAMPU) dan juga Jabatan Ukur dan Pemetaan Malaysia (JUPEM) dengan sokongan *International Symposium and Exhibition on Geoinformation* (ISG).

Y.B. Dato Sri Douglas Uggah Embas, Menteri Sumber Asli dan Alam Sekitar telah sudi menyempurnakan upacara perasmian persidangan kali ini. Beliau telah diiringi oleh Y.B. Tan Sri Datuk Seri Panglima Joseph Kurup, Timbalan Menteri Sumber Asli dan Alam Sekitar, Ketua Pengarah MAMPU Dato' Mohamad Zabidi bin Zainal dan KSU Kementerian Sumber Asli dan Alam Sekitar Y. Bhg. Dato' Zoal Azha bin Yusof

"Mengarusperdana GIS dalam Menghadapi Cabaran Negara" sebagai tema penganjuran NGIS kali ini amat relevan kepada cabaran, pembangunan dan arah tuju negara pada masa kini yang mementingkan modernisasi dan inovasi cara kerja serta berkomitmen kerajaan dalam mencapai taraf negara maju.

Sepanjang dua hari penganjuran, sebanyak tiga ucaptama telah

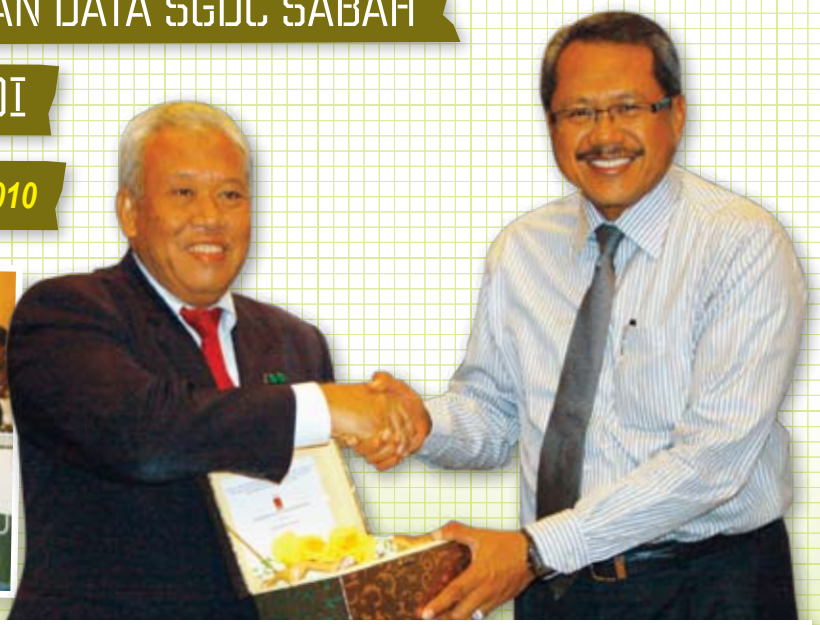
> *"Mengarusperdana GIS dalam Menghadapi Cabaran Negara"*

disampaikan dan empat belas kertas kerja dibentangkan.

Sebelum ini, NGIS telah diadakan tiga kali berturut-turut di PWTC, Kuala Lumpur. Pada tahun 2010 ini, NRE telah mengambil langkah berani untuk menjayakan NGIS kali ini di PICC, Putrajaya. Hasil daripada perubahan tempat ini, NRE telah berjaya menarik minat lebih daripada 700 peserta menghadiri NGIS, ini jauh menlangkaui jangkaan asal iaitu seramai 500 peserta sahaja.

Buat pertama kalinya juga pelajar-pelajar sekolah sekitar Putrajaya telah dijemput melawat pameran NGIS, sebagai pendedahan awal kepada mereka berkenaan GIS. Pelbagai aktiviti kesedaran dan penerapan asas GIS telah dilaksanakan khusus untuk para pelajar sekolah dan guru-guru.

MAJLIS PENYERAHAN DATA SGDC SABAH DAN TAKLIMAT MyGDI NEGERI SABAH *12 JULAI 2010*



TAWAU, SABAH: Majlis penyerahan data projek SGDC Negeri Sabah secara rasminya oleh MaCGDI, NRE kepada Kerajaan Negeri Sabah. Taklimat ini telah dirasmikan oleh Y.Bhg. Dato' Haji Azmi bin Che Mat, Timbalan Ketua Setiausaha II (Alam Sekitar), Kementerian Sumber Asli dan Alam Sekitar. Selain pembentangan kertas kerja dari MaCGDI, demontrasi dan *technology update* oleh syarikat GIS turut dimuatkan pada taklimat tersebut. Acara kemuncak majlis ini ialah penyampaian data SGDC Negeri Sabah oleh Y.Bhg. Dato' Hj. Azmi bin Che Mat kepada Pengerusi Jawatankuasa Teknikal MyGDI Sabah Y.Bhg. Datuk Hj. Osman bin Hj. Jamal, Pengarah Jabatan Tanah dan Ukur Sabah.

TAKLIMAT PENYEDIAAN MyGDI METADATA PERINGKAT NEGERI KEDAH DAN SELANGOR

Taklimat Penyediaan Metadata MyGDI telah dianjurkan bagi menyemak dan mengemaskini metadata bagi produk-produk yang telah diterbitkan secara *online*. Taklimat ini telah memberi pendedahan kepada agensi-agensi pembekal data iaitu JUPEM, JKR, JMG & DOA mengenai kaedah pengisian borang MyGDI secara *online*.

Taklimat-taklimat ini telah berlangsung di Hotel Regency, Alor Star, Kedah Darul Aman pada 19 Mei 2010 dan di Hotel De Palma, Shah Alam, Selangor Darul Ehsan pada 29 Julai 2010.

MESYUARAT PENYEDIAAN RANG UNDANG-UNDANG GEOSPATIAL KEBANGSAAN

PUTERI RESORT, MELAKA: Mesyuarat Akta Geospatial Kebangsaan yang pertama telah diadakan pada 5-7 Ogos 2010. Y.Bhg. Dato' Prof. Sr Dr. Abdul Kadir bin Taib, Ketua Pengarah Ukur dan Pemetaan Malaysia telah mempengerusikan mesyuarat tersebut. Mesyuarat yang melibatkan agensi tunjak pembekal data MyGDI diadakan bagi mendapatkan maklum balas ke atas draf Rang Undang-Undang berkenaan. Ia bertujuan bagi memastikan aspek-aspek perancangan, pengurusan, pembangunan dan keselamatan data geospatial negara diperkemaskan daripada perundangan. Mesyuarat yang melibatkan pihak akademia ini dijalankan bagi memastikan penggubalan Akta Geospatial Kebangsaan dapat disiapkan dalam tempoh masa yang ditetapkan.

SEMINAR STANDARDISASI DALAM SISTEM MAKLUMAT GEOGRAFI (GIS) TAHUN 2010

Seminar Standardisasi Dalam Sistem Maklumat Geografi (GIS) tahun 2010 diadakan bertujuan untuk memberi pendedahan mengenai aktiviti-aktiviti standard dalam bidang maklumat geospatial yang telah digunapakai dalam penyediaan oleh agensi pembekal data negara ini. Seminar ini dianjurkan dengan kerjasama ahli TC2/SIRIM. Beberapa kertas kerja berkaitan dengan MS1759, *Unique Parcel Identifier* (UPI), *Data Quality* (DQ), *Metadata, Positoning Services* dan *Imagery and Gridded Data* telah dibentangkan di dalam seminar ini.

Seminar Standardisasi dalam Bidang Sistem Maklumat Geografi peringkat Kebangsaan telah diadakan pada 22-23 Oktober 2009 di Pulau Pinang. Manakala bagi tahun 2010, ia diperluaskan kepada zon-zon dan telah dilaksanakan pada 22-23 Mac 2010 bagi Zon Timur di Kuantan, Pahang dan pada 5-6 Oktober 2010 bagi Zon Selatan di Johor Bahru, Johor.

MAP ASIA 2010 & ISG 2010

KUALA LUMPUR, 26 JULY 2010: Map Asia 2010 & International Symposium and Exhibition on Geoinformation (ISG) 2010 provides a platform for the Asian geo-informatics community to reveal the stages of dissemination of geospatial information. The event was officiated by Y.B. Dato Sri Douglas Uggah Embas, Minister of Natural Resources and Environment at Kuala Lumpur Convention Centre (KLCC) on 26 July 2010. GIS Development and The Institution of Surveyors, Malaysia (ISM) had jointly organised Map Asia 2010 and the ISG to the growth of GIS and widen its benefits for the GIS community.

With the theme "Connecting Government and Citizen through Ubiquitous GIS", Map Asia 2010 and ISG 2010 turned out to be a phenomenal success where there was an active and dynamic participation of over 1358 members (801 registered delegates and 557 exhibition visitors) of GIS community from over 41 countries. An elegant ceremony marked the inaugural of Map Asia 2010 and ISG 2010 conference at the Kuala Lumpur Convention Centre while recognising the significance of geospatial technology for development and vowing to raise the profile of geospatial industry in the Asian continent.

The event had gathered a few ideas and approached from both the public and private sectors on how to grow towards a connected government. The key success factor of this conference, is how to deliberate the ideas and get solutions that give further leverage to the organizations, integrating horizontally and vertically the national goals. The exhibition involved various agencies such as from local government and private sector which are the lead in Geoinformation technology nowadays. It is an international initiative aimed to allow sharing and use of geospatial technologies. The event also had offers a unique networking and marketing opportunity to the local and international geospatial industry on technology transfer.

BENGKEL TEKNOLOGI DAN APLIKASI
GLOBAL NAVIGATION SATELITE SYSTEM (GNSS) 2010
ANJURAN AGENSI ANGKASA NEGARA

Bengkel Teknologi dan Aplikasi *Global Navigation Satellite System* (GNSS) 2010 telah dianjurkan oleh Agensi Angkasa Negara di bawah Kementerian Sains, Teknologi dan Inovasi (MOSTI) pada 27-28 September 2010 di PICC, Putrajaya.

Bengkel ini telah dirasmikan oleh Y.Brs. Dr. Mustafa Din Subari, Ketua Pengarah Agensi Angkasa Negara. Beliau juga telah memberi ucaptama dan juga terlibat sebagai pembentang kertas kerja pada bengkel kali ini.

Program ini bertujuan untuk memberi sedikit sebanyak pendedahan kepada peserta di sektor awam terhadap perkembangan terkini teknologi GNSS di Malaysia. Di samping itu, ia juga memberi pengenalan terhadap aplikasi-aplikasi GNSS terkini untuk diserap dan diimplementasikan di sektor awam.

Lebih seratus orang peserta dari Jabatan kerajaan dan swasta telah hadir ke bengkel dua hari ini. Dalam pada itu, sebanyak 19 orang wakil telah membentangkan kertas kerja yang menerangkan pelbagai aplikasi dan teknologi GNSS yang digunakan di Jabatan masing-masing.

GIS DAY 2010 DI SEKOLAH KEBANGSAAN TEMENGGONG IBRAHIM PENGGARAM, BATU PAHAT JOHOR

18 NOVEMBER 2010, GIS DAY merupakan hari di mana para pengamal GIS baik dari agensi kerajaan atau swasta akan menggembleng tenaga bersama-sama untuk mendidik orang awam untuk mengetahui dan memahami mengenai GIS.

Hari GIS seluruh dunia biasanya akan disambut pada hari Rabu minggu ketiga pada bulan November setiap tahun. Sambutan GIS DAY ini diadakan secara global. Komuniti GIS di seluruh dunia digalakkan untuk menganjurkan GIS DAY mereka sendiri.

Bagi tahun 2010, sambutan GIS DAY terpaksa ditangguhkan sehari kerana hari GIS sedunia jatuh pada 17 November 2010, bersamaan dengan sambutan Hari Raya Aidil Adha atau Hari Raya Korban.

Buat pertama kalinya GIS DAY 2010 anjuran MaCGDI dengan kerjasama Pejabat Pelajaran Daerah (PPD) Batu Pahat telah berjaya diadakan di luar kawasan Putrajaya, iaitu bertempat di Sekolah Kebangsaan Temenggong Ibrahim, Batu Pahat, Johor. Program ini telah dirasmikan oleh guru besar Sekolah Temenggong Ibrahim iaitu Tn. Hj. Idris bin Hj. Selamat.

Program GIS DAY telah dimulakan dengan taklimat mengenai MaCGDI dan pengenalan asas-asas GIS. Dianggarkan lebih dua ratus pelajar sekolah tersebut telah menyertai GIS DAY 2010 ini.

Bersesuaian dengan tema GIS DAY, iaitu "melihat dunia melalui GIS". Semua aktiviti yang dijalankan adalah secara santai di mana pendekatan secara informal dilaksanakan untuk menyebarkan pengetahuan GIS.

Dengan cara ini para pelajar dapat bergembira dan sambil itu dapat mempelajari mengenai GIS dengan lebih mudah. Secara tidak langsung para pelajar dapat mengetahui lokasi negeri-negeri di Malaysia. Antara aktiviti yang dijalankan adalah pertandingan *Mix Match & Map, Jigsaw Puzzle, Crossword Puzzle,* dan berbagai-bagai aktiviti lain yang menarik.

Upacara penutup dan penyampaian hadiah bagi program GIS DAY 2010 ini telah disempurnakan oleh wakil dari Pejabat Pelajaran Daerah Batu Pahat, iaitu Encik Mairop bin Amal.

Objektif untuk mendidik generasi muda mengenai GIS telah berjaya berdasarkan kepada maklum balas yang diterima daripada guru-guru dan para pelajar yang hadir.

KAMPUS NRE

Pusat Infrastruktur Data Geospatial Negara (MaCGDI) telah diberi peluang untuk menganjurkan Kampus NRE pada 26 November 2010 bertempat di Dewan Baiduri, NRE. Program kampus NRE yang dianjurkan oleh MaCGDI telah dirasmikan oleh Y. Bhg. Dato' KSU Kementerian Sumber Asli dan Alam Sekitar.

Tema untuk Kampus NRE kali ini ialah "PENGGUNAAN MAKLUMAT GEOSPATIAL DALAM URUSAN KERAJAAN". Program dimulakan dengan tayangan montaj mengenai MaCGDI dan disusuli dengan tiga taklimat mengenai penggunaan maklumat geospatial dalam urusan kerajaan dari pihak MaCGDI.

Tajuk taklimat pertama 'Peranan MaCGDI Dalam Pengurusan Maklumat Geospatial' oleh Puan Fuziah binti Abu Hanifah, bagi taklimat kedua 'Penggunaan Maklumat Geospatial dan Aplikasi GIS' yang disampaikan oleh Dr. Zainal bin A. Majeed. Bagi taklimat yang ketiga pula mengenai 'Perkongsian Maklumat Geospatial Melalui MyGDI dan G4NRE' yang disampaikan oleh Puan Mariyam binti Mohamad telah mengakhiri sesi taklimat kampus NRE.

Booth pameran MaCGDI yang berada di luar dewan menyediakan pelbagai informasi berkaitan MaCGDI termasuk persembahan demo aplikasi-aplikasi yang telah dibangunkan oleh MaCGDI kepada para pengunjung Kampus NRE.

Dianggarkan lebih daripada dua ratus warga NRE telah menyertai program ini. Borang kaji selidik telah diedarkan kepada pengunjung dan hasil daripada kaji selidik tersebut akan digunakan sebagai penambahbaikkan kepada program-program yang akan datang.

BULETIN GEOSPATIAL
SEKTOR AWAM

FORMAT DAN GARIS PANDUAN SUMBANGAN ARTIKEL

Buletin Geospatial Sektor Awam diterbitkan dua (2) kali setahun oleh Pusat Infrastruktur Data Geospatial Negara (MaCGDI). Sidang Pengarang amat mengalu-alukan sumbangan sama ada berbentuk artikel atau laporan bergambar mengenai perkembangan Sistem Maklumat Geografi di Agensi Kerajaan, Badan Berkanun dan Institusi Pengajian Tinggi.

GARIS PANDUAN UNTUK PENULIS

1. Manuskrip boleh ditulis dalam Bahasa Melayu atau Bahasa Inggeris.

2. Setiap artikel perlu mempunyai abstrak dan perlu ditulis dengan huruf condong (italic).

3. Format manuskrip adalah seperti berikut:

Jenis huruf (font)	:	Arial
Saiz huruf bagi tajuk	:	12
Saiz huruf	:	10
Langkau (spacing)	:	single
Margin	:	Atas, bawah, kiri dan kanan = 2.5 cm
Justifikasi teks	:	Kiri
Lajur (column)	:	Satu lajur setiap mukasurat

4. Sumbangan hendaklah dikemukakan dalam bentuk softcopy dalam format Microsoft Word.

5. Semua imej grafik hendaklah dibekalkan dalam format .tif atau .jpg dengan resolusi tidak kurang daripada 150 d.p.i.

6. Segala pertanyaan dan sumbangan hendaklah dikemukakan kepada :

Ketua Editor
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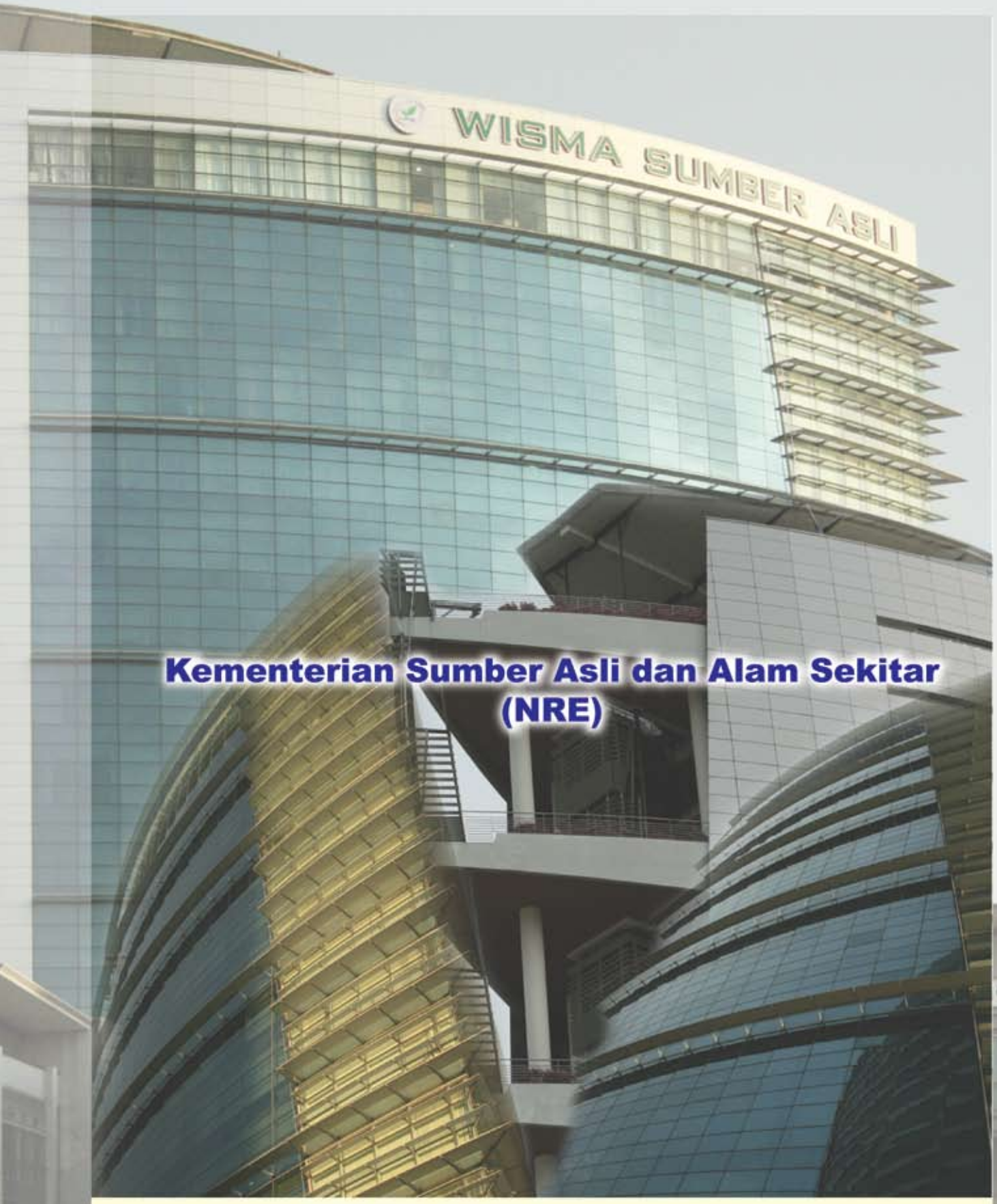

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