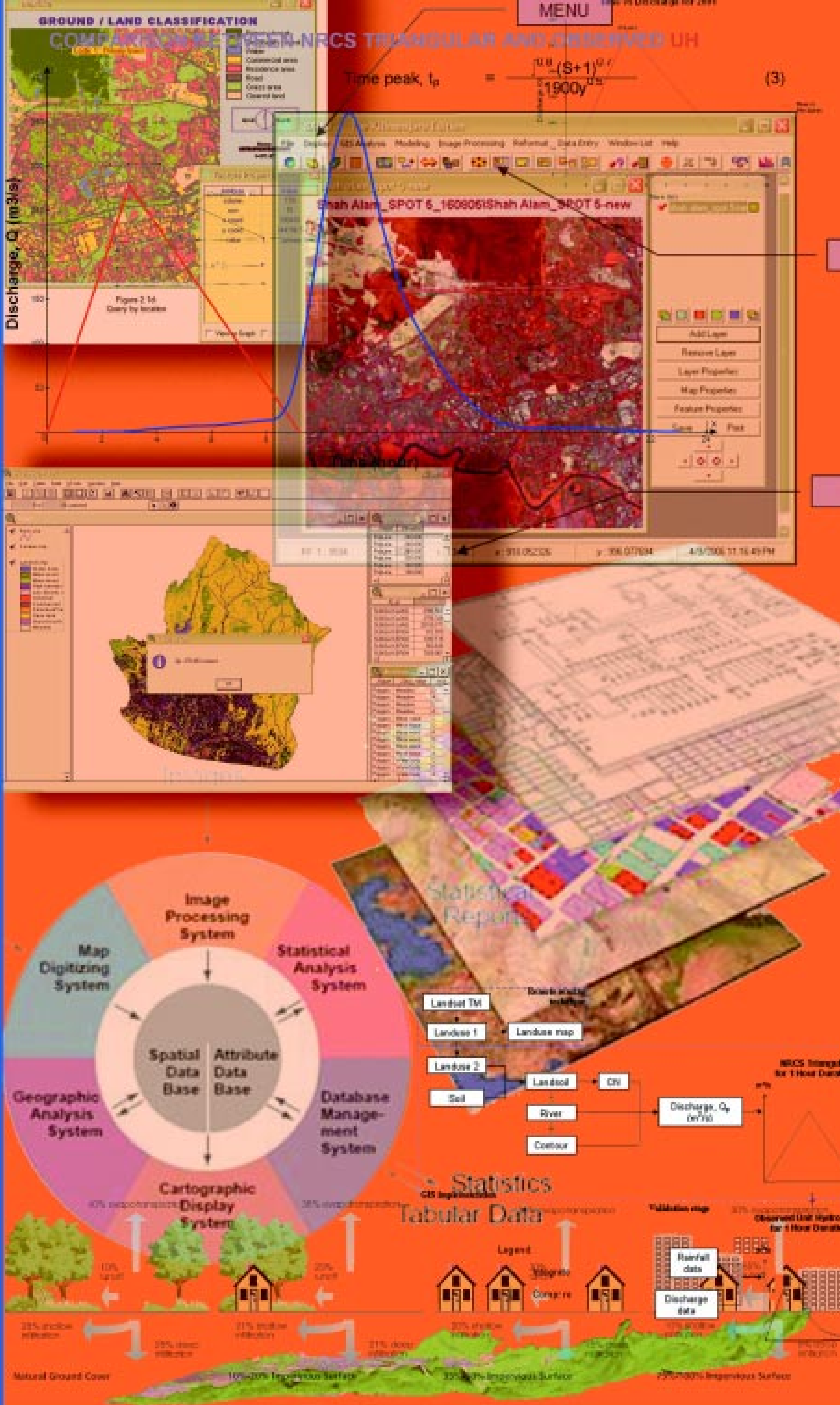
BULETIN GIS



JAWATANKUASA PEMETAAN DAN DATA SPATIAL NEGARA

BIL. 1/2007

ISSN 1394 - 5505

PENDAHULUAN

Jemaah Menteri berasaskan Kertas Kabinet No.243/385/65 bertajuk *National Mapping Malaysia* telah meluluskan jawatan dan terma-terma rujukan *"Surveyor-General Malaya and Singapore"* sebagai Pengarah Pemetaan Negara Malaysia dan mengesahkan keanggotaan serta terma-terma rujukan Jawatankuasa Pemetaan Negara pada 31 Mac 1965.

Cabutan para-para 2(b), 2(c) dan 2(d) daripada kertas kabinet tersebut mengenai keanggotaan dan terma-terma rujukannya adalah seperti berikut:

"2(b) National Mapping Committee

That a National Mapping Committee be appointed to comprise the following:

- *i. Director of National Mapping;*
- *ii. Director of Lands & Surveys, Sabah;*
- *iii. Director of Lands & Surveys Sarawak;*
- *iv. Representative of the Ministry of Defence;*
- *v. Representative of the Ministry of Rural Development (now substituted by the Ministry of Natural Resources and Environment); and*
- *vi. Assistant Director of Survey, FARELF.*

2(c) The terms of reference of the National Mapping Committee to be as follows:

- *i. to advise the Director of National Mapping on matters relating to mapping policy; and*
- *ii. to advise the Director of National Mapping on mapping priorities.*

2(d) That the Committee be empowered to appoint a Secretary and to co-opt persons who would be required to assist the Committee,"

Seterusnya pada 22 Januari 1997, Jemaah Menteri telah meluluskan pindaan terhadap nama, keanggotaan dan bidang-bidang rujukan Jawatankuasa Pemetaan Negara kepada Jawatankuasa Pemetaan dan Data Spatial Negara (JPDSN), bagi mencerminkan peranannya yang diperluaskan ke bidang data pemetaan berdigit. Keanggotaan JPDSN pada masa kini adalah terdiri daripada agensi-agensi seperti berikut:

1. Jabatan Ukur dan Pemetaan Malaysia
2. Jabatan Tanah dan Ukur Sabah
3. Jabatan Tanah dan Survei Sarawak
4. Wakil Kementerian Pertahanan
5. Jabatan Mineral dan Geosains Malaysia
6. Jabatan Perhutanan Semenanjung Malaysia
7. Jabatan Pertanian Semenanjung Malaysia
8. Jabatan Perhutanan Sabah
9. Pusat Infrastruktur Data Geospatial Negara (MaCGDI) *(co-opted)*
10. Jabatan Pertanian Sabah
11. Jabatan Pertanian Sarawak
12. Pusat Remote Sensing Negara (MACRES)
13. Universiti Teknologi Malaysia
14. Universiti Teknologi MARA *(co-opted)*
15. Universiti Sains Malaysia *(co-opted)*
16. Jabatan Laut Sarawak *(co-opted)*
17. Jabatan Perhutanan Sarawak
18. Jabatan Perancangan Bandar dan Desa

Buletin GIS ini yang diterbitkan dua kali setahun merupakan salah satu aktiviti yang dijalankan oleh Jawatankuasa Pemetaan dan Data Spatial Negara. Ia adalah sebagai salah satu media pendidikan dan penyebaran maklumat dalam mendidik masyarakat untuk memanfaatkan maklumat spatial dalam pembangunan negara. Walau bagaimanapun, sebarang kandungan artikel-artikel adalah tanggungjawab penulis sepenuhnya dan bukan melambangkan pandangan penerbit.

Kandungan

Pencetak
Jabatan Ukur dan
Pemetaan Malaysia
Jalan Semarak,
50578 Kuala Lumpur

Dari Meja Ketua Editor

Pekeliling Arahan Keselamatan Terhadap Dokumen Geospatial Terperingkat telah diluluskan oleh YBhg. Tan Sri Mohd. Sidek bin Haji Hassan, Ketua Setiausaha Negara pada 23 Mei 2007 bagi menggantikan "Buku Arahan Keselamatan, Kawalan Serta Penyenggaraan Maklumat-maklumat Ukur dan Geografi yang antara lainnya Merangkumi Peta-peta Rasmi dan Citraan Penderiaan Jauh" yang telah diterbitkan pada tahun 1990. Pekeliling baru ini amat bersesuaian dikeluarkan kerana kemajuan pesat dalam bidang teknologi maklumat dan komunikasi yang mengakibatkan satu arahan baru diperlukan bagi mengawal dan melindungi dokumen rahsia rasmi dan perkara terperingkat kerajaan daripada dimiliki oleh pihak-pihak yang tidak sepatut menerimanya. Bagi maksud penyediaan dokumen ini, beberapa siri perbincangan telah diadakan oleh Jawatankuasa Teknikal Dasar dan Isu-Isu Institusi bagi memperhalus semua aspek sebelum dirujuk kepada pihak Pejabat Peguam Negara bagi memperkukuhkan lagi dokumen ini.

Dengan berkuatkuasa pekeliling ini, semua Jabatan Kerajaan di peringkat Persekutuan dan Negeri serta Sektor Swasta perlu mengambil tindakan tegas terhadap pelanggaran dalam aspek Keselamatan Perlindungan di pejabat masing-masing, mengikut peruntukan-peruntukan Akta Rahsia Rasmi 1972 atau Bab D Peraturan-peraturan Pegawai Awam (Kelakuan dan Tatatertib) 1993.

Semua ahli Jawatankuasa Pemetaan dan Data Spatial Negara yang secara langsung terlibat dalam penggunaan dokumen terperingkat, diseru bersama-sama menghayati dan mematuhi Arahan Keselamatan ini sepenuhnya demi memelihara keselamatan dan kedaulatan negara yang menyambut ulang tahun kemerdekaan kali ke-50 pada 31 Ogos 2007.

Ketua Editor

REMOTE SENSING (RS) AND GEOGRAPHIC INFORMATION SYSTEM (GIS) APPLICATION USING IDRISI KILIMANJARO FOR SCHOOL PURPOSES

By
Abd. Manan bin Samad & Norhanim bt. Ahmad Hifni
Jabatan Sains Ukur dan Geomatik, FSPU
Universiti Teknologi MARA (UiTM) Malaysia, 40450 Shah Alam, SELANGOR
e-mail: dr_abdmanansamad@yahoo.co.uk

1.0 INTRODUCTION

1.1 IDRISI KILIMANJARO

Abu Abdallah Muhammad Ibn Muhammad Ibn Abdullah Ibn Idris Ash-Sharif was born in Ceuta, Spain, in 1099 C.E. Also known by his abbreviated name Al-Sharif Al-Idrisi al-Qurtubi, he studied at Cordova and became a cartographer and geographer of major significance during the medieval period. His major contribution lies in medicinal plants as presented in his several books, especially Kitab al-Jami-li-Sifat Ashtat al-Nabatat. He also made original contributions to geography, especially as related to economics, physical factors and cultural aspects. Al-Idrisi, later on, compiled another geographical encyclopedia, larger than the former entitled Rawd-Unnas wa-Nuzhat al-Nafs. Apart from botany and geography, Idrisi also wrote on fauna, zoology and therapeutically aspects. His work was soon translated into Latin and, especially, his books on geography remained popular both in the East and the West for several centuries. So the IDRISI software's are dedicated from his name.

Clark Labs was founded in 1987 by Geography Professor, Ron Eastman, as the IDRISI Project. In 1994, the name was changed to the Clark Labs to reflect the broader suite of software offered and the full range of activities undertaken. The Clark Labs is an educational and research institution located at Clark University in Worcester, Massachusetts, USA. Activities are broadly grouped into three areas: software development, distribution and support; research; educational programs. With a team of research scientists, Clarks Labs is pioneered in both the theoretical advancement and application of GIS in areas such as decision support, change and time series analysis, digital image processing, uncertainty management, and technology transfer. Clarks Labs are responsibility to design software which is powerful and high technology to fulfill the needs of the most sophisticated professionals at pricing that make them attainable for all user levels. Clark Labs software is designed to be easy to use, yet provide professional-level capabilities on Windows-based personal computers. Since the introduction of the IDRISI system in 1987, it has grown to become one of the largest raster-based microcomputer for GIS and image processing systems.

Now in fourteenth major release since 1987, IDRISI provides the most extensive set of GIS and Image Processing tools available in a single and affordable integrated package. IDRISI provides research-grade tools that are at the forefront of the industry, yet are approachable and accessible to all. IDRISI KILIMANJARO, the 32-bit version designed for Windows NT, content of over 200 modules will provides an unsurpassed depth of capability. Special facilities are included for environmental modeling and natural resource management, including change and time series analysis, land change prediction, multi-criteria and multi-objective decision support, uncertainty analysis and simulation modeling. TIN interpolation, Kriging and conditional simulation are also offered. For Image Processing, a complete suite of tools is available for restoration, enhancement and transformation, and for signature development and classification, including hard and soft classifiers and hyper spectral image classification.

1.2 REMOTE SENSING (RS) AND IMAGE PROCESSING

Remote sensing is a technology involving the use of sensors placed on platform moving at a far distance from earth's surface and it can be used for collecting data of the earth for the purposes of inventorying and monitoring. Of all the various data sources used in GIS. Now we have access to remotely sensed images in digital form, allowing rapid integration of the results of remote sensing analysis into a GIS. The development of digital techniques for the restoration, enhancement and computer-assisted interpretation of remotely sensed images initially proceeded independently.

However, the raster data structure and many of the procedures involved in these Image Processing Systems (IPS) were identical to those involved in raster GIS. IDRISI is a combined GIS and image processing system that offers advanced capabilities in both areas.

1.3 GEOGRAPHICAL INFORMATION SYSTEM (GIS)

A Geographic Information System (GIS) is a computer-assisted system for the acquisition, storage, analysis and display of geographic data. Figure 1.3 gives a broad overview of the software components typically found in a GIS. Not all systems have all of these elements, but to be a true GIS, an essential group must be found.

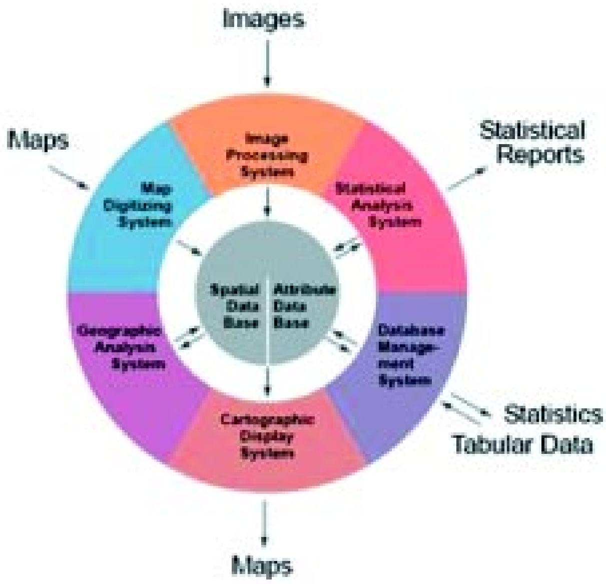


Figure 1.3: The software component in GIS
(Source: IDRISI KILIMANJARO Guide to GIS and Image Processing)

Central to the system is the database. Database is a collection of maps and associated information in digital form. Spatial database describing the earth surface features while an attribute database describing the characteristics or qualities of these features. In some systems, the spatial and attribute databases are rigidly distinguished from one another, while in others they are closely integrated into a single entity hence the line extending only half-way through the middle circle of Figure 1.3. IDRISI integrates the two components into one. Surrounding the central database, there are a series of software components which are including in the IDRISI system. A Geographic Information System stores two types of data that are found on a map such as the geographic definitions of earth surface features and the attributes or qualities that those features possess. Not all systems use the same logic for achieving this.

Nearly all, however, use one or a combination of both of the fundamental map representation techniques: vector and raster. Raster and vector systems each have their special strengths. As a result, IDRISI incorporates elements from both representational techniques. Though it is primarily a raster analytical system, IDRISI does employ vector data structures as a major form of map data display and exchange. Fundamental aspects of vector database management also provided. In geographic database concept, IDRISI can link a feature identifier layer (a layer that contains the identifiers of the features located at each grid cell) with attribute tables. In the other hand, IDRISI also provide utilities for changing the projection and reference system of digital layers and provide the analysis tools for analysis in GIS.

1.4 IDRISI KILIMANJARO IN MALAYSIA

Nowadays, there is much software for RS and GIS applications had been introduced and used widely in Malaysia whether in government organizations or non government organizations such as ARCInfo, ARC GIS, ARC View, ERDAS Imagine 8.5 and Map Info. However, IDRISI KILIMANJARO software is not very familiar in Malaysia although it was release with raster-based GIS and image processing package. This exploration will show the capability and special facilities of this software for school purposes and to exposed RS and GIS simultaneously by using IDRISI KILIMANJARO.

2.0 RS AND GIS FOR SCHOOL PURPOSES

In Malaysia, the importance of geography subject in curriculum at school had decreased. Beside mathematics and Bahasa Melayu, geography is one of the important subjects at primary and secondary school in the beginning of the education system in Malaysia. Geography still becomes a core subject after cabinet make a research on implementation of Dasar Pelajaran in 1979 for form 1, 2 and 3 and an elective subject for form 4 and 5. After KBSM (Kurikulum Baru Sekolah Menengah) had launched in 1988, there are no changing on geography implementation in secondary school but geography is not a favorite subject among students. Student is preferred to choose an economy or art education as an elective subject for stage form 4 and form 5. Therefore, the number of students who followed this subject is decrease and there are schools which have not offered geography subject to their students. Nowadays, RS and GIS applications was introduced and used widely in Malaysia. This sophisticated technology had exposed to the education system in Malaysia at university level such as University Teknologi MARA (UiTM), Universiti Teknologi Malaysia (UTM), Universiti Sains Malaysia (USM), Universiti Putra Malaysia (UPM), University Malaya (UM) and Universiti Kebangsaan Malaysia (UKM) but in a small amount in primary and secondary school. This technology has to expose for school students supposedly in order to make Malaysia as a development country which applies a new technology like another development country such as United States and Britain. Beside introduce this technology as a supplement in school syllabus, one of the methods is by expose this technology through software exploration. There are many GIS and image processing software in market, but the IDRISI KILIMANJARO software is not famous like other software although it s quite cheap. IDRISI KILIMANJARO is one of the most widely used integrated remote sensing and raster GIS packages. This capability exploration will help the students to develop this extensive set of GIS and Image Processing software to produce a simple map.

2.1 IDRISI KILIMANJARO EXPLORATION FOR SCHOOL PURPOSES (OPERATION MANUAL PREPARATION)

When IDRISI KILIMANJARO is open, the application window will completely occupy the screen (in Windows terminology, it is automatically maximized). Though not required, it is recommended that it be kept maximized because many of the dialog boxes and images you will display will require a substantial amount of display space. The IDRISI KILIMANJARO application window includes the menu, the toolbar, and the status bar (Figure 2.1a). The menu system is at the top of the application window. Below the menu is a set of buttons that are collectively known as the tool bar. Each button represents either a program module or an interactive operation that can be selected by clicking on that button with the mouse. Some of these buttons toggle between an active and an inactive state. When active, the button appears to remain depressed after being clicked. In these cases, the button can be released by clicking it again. At the bottom of the screen is the status bar. The status bar provides a variety of information about program operation. When maps and map layers are displayed on the screen and the mouse is moved over one of these windows, the status bar will indicate the position of the cursor within that map in both column and row image coordinates and X and Y map reference system coordinates. In addition, the status bar indicates the scale of the screen representation as a Representative Fraction.

Exploration on IDRISI KILIMANJARO Software is through tutorial which can be accessed through the help menu of the IDRISI KILIMANJARO program. There are thirty-eight tutorial exercises are provided divided into sections Using Idrisi, Introductory GIS, Advanced GIS, Introductory Image Processing, Advanced Image Processing, and Database Development. Another help menu in the Idrisi System is IDRISI Manual. There are eleven chapters present the fundamentals of GIS, Image

Processing, Georeferencing, and the use of the IDRISI system. Twelve chapters present the information about specialized topics such as Decision Support, Uncertainty Management, and Change and Time Series Analysis.

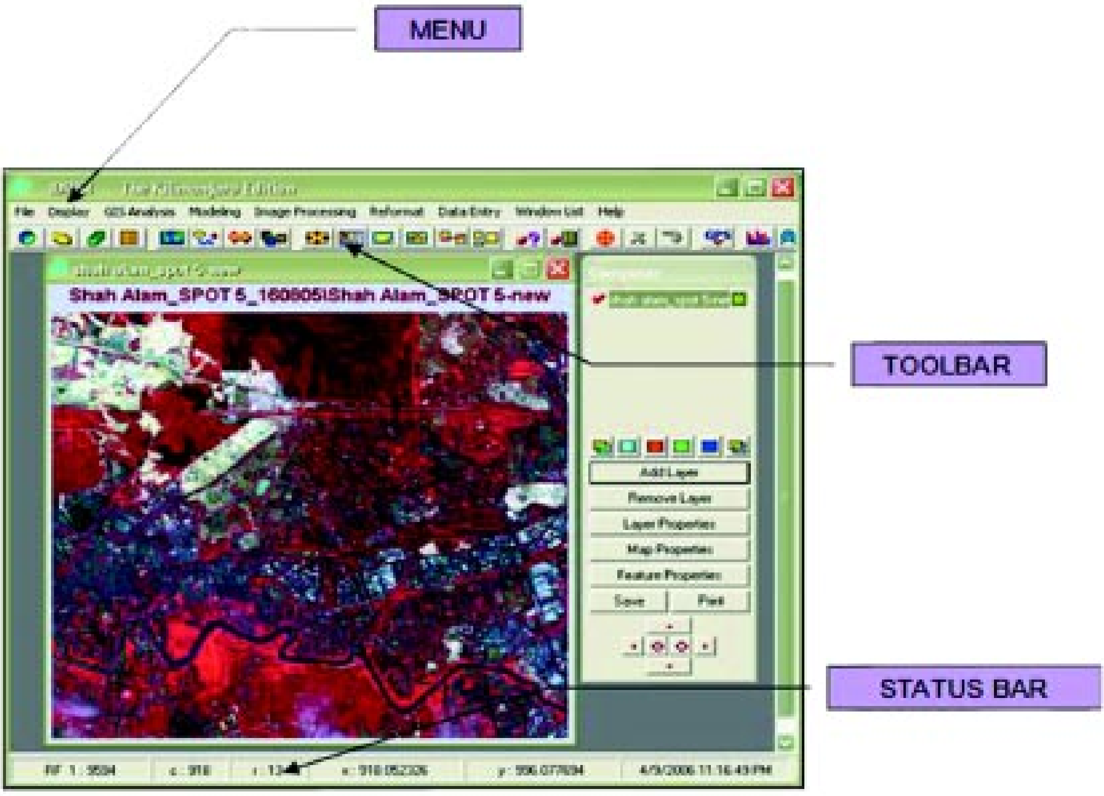


Figure 2.1a: Window application of IDRISI KILIMANJARO

The data used was divided into three stage were categorized as digital image processing, ground truth and GIS analysis part. For the digital image processing part, SPOT-5 image (Figure 2.1b) for the Shah Alam was used. This image was obtained from Malaysian Center of Remote Sensing (MACRES). For the second and third part, the topographic map was used. While doing the ground truth, the Shah Alam topographic map was used by comparing the features in the image and the ground visit. Besides that, GIS analysis stage was used a topographic map for the vector conversion. This topographic map year 2003 with the scale 1:10 000 and 22 as the sheet number were acquired from the Department Of Survey and Mapping Malaysia (JUPEM).

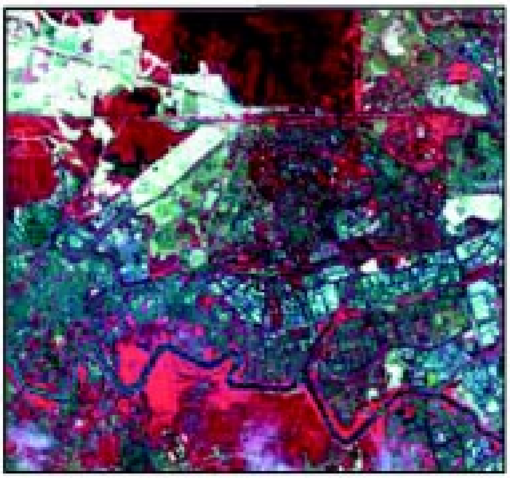


Figure 2.1b: SPOT 5 image (16 August 2005)
(Source: MACRES)

In RS digital image processing, there are 3 stages that have to be implemented such as image rectification and restorations, image enhancement and image classification.

The operations of image rectification and restoration are also known as georeferencing process. The aim of the georeferencing process is to correct distorted or degraded image data for creating a more faithful representation of the original scene. These operations often termed pre-processing. In the pre-processing, there are three things that may be applied such as radiometric correction, geometric correction and the noise removal. In this project, the geometric correction will be applied. The purpose of the geometric correction is to transform the image coordinates system (u, v), which may be distorted, to a specific map projection (x, y). For mapping purposes, it is essential that any form of remotely sensed imagery be accurately registered to the proposed map base. Two methods in geometric correction is image-to image registration and image to map registration. Image to image registration is transforming one image coordinate system into another image coordinating system, while image to map registration is transformation of the image coordinate system to map coordinate system resulted from a particular map projection.

Resampling is a procedure for spatially georeferencing an image to its known position on the ground. It is used to register an image to a universally recognized coordinate reference system such as Lat/Long or Universal Transverse Mercator (UTM). Resampling is use to determine the pixel values to fill into the output matrix from the original image matrix.

The objective of image enhancement is to improve the visual interpretability of an image by increasing the apparent distinction between features in the scene. The process of visually interpreting digitally enhanced imagery attempts to optimize the complementary abilities of human mind and the computer. There are three techniques that can be categorized as contrast manipulation, spatial feature manipulation and multi-image manipulation.

Finally, image classification is the process of developing interpreted maps from remotely sensed images. As a consequence, classification is perhaps the most important aspect of image processing to GIS. There are two procedures that can be implemented; there are supervised and unsupervised classifications. In supervised classifications, the image analyst will supervised the pixel categorization process by specifying, to the computer algorithm, numerical descriptors of the various land cover types present in a scene. To this, representative sample sites of known cover type, called training areas, are used to compile a numerical number interpretation key that describe the spectral attributes for each features type of interest.

Like supervised classifiers, the unsupervised procedures are applied in two separate steps. The fundamental difference between these techniques is that supervised classification involves a training step followed by a classification step. In the unsupervised approach the image data are first classified by aggregating them into the natural spectral groupings, or clusters, present in the scene. Then the image analyst determines the land cover identity of these spectral groups by comparing the classified image data to ground reference data.

Accuracy assessment is important in image classification which means a classification is not complete until its accuracy is accessed. The common means of expressing classification accuracy is the preparation of a classification error matrix (confusion matrix or a contingency table). Error matrices compare, on a category by category basis, the relationship between known reference data (ground truth) and the corresponding results of an automated classification. Several characteristics about classification performance are expressed by an error matrix. Several other descriptive measures can be obtained from the error matrix such as overall accuracy, producer's accuracy and the user's accuracy. The minimum overall accuracy that has to achieve is 85%.

After the accuracy is achieved, the map will be produce. The map properties button on Composer will use in order to produce a complete map. The elements that have in map properties are legends, georeferencing, map grid, north arrow, scale bar, text inset, graphic set, tittles, background and placemarks. This entire item will use to produce a map (Figure 2.1c).

For the GIS analysis, there are simple operations that can be explored. The GIS analysis that include in IDRISI KILIMANJARO is database query (Figure 2.1d), mathematical operators, distance operators, context operators, statistics, decision support, change/time series analysis and the surface analysis. For this project, the simple operation which suitable for school purposes was exposed.

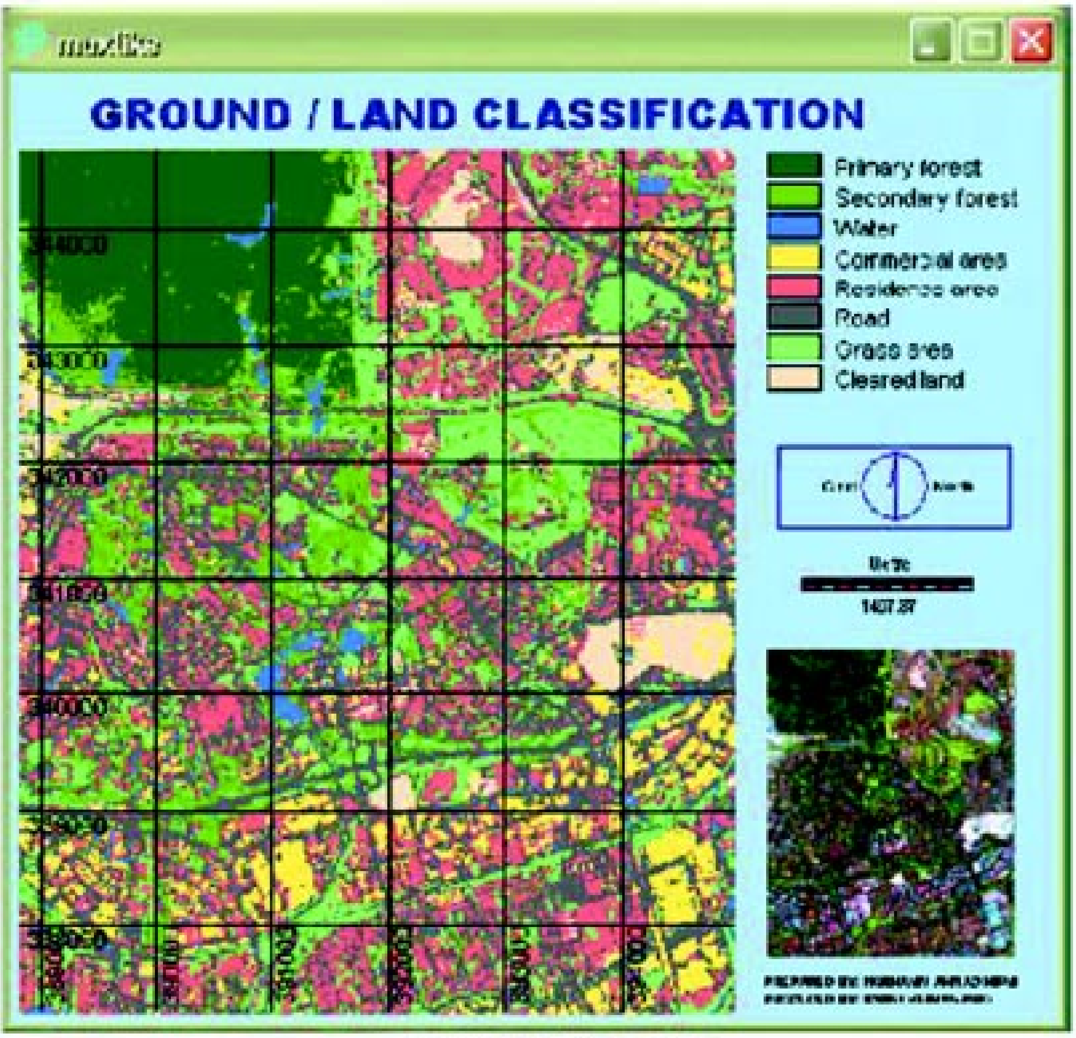


Figure 2.1c: Map Composition

2.2 PRODUCING A SIMPLE OPERATION MANUAL OF IDRISI KILIMANJARO FOR SCHOOL PURPOSES

After all the RS digital image processing and the GIS analysis were completed by using IDRISI KILIMANJARO, an operation manual was produced (Table 2.2a). This simple operation manual hopefully will help the students at school level to explore and to use the capability IDRISI KILIMANJARO software for RS and GIS application.

Table 2.2a: Finding Outline for RS Digital Image Processing and GIS Analysis

RS DIGITAL IMAGE PROCESSING	
Stage 1	Format converting
Stage 2	Layer Interaction effect
Stage 3	Image georeferencing -Control point marking -Creating a correspondence file -Creating a reference system -Resampling calculation
Stage 4	Window-extract a sub image

Stage 5	Image enhancement
Stage 6	Image classification -Training site development -Signature development -Classification
Stage 7	Accuracy assessment
Stage 8	Map composition -Symbol workshop -Map composition
GIS ANALYSIS	
Stage 1	Database query -Query by location -Query by attribute
Stage 2	Distance operators -Buffer

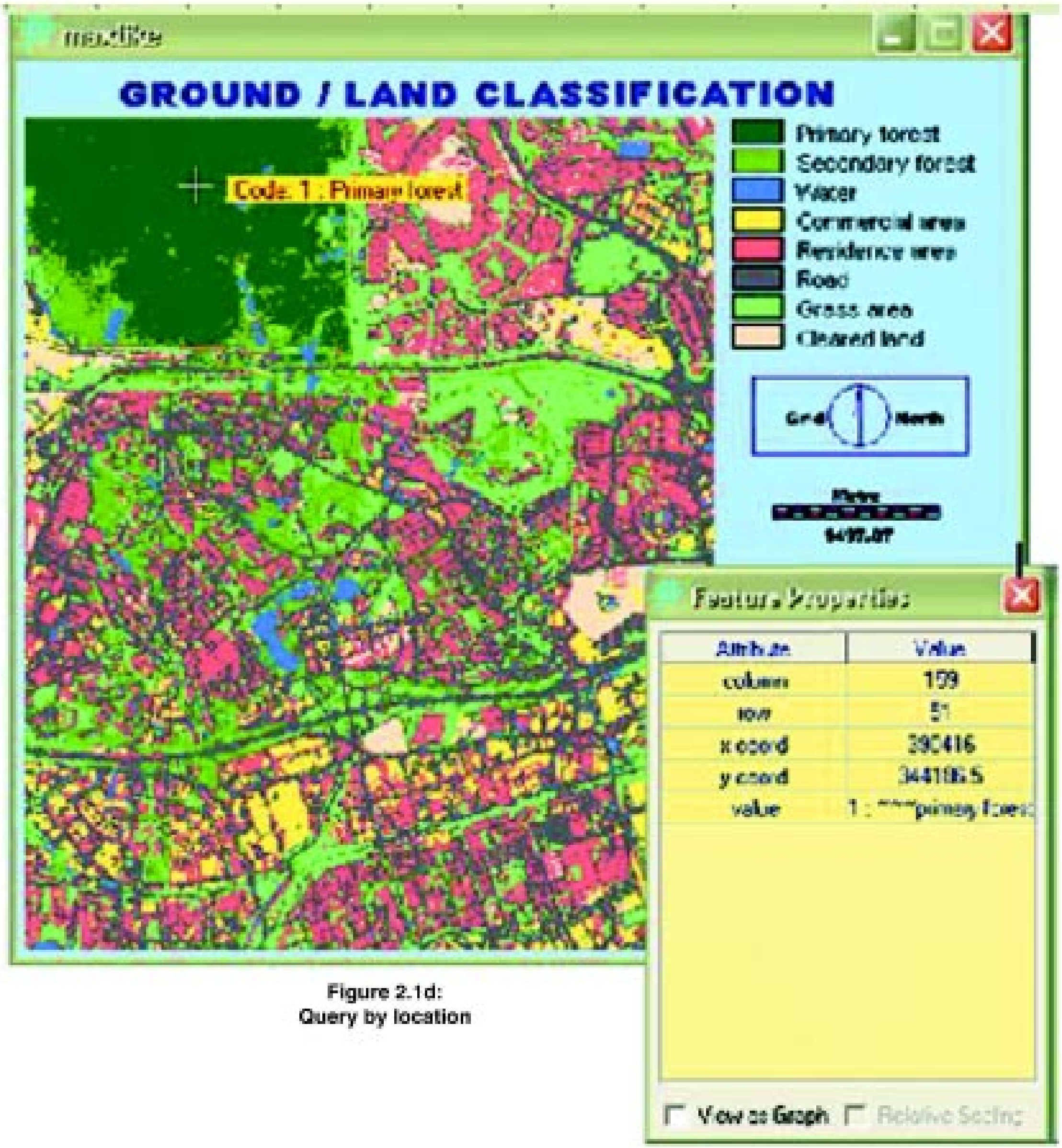


Figure 2.1d:
Query by location

3.0 CONCLUDING REMARKS

This simple operation manual was developed by stage starting with importing from another format into IDRISI KILIMANJARO, georeferencing, image enhancement, image classification, accuracy assessment, map composition and GIS analysis function which act as basic principles in RS digital image processing and GIS analysis. This operation manual is more toward user friendly and easy to follow. Beside that, this operation manual developed with a simple command, so that easy for students at school level to follow the instruction that given.

REFERENCES

Thomas M. Lillesand, Ralph W.Kiefer & Jonathan W.Chipman. 2004. Remote Sensing and Image Interpretation. Fifth Edition. University of Wisconsin-Madison: Ryan Flahive.

John R. Jensen, 1996. Introduction Digital Image Processing, a Remote Sensing Perspective. Second Edition. New Jersey: Prentice Hall Upper Saddle River

http://www.American Society for Photogrammetry and Remote Sensing.htm The imaging & Geospatial Information Society. (20 Mac 2006)

http://www.79.1911encyclopedia.org/I/ID/IDRISI.htm 20 Mac 2006

http://www.clarklabs.org/applications/upload/CS_LP_CellTower1-6.pdf

http://www.clarklabs.org/applications/upload/CS_ECA_CWB1-6.pdf

http://www.directionsmag.com/product_reviews.php?feature_id=40

http://www.ummah.net/history/scholars/IDRISI.html

http://www.asprs.org/resources/software/review-06-2004/index.html

http://www.clarklabs.org/News.asp?cat=5

http://web2.cast.uark.edu/nerdnews/2001_01/idrisi32/idmap/index.htm

http://www.clarklabs.org/

http://publish.uwo.ca/~jmalczew/gida_2/Idrisi/Idrisi.htm#1.%20General

MODELLING FOREST HARVESTING USING REMOTE SENSING AND GIS IN P. MALAYSIA

By
Mohd. Hasmadi Ismail and Kamaruzaman Jusoff
Department of Forest Production
Universiti Putra Malaysia
43400 UPM, Serdang, Selangor, Malaysia
Tel: 603 89467220, Fax: 603 89432514
mhasmadi@putra.upm.edu.my

Taylor, J.C.
Cranfield Centre for Geographical Information Management
National Soil Resources Institute
Cranfield University, Silsoe, Bedford, MK45 4DT, UK
Tel: 0044-1525 863064
j.c.taylor@cranfield.ac.uk

ABSTRACT

The use of satellite remote sensing and GIS in Malaysian forestry is well growth since 1970's. Current efforts of remote sensing and GIS application in forestry are mainly in monitoring forest land use change, forest type classification; forest inventory, and remote sensing as a tool in rehabilitation and reforestation. However, modelling of forest harvesting using remote sensing or GIS is not exploring as much as other application. Recent development in computer hardware and software enable the decision making in forest management were made by the aid of modelling approaches from different sources in a reasonable time. This paper discuss the main area where remote sensing and GIS can play a role in forest harvesting of P. Malaysia, the need of forest modelling in harvest planning and use of DEM as a solution in forestry problem. It is concluded that there is a high potential of satellite remote sensing and GIS application in Malaysia, especially modelling forest harvesting management. This is due to it's as a tool for fast decision making, reduced cost and time, and provide accurate information needed for sustainable forestry, and a sound management decision. For instance, it is envisaged that through these technology sustainable forest management objective can be achieved and meet the sound of ecologically and environmentally.

1.0 INTRODUCTION

The tropical rain forest is one of the world's richest and unique natural resources. The harvesting and conversion of forest resources is vital to many tropical countries for economic development, as well as provide a livelihood to millions of people for that country. In P. Malaysia all the forest land are owned and managed by the state government. However, the specification and management guideline for the forest harvesting were outlined and issued by Forestry Department Peninsular Malaysia called Forest Harvesting Guidelines and Specification for Forest Road in Peninsular Malaysia (Anon, 1988 and Anon, 1997). These manuals were pertaining to the road construction, alignment, gradient, drainage, tree marking, direction of felling, and the setting up the log yards. Generally, forest harvesting in P. Malaysia covers the area of Permanent Forest Reserve (PFR), State Land and also individual land. For Permanent Forest Reserve, only areas that have been classified as "Productive Forest Under Sustainable Income" regarding to section 10 (1) National Forestry Act 1984 (Amendment 1993) can be harvested while the other areas are protected forest areas that cannot be harvested and they have been classified as follows; Soil Protection Forest, Soil Reclamation Forest, Flood Control Forest, Water Catchment Forest, Forest Sanctuary for Wildlife, Virgin Jungle Forest Reserve, Amenity Forest, Education Forest, Research Forest, and Forest for Federal Purposes.

Much of current forest management practice can be improved through the use of current technology include remote sensing and GIS. Forest management planning relies on different type of information to provide an up-to-date description of the forest and to formulate plan for their management (Battad et al., 2000). Some of the types of information required are maps, survey data, measurement growth and yield, aerial photograph and satellite data. In forest operation, forest harvesting and transportation operation were recognised lie on a near optimal path for creating conflict. Thus, the careful planning and implementation is important not only for the sustainability of forest but also for the continuation of forestry as a profession.

In the era of information technology, remote sensing, GIS and related technologies has been a useful tool in forestry and environment assessment application. Currently, the trends of using geo-spatial data such as remote sensing and GIS technology in forest land use monitoring in Malaysia were playing a greater role (Mohd Hasmadi and Kamaruzaman, 1999), In fact, Forestry was one of the first disciplines in Malaysia to recognise the value of remote sensing in obtain timely and reliable information which is essential for sustained yield forest management and monitoring the trend of forest land use (Kamaruzaman, 1997). Forest harvest modelling is a particularly difficult problem when approach from the traditional direction of optimisation. For the solution, applying technology and modelling could be more popular for many forests harvesting operation. Remote sensing can provide data at synoptic scale offering the potential to discern large-scale ecosystem pattern (Roughgarden et al., 1991). Remote sensing and GIS technologies have been primarily utilized for obtaining static information on forest patterns, but they are increasingly important to be use as a source in forest harvesting modelling for both data input and model validation.

The future optimal harvesting plans of tropical forest resource in P. Malaysia is going to be largely dictated and affected by the availability and extended use of information technology. The availability of several of remote sensing and GIS offers many advantages in this respected field. It is anticipated that the effective of tropical forest harvesting would gain momentum by interactive utilize of these technologies. Issues on information technology in tropical forestry especially on the role of geo-informatics for the development of various forestry models with efficient data integration both in term of spatial, non-spatial and temporal attribute is well addressed.

2.0 THE NEED OF MODELLING IN FOREST HARVESTING

Nowadays, sophisticated information technology does change the nature of decision making to some extent. In many cases it uses documentation, information and modelling rather than observation as its data source. Planning for decision-making is essential because it provides the specific discipline that welds together all part of forest management system. According to Mumford (1991) decision making is the process of making a conscious choice among several alternatives. In fact, decision making always requires a good knowledge of the organizational environment, which is becoming more and more complex.

Forest management decision, because of the many conflicting involved, required much iteration to achieve a feasible plan. Forest management planning is increasingly complex because specific forest harvesting is restricted to predetermined forest zone and occurs at a number of spatial scales. One of the difficulties with traditional harvest planning is that there is no real model of space inside the system (Baskent and Jordan, 1991). For this reason, there is need a knowledge of spatial modelling for planning the forest area. Forest research data and forest resource maps can be combined with other data sets within a GIS to be used for analysis and modelling.

There are many example of the use of modelling-based remote sensing and GIS for forest management. For example, in North America forest modelling and analysis has been conducted for planning forest management (Martin, 1985). The road construction, cutting, silviculture and watershed management and forest resource mapping are the element, which considered in the modelling (Tomlinson 1987).

Battard et al.,(2000) developed and demonstrated a system called Integrated forest planning system (IFPS) for forest management. IFPS is a spatially —based modelling system consisting of several computer application linked together through a common database. The core of the system is database management system (DBMS) from GIS and remote sensing sources. The main benefit of the IFPS is relatively low cost of system development and the flexibility of adapting the system to the forestry application.

Although information technology can greatly speed up the modelling work for decision making process, it is important to note that this technology is closely dependent on the development of computer system, and that computer are running by the human. Computer are not used to replaced human being for decision making but it can help in assisting and advising the decision maker to understand the problem, agree the solution and implement the solution successfully. It is worthy to note that although computer system based GIS and related technology is helping as decision support system, it is the planner ultimately who will decide on the optimum decision (Ismail et al., 2001).

3.0 DIGITAL ELEVATION MODEL (DEM) IN FOREST HARVESTING

Recent development in computer hardware and software enable the production of DEMs from different sources in a reasonable time. The sources of a DEM can be streopair of aerial photograph, satellite imagery, or a digitised contour map. In fact, DEM opens the way for 3D viewing of the landscape, which enhances features representation and the human perception of spatial entities and helps the visual interpretation of images and the understanding of images and the understanding the relationship between landscape elements (Green, 1992).

The use of 3D based visualization technique with GIS and remote sensing data historically should be applied for visual impact assessment in natural resource management. According to Nik et al.,(2001) forestry professional and researchers have been investigating visualization technique for many years addressing a variety of forest management problem.

Use of DEM in forestry is increased tremendously. DEM can be use in surface analysis such as terrain, elevation, aspect, slope and present perspective view of the forest area. Beaudoin and Seen (1997) described a DEM and particularly the slope layer derived from it, without doubt very important process of information, which needs to be accounted for in the management of forestry area.

Hart and Wheerry (1987) demonstrated the application of DEM based Landsat TM in forest harvesting and found that classified Landsat TM data is capable to depict the vegetation association, administration area, road and trail as well as measure the distance of the road. Information from the images was used in planning the management of timber harvest method along the road to enhance the scenery experience for traveller in Flathead National Forest, U.S.A.

Another study was carried out by Jones and Wyatt (1990) under the EC Programme to assess the role of satellite remote sensing in management of upland areas. Snowdonia were selected as a potential area to provide an assessment of the visual effect of conifer plantation on landscape quality. 3D perspective views were created to simulate tree height above the land. Landsat TM data set of the same study area was used to generate image of both mature forest, and of the forest clear felled. Although the image generated were found not realistic, but the likely outcome of such action.

Under the same programme, Jones and Wyatt (1990) conducted a separate study used a DEM overlaid with remote sensing data and cartographic feature in Eire. The aim of the study is to produce a map of forest for tourist. An OS 20 X 20km section on a 20m grid was converted to a binary image by rescaling the elevation value in 4m steps into 0-255m ranges. The binary image was resampled to a 10m pixel for compatible with the satellite imagery, which was then overlaid on the DEM. The study used Arc/Info and Macintosh system for map production, and resulted in a high quality satellite based map showing 3D landscape feature of interested to tourism. They concluded that DEM could be used for forestry application especially in planning in upland areas, in conjunction with remotely sensed data.

Recently, computer aided road design system were use DEM have become more attractive with a availability of high resolution of DEM data. Ahmed et al., (2000), claimed that one method for gathering high resolution elevation data is with the use of airborne laser mapping technology such as LIDAR. LIDAR elevation has been found to be accurate to within 15 cm, and allowed to create of an accurate, high resolution DEM and enabling computer estimate earthwork accurately and quickly.

4.0 APPLICATION OF REMOTE SENSING AND GIS IN FORESTRY

In fact, remote sensing application was started in 1961 by using extensive aerial photography for demarcated the upper altitudinal limit of forest land suitability for inclusion in forest state production (Kamaruzaman and Souza, 1997). A black and white aerial photography was use widely in forest resource survey in P. Malaysia in 1962 which involved the systematic assessment of the forest potential for management purposes. Meanwhile in 1981 aerial photograph were use in checking the forest changes in P. Malaysia between 1972 to 1982. The set of first forest inventory data were compared with 1: 40 000 scale of aerial photograph. Result indicated that a total of 148 000 ha of forested land has been converted to non forestry purposes. Although the use of aerial photography had long been established in P. Malaysia, the existence of such images for large areas naturally led to the desire to interpret the imagery itself, rather than to wait for it to be eventually transformed into maps. Other types of remote sensing opened up wider possibilities. Whereas aerial photography for photogrammetric purposes taken at relatively low altitude remains unrivalled for detailed in the visible spectrum, satellite. Based sensing systems can measure reflected and emitted radiation at much greater range of wavelength.

The use of remote sensing and GIS becoming very important in which the integration of data and information are immense and unavoided. Realising this, Forestry Department of P. Malaysia has set-up one unit named mapping and GIS section in 1997 with an objective to develop an operational GIS and remote sensing for more effective use in many field regarding to forestry (Alias, 2001). The section, currently in the process of integrating all the information for the development and modelling of Management Information System (MIS). The final objective however, is to use the MIS to be manage forest areas more effective, easy handling in accordance with he sustainable forest management concept which is has been implemented.

In 1988, a study was conducted by Forestry Department of P. Malaysia with special objective is to test the usefulness of Landsat MSS and SPOT in classification and mapping a broad forest type, monitoring and detecting the changes on forest pattern (Wan Yusoff, 1988). From the interpretation and analysis of the both Satellite imagerises, using EASI/PACE on the 50 000 ha lowland forest area, a following result were noted: (i) stratified component of logging such as road,skid trail, bare soil were easily detected on the both satellite data using visual and digital interpretation,(ii) Previous logged over forest with intensive felling were easily detected and mapped using Landsat MSS and SPOT data.

Another study conducted by Zahriah et. al,(1989) with the objective to detecting and map the status of forest changes in the period of 1982-1988. The study attempted in the Lesong Forest Reserve, Pahang. Forest resource map (scale 1:25 000) were use together with Landsat TM July 1988. The classified image from the Landsat TM imagery were the transferred into GIS application (ARC/INFO) where the forest resource map of 1988 were produced. The result of the study revealed that Landsat TM were possible to detected and monitor the changes over the time and provide a good data in updating the forest resource information through the integration of GIS.

Among of the various type of sensor available in the system, Landsat TM and SPOT data is a most useful in forestry application in P. Malaysia. Meanwhile for passive sensor RADARSAT data have been tested by many agencies especially for forestry application. Realising the potential and the important of remote sensing technology for the country, Malaysia government has seriously invested into space technology programme. The first Malaysian remote sensing satellite called TiungSat-1 successfully launched on 26th September 2000. The microsatellite equipped with 80 m resolution (three narrow angle camera) and 1.2 km resolution for one wide angle. Tiungsat-1 could provide detailed information on earth resources including for forestry application.

5.0 CURRENT EFFORT OF USE REMOTE SENSING AND GIS IN FOREST HARVESTING IN P. MALAYSIA

This section discusses several research project undertaken under the use of remote sensing and GIS, which special reference to forest harvesting scope. It is interest to note that, modelling of forest harvesting using remote sensing and GIS is not exploring as much as other application (e.g. forest type mapping, forest land use change, monitoring logging impact, forest rehabilitation, etc.) in P.

Malaysia. For instance, in implementing the use of remote sensing and GIS in P. Malaysia is inline with sustainable forest management concept and has given emphasized by Malaysian government currently.

5.1 Forest road planning

Forest harvesting in hill forest in P. Malaysia is generally carried out by combination of crawler tractor-winch lorry, which is tractor skid the log from the felled site to the skid trail where the winch lorry will continuous the log transportation to the roadside log yard or direct to the mill. The road feature and alignment are complex edge in geometric. During the last few decade there has been increasing in computer-aided analysis of road planning as it provide quick evaluation of alternative in a more systematic manner. Forest operation in P. Malaysia has adopted a Standard Road Specification and Forest Harvesting Guideline which is outlined by Department of Forestry, P. Malaysia to be strictly adhering by all harvesting contractors at the planning, implementation, and maintenance level.

Implementation of this guideline is important to mitigate and reduce the adverse impact of forest harvesting to the forest ecosystem. Consequently, the harvesting plan, particularly regarding to the design and construction of forest road in hill forest areas is inline with the Malaysian Criteria and Indicator (MC&I) requirement to ensure the sustainability and quality of forest resources. It is anticipated that with the availability of remote sensing and GIS, a modelling of forest harvesting activities can be contribute more for better planning of forest road and transportation.

For example, Samsul (1999) have conducted a study to propose the road network for log transportation and assess the road density in Balah Forest Reserve, in Kelantan state. The study was performed using GIS tool-ArcInfo/View for modelling the alternative of the proposed forest road location in the study area. The criteria to locating of the forest were based on the information supplied by the Forestry Department of P. Malaysia. The result indicated that the suitable road alignment and siting could be trace out by the GIS modelling function. For the road density analysis, it is reported that the proposed of road construction must be 25 m/ha for main road, secondary and feeder road with a total length 7, 861 m. This guideline is enable the forest harvesting will be carried out with minimum environmental disturbance.

A recent study of the forest road planning using remote sensing and GIS modelling was carried out by Musa and Mohamed (2001). The study is located at hill forest area namely Ulu Muda Forest Reserve, in the state of Kedah, north P. Malaysia. In the study, various spatial data layer was inputted in the road planning model including forest administrative boundary, river network, and contour line. The analysis was performed based on Best Path Modelling method which is derived and determined the best road alignment and transportation network. This study revealed that modelling forest harvesting with combination of remote sensing and GIS is enable to provide the accurate and fast in order to make the decision.

In the same year Mohd Rasol (2001) have undertaken a study in the development of intelligent agents system based on GIS and information technology. The system is useful to facilitate decision-making process in forest harvesting including forest road planning. The result of the study shown that the intelligent agents system -based GIS can be determine the type of tree species and their size to cut, future standing trees at the next rotation period and formulate a plan for silvicultural treatment.

5.2 Determination of suitable harvesting zones

Forest management planning is increasingly complex because specific forest harvesting is restricted to predetermined forest zone. The harvesting of hill rainforest requires inventory and monitoring of large areas at fine scales. Increasingly, modelling is being used as a research and management tool to examine spatial-temporal processes such as resource harvesting. Forest zoning classification is one of the integral parts of the forest harvesting planning procedure. The objective of the zoning is to confine certain forest activity to the designated zones, whereas the productive and protection forest area can be realized.

MC&I have been formulated and use as a guideline and therefore as a standard for assessing forest management practices in Permanent Forest Reserve in P. Malaysia. Beside MC&I, Permanent Forest Reserve is managed sustainable under the rules and procedure pertaining to International Timber

Organization (ITTO) and ISO 2001. Modelling of GIS in determining the suitable forest zones can assist forest manager in achieving the objective of above requirement.

Khali Aziz (2001) reported that a study in 10,000 ha of Temenggor Forest Reserve in Perak state were used GIS modelling in order to classified the suitable harvesting area. The result of the primary hill forest shown that about 2% was classified as very steep terrains (slope more than 40^0) and 31% of the total area was classified under river buffer zone, which is a total of approximately 3,300 ha is need to reserved as a protection forest. Only a total of 9, 700 ha were classified as a suitable area for harvested by contractor.

Realizing the traditional process of delineating Permanent Forest Reserve is quite time consuming and expensive, Ismail et al., (2001) have undertaken the similar study in Bintang Hijau Forest Reserved in the state of Perak . The forest is covering an area about 84, 702 ha and is undulating area and intercepted by the steep slope. The methodology involved in the study is development of slop map and DEM from Landsat TM data and using GIS spatial modelling technique for zoning the forest by integrating with other information as input in the model. From the study four zone are identified into the different category namely protection forest, productive forest, amenity forest and research and education forest. From the total of 84, 702 ha forested area, 57, 058 ha is designated for production forest, 27, 029 ha for protection forest, 247 ha for amenity forest and 369 ha for research and education forest, respectively.

By incorporating the element of modelling with remote sensing and GIS into forest harvesting operation, it implies the opportunity to use these technology as a decision support tool in forest resources planning and management in the near future in P. Malaysia.

6.0 CONCLUSION

Current awareness on the importance and the potential of remote sensing and GIS in forestry modelling have pave a way a Forestry Department of P. Malaysia to make full use of these technology in the management of Malaysian Forest. In this brief review of remote sensing and GIS modelling in forestry application, it is very powerful tool and promising for forest harvesting planning and management in P. Malaysia. Modelling of forest resource management wit the remote sensing and GIS provide an accurate, affordable cost, less time consuming and can derived a fast solution in decision making. In order to enhance of decision making process as well as to contribute successful implementation forestry modelling with remote sensing and GIS, a assistance and cooperation from the developed country especially in the field of forest management, harvesting and protection are required. However, to make full use of the technology, studies on different aspect of remote sensing and GIS modelling for forestry application such as different sensor type of optical, radar, and airborne data could be continuously conducted to develop the most appropriate technique in forest harvesting modelling.

REFERENCES

1. Ahmad,K.M., Reutebach, S,E. and Curtis,T.E. 2000. Accuracy of high resolution airborne laser data with varying forest vegetation cover. Paper presented at 2nd International Conference on Earth Observation and Environmental Information, 11-14 Vovember 2000, Cairo,Egypt. 13p

2. Alias,A.M. 2001. Application of remote sensing and GIS by Forestry Department. P.Malaysia-current status. Paper presented at the Seminar Remote Sensing and GIS Technology in Forestry, 31 July 2001, Kuala Lumpur. 10p.

3. Anonymous. 1997. Forestry in Peninsular Malaysia. Forestry Department Peninsular Malaysia Press. 32p.

4. Anonymous, 1988. Specification for Forest Road in P. Malaysia. Forestry Department Peninsular Malaysia Press. 47p.

5. Baskent,E.Z. and Jordan,G. 1991. Spatial wood supply simulation modelling. The Forestry Chronicle, v.67.pp: 610-621.

6. Battad, D, Lau,J.A. and Sutton,M. 2000. Integrated forest planning system (IFPS). Forest Note, FS0042. 4p.

7. Beaudoin,A. and Seen, D.L.1997. Contribution of radar imagery to tropical forest monitoring and management. Proceeding of International Workshop on Management of Secondary and Logged-Over Forest in Indonesia, 17-19 November 1997, Indonesia.pp: 93-100.

8. FAO. 1996. Forest Resources Assessment 1990 - Survey of Tropical Forest Cover and Study of Change Processes. Food and Agriculture Organization of the United Nations Forestry Paper 130. Rome, Italy. 152 pp.

9. Green,K. 1992. Spatial imagery and GIS integrated data for natural resources management. Journal of Forestry, 90: 32-36.

10. Hart,A.J. and Wherry, D.B. 1987. An operational GIS for Flathead National Forest. GIS for Forest Resource Management: A Compendium. American Society for Photogrammetric and Remote Sensing and American Congress on Survey and Mapping USA.pp: 219-230.

11. Ismail Adnan Malek, Ainuddin Nuruddin and Sah Rani Zailan. 2001. A GIS Spatial Modeling Approach in Forest Zones Classification: A Case Study of Bintang Hijau Forest Reserve, Perak Darul Ridzuan, Malaysia. Paper Presented at Malaysia Science and Technology Congress 2001, 24-26 September 2001, Kota Kinabalu, Sabah, Malaysia. 10p.

12. Jones,A.R. and Wyatt,B.K.1990. An evaluation of the Role of Second Generation Earth Observation Satellite as a source of information for integrated resource management in the upland. Final Report to Environmental Research Council, Institute of Terrestrial Ecology, Hungtington,U.K.

13. Kamaruzaman Jusoff and Souza,G.D. 1997. Use of satellite remote sensing in Malaysia and its potential. International Journal of Remote Sensing, 18,(1): 57-70.

14. Khali Aziz Hamzah. 2001. Remote sensing, GIS and GPS as a tool to support precision forestry practices in Malaysia. Paper presented at the 22nd Asian Conference on Remote Sensing, 5-9 November 2001, Singapore.5p.

15. Martin,F.C. 1985. Using GIS for forest land mapping and management. Photogrammetric Engineering and Remote Sensing, 51(11): 1753-1759.

16. Ministry of Science, Technology and Environment.1997. Assessment of Biological Diversity in Malaysia. Ministry of Science, Technology and Environment, Kuala Lumpur, Malaysia.

17. Mohd Darus Mahmud.1978. Forest Resources of Peninsular Malaysia. The Malaysian Forester, 41,(2):82-93

18. Mohd Rasol Abd. Manaf. 2001. Developing an intelligent agent based system for decision making in forest harvesting. Paper Presented at International Conference on Forestry and Forest Product Research 2001, 1-3 October 2001, Nikko Hotel, Kuala Lumpur, Malaysia. 12p.

19. Mohd. Hasmadi Ismail and Kamaruzaman Jusoff. 1999. Use of satellite remote sensing in forest resource management in Malaysia. Paper Presented at 2nd Malaysian Remote Sensing and GIS Conference, 16-18 March, 1999, ITM Resort & Convention Centre, Shah Alam, Selangor, Malaysia. 24p.

20. Mumford,E.1991. Decision making and the organizational environment: Today s problem and tomorrow s needs. In: H.G Sol and J.Vesceny(eds.).Elsevier Science Publishers, Victoria, Canada.48p.

21. Musa,M.K.A. and Mohamed,A.N. 2001. Alignment and locating forest road network by Best Path Modelling method. Paper presented at the Seminar on Remote Sensing and GIS Technology in Forestry Application, 31 July 2001, Kuala Lumpur, Malaysia. 13p.

22. Nik Isrozaidi Nik Ismail, Daut Daman, Mohd Shafry Rahim and Puteri Suhaiza Sulaiman. 2001. 3D visualization technique for forest management and research. Paper Presented at Malaysia Science and Technology Congress 2001, 24-26 September 2001, Kota Kinabalu, Sabah, Malaysia. 8p.

23. Roughgarden, J., Running,S.W. and Matson, P.A. 1991. What does remote sensing do for ecosystem?. Ecology, 72: 1918-1922.

24. Samsul Sainan. 1999. Geographical information system for forest road planning: A case study of Balah Forest Reserve, Ulu Kelantan. Bac. Sc. thesis, Faculty of Forestry, Universiti Putra Malaysia, Serdang, Selangor, Malaysia. 71p.

25. Tomlison,R.1987. Current and potential use of GIS: The North American Experience. International Journal of GIS,1(1): 203-209.

26. Wan Yusoff Wan Ahmad. 1988. Application of Landsat/SPOT digital and visual analysis as a tool for forest classification and mapping in Lesong Forest Reserve, P. Malaysia. Fellowship Report, ASEAN Institute of Forest Management, Kuala Lumpur, Malaysia.

27. Zahriah Anis, Cheah, H.G. and Layden,G. 1989. Forest mapping and change detection using satellite data. Paper presented at the 10th Asian Conference on Remote Sensing, 23-29 November 1989, Kuala Lumpur, Malaysia.

SATELLITE IMAGERY AND GIS APPLICATION IN NRCS MODEL

By
Nuratifah Zaharudin and Abd Manan Samad
Department of Surveying Science and Geomatics,
Faculty of Architecture, Planning and Surveying,
Universiti Teknologi MARA Malaysia,
e-mail: nur_atifah_zaharudin@yahoo.com

Wardah Tahir
Department of Water Resources and Environmental System
Faculty of Civil Engineering,
Universiti Teknologi MARA Malaysia,

ABSTRACT

Klang River catchment, which partly includes Kuala Lumpur, encounter with a rapid development in the recent years. At the same time, flash flood occurrences in this area have also increased from year to year. The flood events have been correlated to the unexpected rainfall amount. However, that is not the only reason which turns Kuala Lumpur into a drenched basin after the rain. Landuse changes especially in rapid development are believed take part as a big role in the rise of flash flood events. The land conversion processes have changed the nature of the catchment area into more impermeable areas or less infiltrate surfaces deserved by the construction of more buildings and roads. It show that flood event in rapid development have good relation with runoff ratio. The Natural Resources Conservation Services (NRCS) model of the US SCS had been established to estimate runoff generation from a rainfall event in a catchment. Besides, the effect of the surface conditions to catchment itself is evaluated by means of landuse and soil type which represented by CN value. Runoff value would increase due to landuse changes from its natured surface to the man-made feature. This study combines the NRCS model and GIS in an integrated system to estimate the peak runoff. The research exploits GIS capability to manage and control the circumstances through its layer information. The outcome from the system developed can be utilized to estimate flood possibility due to landuse changes.

INTRODUCTION

A simple definition for flood is when dry and safe surfaces are covered with water. The main source of water may come from variety of source and one of the sources is rainfall. There are two types of surface, which may accept the rainfall: first the impervious surface and second the pervious surface. Those types of surfaces are related to their land use. Some places did not take a long time for major landuse changes. The change from one type of landuse to another type of landuse is part of the development process aimed for better living conditions. Every single land use change has an impact to the surface. Figure 1, illustrated how landuse gave an impact to the runoff value. With forest condition, it created a natural ground cover. The balance condition infiltration process will return a small runoff value. The deforest process increase the runoff value from time to time due to the landuse changes. At the end, the impervious surface disturbs the balance conditions and potential of runoff value will increase.

Figure 1: Impact of land development in runoff
(Source Prince George's County, 1999

Natural Resources Conservation Services (NRCS) model

The Natural Resources Conservation Services (NRCS) technique is a runoff generation model. It was established by the United State Department of Agriculture. The model consideration starts with a rainfall amount imposed on a watershed over a specified time distribution. The accumulated rainfall is converted to mass runoff by using a runoff curve number (CN). CN describes a catchment runoff production behavior through landuse, which the higher CN will generate more runoff. The major factors that determine CN value are soils, plant cover, amount of impervious area, interception and surface storage (USDA, 1986). All the features are described in detail in Hydrologic Soil Group (HSG) table. Combination of landuse and soils classification or namely as HSG table are the main parameters in elaborating and describing a catchment area as shown in Table 1.

Table 1: Landuce that combined with soil classification or HSG table with assiociated Curve Number

Description	Average Impervious (%)	Soil Group			
		A	B	C	D
Residential (High Density)	65	77	85	90	92
Residential (Med. Density)	30	57	72	81	86
Residential (Low Density)	15	48	66	78	83
Commercial	85	89	92	94	95
Industrial	72	81	88	91	93
Disturbed / Transitional	5	76	85	89	91
Agricultural	5	67	77	83	87
Open Land — Good	5	39	61	74	80
Meadow	5	30	58	71	78
Woods (Thick Cover)	5	30	55	70	77
Woods (Thin Cover)	5	43	65	76	82
Impervious	95	98	98	98	98
Water	100	100	100	100	100

(Source: USDA, 1986)

HSG is an information table about soil group which are classed as A, B, C and D and combined with landuse. This two (soil and landuse) information combination produces a unique CN value for each landuse and its soils condition. Cover type placed at the left side of the HSG table is classified following the possibility available on the earth such as water, impervious area, forest and disturbed/transitional area. The top right of the table lists 4 soil classes A, B, C and D. Each soils group describes the potential of runoff as classified under Table 2.

Table 2: Soil group summary

Soils Group	Soils Textures	Runoff Potential	Final Infiltration Rate mm/hr	Permeability Rate mm/hr
A	Sand, loamy sand or sandy loam	Low	25	> 7.6
B	Silt loam or loam	Moderately Low	13	3.8 to 7.6
C	Sandy clay loam	Moderately High	6	1.3 to 3.8
D	Clay loam, silt clay loam, sandy clay, silt clay, or clay	High	3	< 1.3

(Source Gumbo, Munyamba, Sithole and Savenije, 2002)

According to Chow, Maidment and Mays (1988), mathematical language is use to describe and explain NRCS model in runoff generation process. In condition when the depth of excess precipitation

(Q) less than or equal to the depth of precipitation (P), runoff would not occur. In addition, after runoff begins, the additional depth of water retained in the catchment (F_a), is less than or equal to some potential maximum retention (S). At this stage, there exists an initial abstraction (I_a) which refers to all losses before runoff begins that include water retained in surface depressions, water intercepted by vegetation, evaporation, evapotranspiration and infiltration.

$$Q = \frac{(P - 0.2S)^2}{P + 0.8S} \tag{1}$$

According to Yu, B. (1998), S would become the only parameter for the NRCS method as P is representing the rainfall. It commonly expressed in inches in terms of a runoff CN through the relationship,

$$S = \frac{1000}{CN} - 10 \tag{2}$$

where CN was referred to as the dimensionless number that have a range from 0 to 100.

Unit Hydrograph

Wai (2002) noted that the nobility of unit hydrograph is in deducing that rainfall excess occurs over a fixed hydrograph of a time base. It is expressed in volume unit which refer to unit depth of runoff per catchment area either 1 in or 1 cm. An illustration of a runoff hydrograph is given in Figure 2.

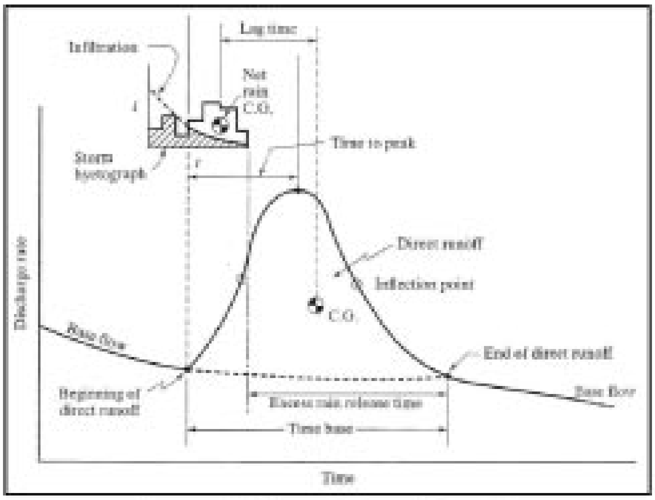


Figure 2: Hydrograph time relationships
(Source: Chow, Maidmont and Mays, 1988)

Chow, Maidment and Mays (1988) states that there are three types of synthetic unit hydrograph as follows:

i. the one that describes the hydrograph characteristics such as peak flow and base time.
ii. the one that is based on a dimensionless unit hydrograph and
iii. the one that refers to watershed storage model.

The NRCS Synthetic Unit Hydrograph

In NRCS Synthetic Unit Hydrograph method, the runoff from a catchment is calculated based on the catchment characteristics including the CN value. In this method, the main output would be the value of runoff peak (Q_p) with its time rise (t_r) and also time base (t_b). The results from the calculation are shown as a triangular hydrograph employing the above three parameters as shown in Figure 3.The calculation of the parameters requires the values of the catchment area (A), stream length ("), contour data (slope, y) and rainfall duration (D) as given in equation 3, 4, 5 and 6.

$$\text{Time peak, } t_p = \frac{^{0.8}(S+1)^{0.7}}{1900y^{0.5}} \tag{3}$$

Time of rise, t_r = $D/2 + t_p$ (4)

Time of fall in hr, t_b = $1.67 \times t_r$ (5)

$$Q_p = \frac{2.083\ A}{t_r} \qquad (6)$$

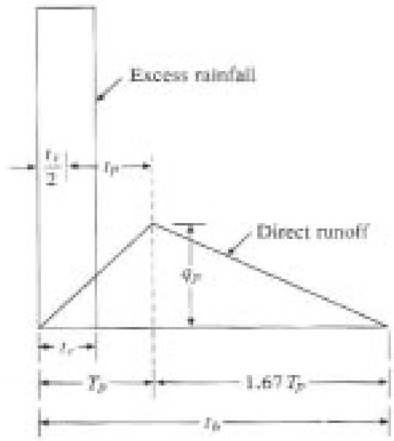


Figure 3: NRCS Triangular Unit Hydrograph
(Source: Chow, Maidment and Mays, 1988)

Remote sensing technique and GIS implementation in NRCS model

This research proved that remotely sensed data is utilized to supply the landuse information. Through remotely sensed data, the user is able to discover topographic details (Smith, 2001) for the specific watershed such as landuse classification, watershed geometry and drainage network. These are important elements to generate the hydrological structure of a runoff model. Shrestha (2003) opted to use remote sensing because the potentiality of the sensor to view synoptic scene and monotonous coverage. This could lessen the cost of data acquisition (Mohd Ibrahim and Mohamad Adli, 2000). Application of remotely sensed data in hydrological field reveals complex spatial diversification in hydrology application (Koster, Houser and Engman, 1999). In addition, Carlson (2004) and Smith (2001) admitted that remotely sensed data like Landsat TM and SPOT can contribute to a variety of products applicable in watershed management such as flood and can be defined as part of runoff coefficients especially in NRCS model.

Many new opportunities for runoff study can be recommended through GIS implementation, since the tools can be used to construct spatially distributed models of watershed (Schumann, Funke and Schultz, 2000). One of the objectives is to improve the existing conceptual watershed model. Besides, simulation models with GIS help the researchers in learning and visualizing the processes involved. According to He (2003), simulation model is a tool to analyze the watershed process. Other than that, simulation model is also discussed as tools in the development planning and to evaluate the watershed management. Nowadays, users have integrated GIS with many hydrologic models (and NRCS model is one of them) within the Windows environment for PC s to increase the assessment and evaluation level. Coskun and Musaoglu (2004) stressed that GIS is a suitable system to handle hydrologic model because GIS exists in two types of data which are spatial data such as topography and attribute data that describe and identify the characteristics of spatial data.

Figure 4: Layer imformation

The entire processes involving GIS can be started after all the data are in layer position (Coskun and Musaoglu, 2004; Melesse and Shih 2002) because every layer is connected to another layer as shown in Figure 4. Nayak and Jaiswal (2003) added that analysis through GIS can be worked further to get the consequences of landuse changes.

OBJECTIVES

- To prepare the landuse follow the HSG table within catchments boundary from satellite imagery as main source.
- To combine landuse information and soils classification to form HSG table through and identified Curve Number for each intersection in ArcView.
- To generate runoff value.

STUDY AREA

The specific study area is lied in boundary coordinate of North of 428369, East of 375032 and North of 401169, East of 345231. The main criterion was based on the existence of flow gauging station. The selected gauging station was Sultan Sulaiman Bridge which covers an area of around 462 km^2. Previous studies in hydrology field held in Klang watershed among others are by Rohaya and Shattri (1999), Mohd Ibrahim and Mohamad Adli (2000), Azrinda and Md. Nor (2005) and Janmaizatulriah, Marfiah and Wardah (2005).

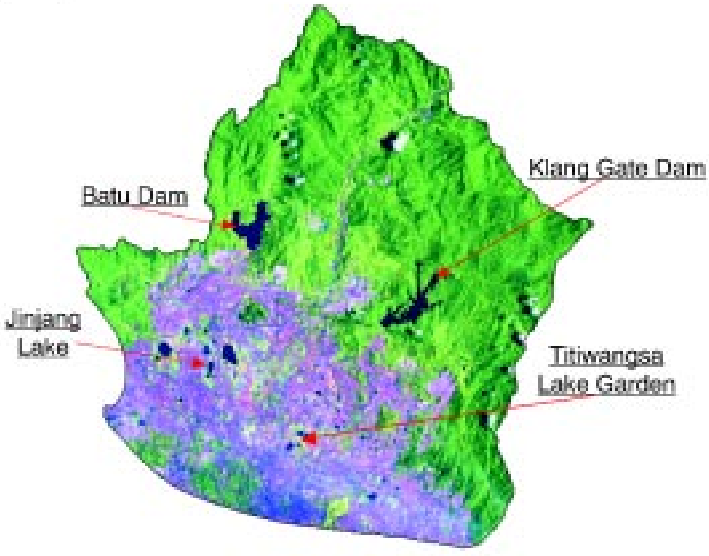


Figure 5: Study Area consist many element of water body such as rivers, dams and lakes

There are two major dams in Klang watershed which are Batu Dam and Klang Gate Dam. It located at the upper region of watershed. Water element like lake was very easy to find in this area such as Jinjang Lake in Jinjang area and Tasik Titiwangsa Lake Garden. Klang River catchment has a bowl topographic. According to Figure 6, the bowl area was identified as urban area. It surround by forest area. The highest point is 1260 meter while the lowest point is 40 meter.

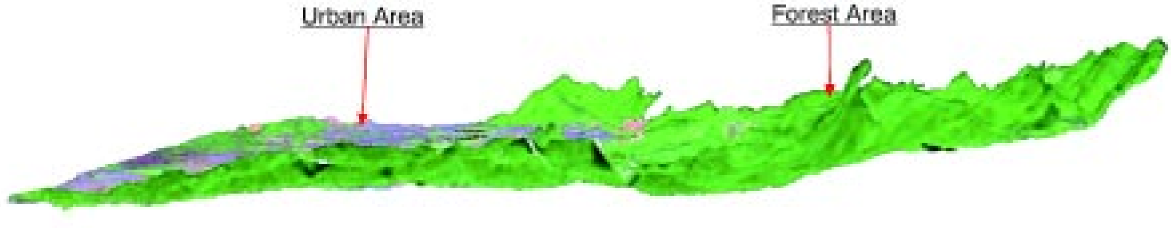


Figure 6: The bowl area identified as urban area

METHODOLOGY

There are 3 stages of methodology. There are remote sensing technique, GIS implementation and validation stage.

Through remote sensing technique, landuse information was extracted from Landsat dated September 20, 2001. The extraction information only focuses to the basic class such as water body, urban, forest, disturbed/transitional and open land. In methodology flow chart, it was namely as Landuse 1 and able to produce the landuse map for Klang River catchment.

GIS was the major application in this research. Based on Landuse 1, the specific landuse able to produce. It called as Landuse 2. The generation of Landuse 2 was important to follow and fulfill the HSG table. Subsequent to the result, it has been integrated with Soil data to identify the CN value. Peak discharge for Klang River catchment produced from the calculation that based on the available CN, river and also contour data. The relevant graph has been produced for best in presenting the peak discharge for Klang River catchment.

The final procedure was validation stage. According to Figure 7, the validation made through comparison between NRCS Triangular for 1 hour duration with Observed Unit Hydrograph which also for 1 hour duration. The Observed Unit Hydrograph calculated from recorded rainfall and discharge data.

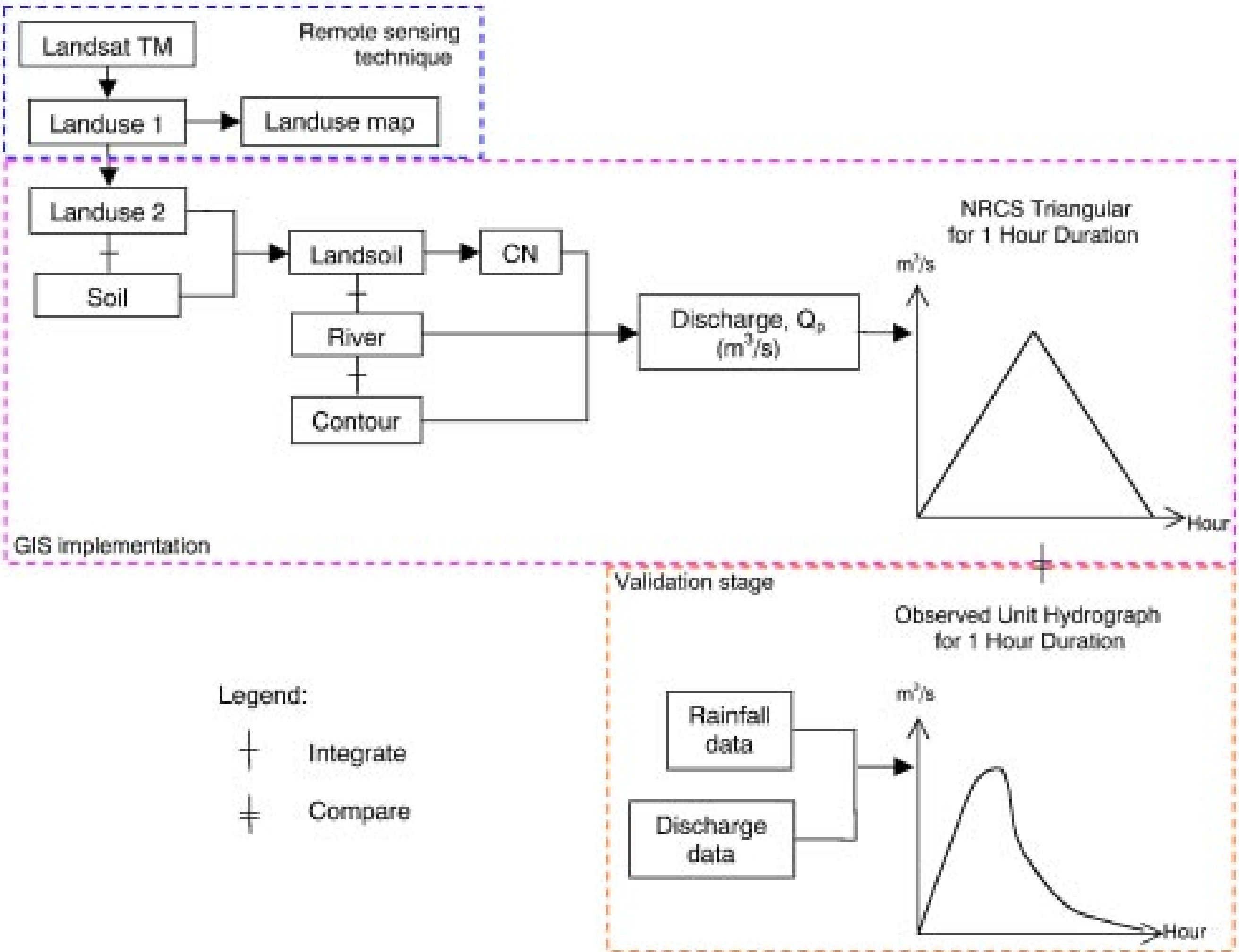


Figure 7: The whole process to implement remote sensing technique and GRS in NRCS model

RESULT AND ANALYSIS

Implementation of GIS

Through the image processing, five main classes have been successfully extracted namely the water body, urban, forest, disturbed/transitional and open land. According to Table 3, the extraction process archive 84% for accuracy assessment and 0.8 for kappa value.

Table 3: Overall accuracy assessments for 2001 landuse extraction from Landsat TM

Accuracy Assessment (%)	Kappa Statistic		
	Landuse	Each Class	Overall
84%	Water	0.6512	0.8000
	Forest	1.0000	
	Urban	0.8750	
	Disturbed/Transitional	0.8718	
	Open land	0.6429	

Further, there are two stages of subclass. The first subclass is based on the main class and the second subclass relies on the first subclass. Existence of attributes such as types of house and area of bare land are then taken into consideration. As shown in Table 4, the area after extraction was represented in percentage. While it split into subclass 1 and subclass 2 for residential classes, the landuse area decreases except for water body and disturbed/transitional area.

Table 4: Area and subclass generation from GIS implement

Landuse extraction from Landsat TM	Area (%)	Subclass I	Area (%)	Subclass II	Area (%)
Water body	3	-	-	-	-
Urban	28	Residential	17	Residential (Low density)	10
				Residential (high density)	7
		Industrial	4	-	-
		Commercial	3	-	-
		Impervious area	4	-	-
Forest	64	Thick	61	-	-
		Thin	3	-	-
Disturbed / Transitional	2	-	-	-	-
Open land	3	Open land	3	-	-
		Meadow	0	-	-

Implementation of NRCS model in GIS starts with CN value production and ends up with peak runoff (Q_p) calculation. Utilizing the Avenue that ArcView 3.2, average catchment CN values calculated and other relevant data are compiled following the requirement of NRCS Triangular method to produce Q_p. The data management and algorithm have been simplified by using the Avenue program that build-in ArcView 3.2 itself. It was an object-oriented language associated with ArcView.

Table 5: The NRCS triangular result

Time (hr)	0	3.0	9.2
Discharge (Q_p)	0	278.463	0

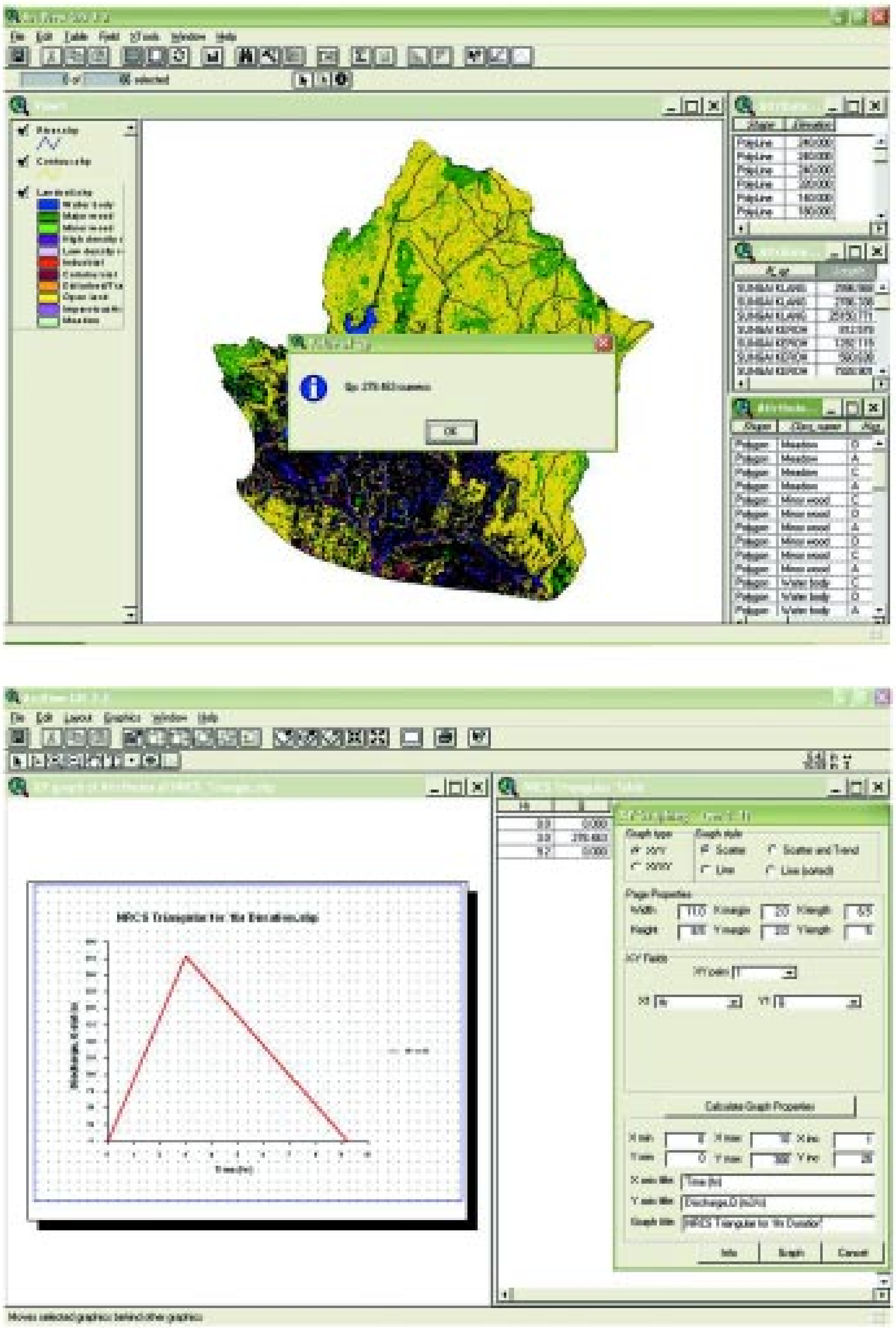


Figure 8: Q_p calculation in the AcrView 3.2 untill it generate the relevent graph

This research found that Avenue is simple and easy programming language for GIS purpose. The appropriate graph has been generated after the calculation through Avenue in ArcView. The graph represented the Klang River Catchment. Research set the Avenue to convert the result of runoff peak at specific peak time and the time it base into tabular data.

The result from the system is given in Table 5. The flow starts from zero values. At the hour of 3, the flow reaches 278.463 cumecs and then decreases back to 0 at the hour of 9. Figure 9 illustrates the results in NRCS Triangular through Avenue programming in ArcView.

NRCS TRIANGULAR FOR 1HR DURATION

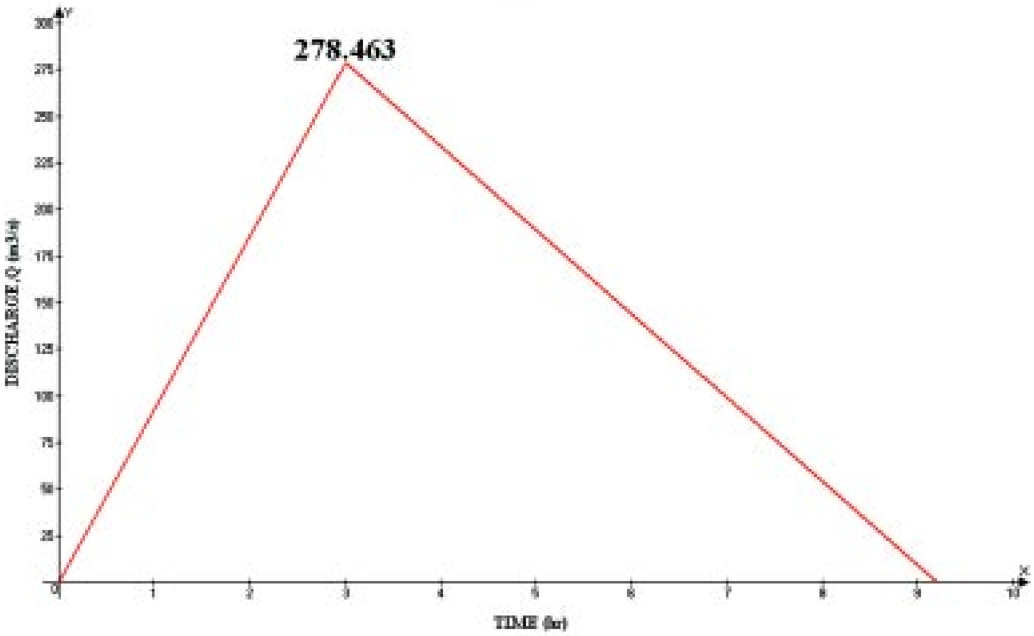


Figure 9: The unit hydrograph for 1 hour rainfall duration

The results have been compared to the observed unit hydrograph. Observed unit hydrograph was developed from recorded runoff and rainfall data for Klang River catchment. Figure 9 shows that a higher peak flow has been estimated by the observed as compared to the peak flow of the system in average of 1 hr unit hydrograph.

COMPARISON BETWEEN NRSC TRIANGULAR AND OBSERVED UH

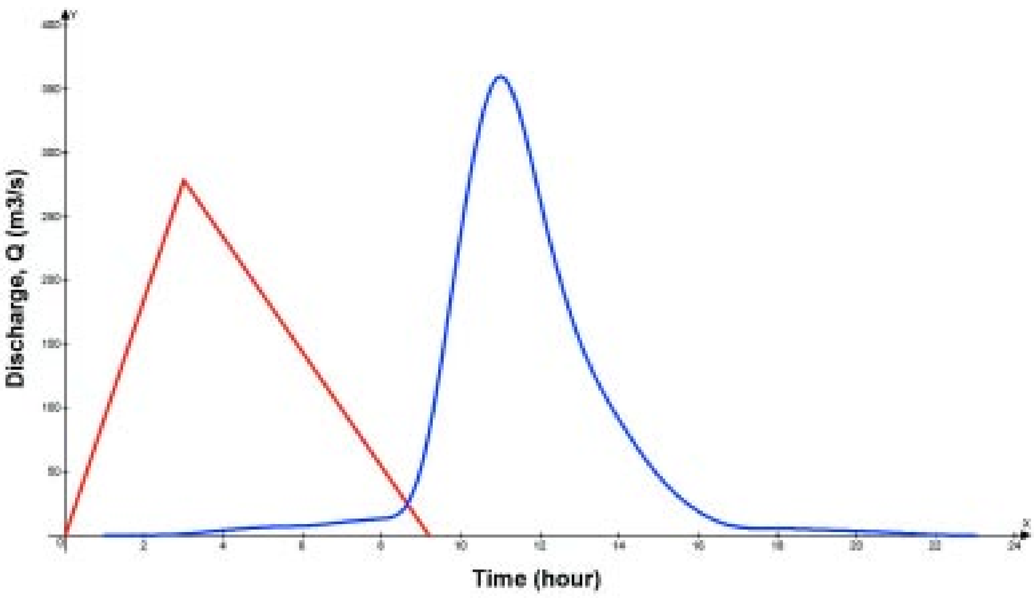


Figure 10: Comparison between observe UH and NRCS

From recorded data, 5 events were selected as noted by Ponce (1989). Average for 5 events equal to 359.959 m^3/s. The graph was also plotted on Time versus Discharge axis. It was in units of hour and m^3/s respectively. The error between NRCS Triangular and Observed Unit Hydrograph was 23% which lied as acceptable value. This value normally in practical is close to the NRCS Triangular calculation for Klang River catchment except for the time base.

CONCLUDING REMARKS

Through this research, it shows that remote sensing technique and GIS able to be apply on NRCS model. It has been prove by the error between NRCS Triangular and the observed Unit Hydrograph lied in acceptable value. At this stage, effort is still being made to improve the system for improved output accuracy. In future, it is recommended that the research using the same model to show the impact of soil in runoff. Study on this matter might also be able to be done through remote sensing technique and GIS.

REFERENCES

Azrinda, H.M, & Md. Nor, K. (2005), 'Flood Plain Simulation Model by Integration of Surveying Packages and GIS', paper given at International Symposium & Exhibition on Geoinformation 2005, Penang, Malaysia, 27-29 September 2005.

Carlson, T.N. (2004), 'Analysis and Prediction of Surface Runoff in an Urbanizing Watershed Using Satellite Imagery', Journal of The American Water Resources Association, 1087-1098.

Coskun M. & Musaoglu N. (2004), 'Investigation of Rainfall-Runoff Modeling of the Van Lake Catchment by Using Remote Sensing and GIS Integration', International Society for Photogrammetry and Remote Sensing, 35 (7).

Chow, V.E., Maidment, D.R. & Mays L.W. (1988), Applied Hydrology, eds B. J. Clark and John Morriss (McGraw Hill).

Gumbo, B., Munyamba, N., Sithole, G., & Savenije, H.H.G. (2002), 'Coupling of Digital Elevation Model and Rainfall-Runoff Model in Storm Drainage Network Design', 27, 755-764.

He, C. (2003), 'Integration of Geographic Information Systems and Simulation Model for Watershed Management', 18, 809-813.

Janmaizatulriah, J., Marfiah, A.W., & Wardah, T. (2005), 'The Effect of Landuse Changes on Flooding Using SCS Method and GIS', Institute of Research, Developement and Commercialization University Technology MARA (University Technology MARA).

Koster R.D., Houser P.R., and Engman, E.T. (1999), 'Remote Sensing May Provide Unprecedented Hydrological Data', (American Geophysical Union).

Melesse, A.M. & Shih, S.F. (2002), 'Spatially Distributed Storm Runoff Depth Estimation Using Landsat Images and GIS', 37, 173-183.

Mohd Ibrahim, S.M. & Mohamad Adli, M. (2000), 'Flood Predicition from LANDSAT Thematic Mapper Data and Hydrological Modeling', paper given at 20th Asian Conference on Remote Sensing, Hong Kong, China.

Nayak, T.R. and Jaiswal, R.K. (2003), 'Rainfall-Runoff Modeling using Satellite Data and GIS for Bebas River in Madhya Pradesh', Institutions of Engineer, India, 84, 47-50.

Nuratifah, Z. & Abdul Manan, S. (2005), Penjanaan Model NRCS Menggunakan Imej Penderiaan Jauh dan GIS, Persidangan Bersama Geosains UKM-ITB, Malaysia

Ponce, V.M. (1989), Engineering Hydrology:Principles and Practices , Prentice-Hall Inc.

Rohaya, M. & Shattri, M. (1999), Remote Sensing and GIS for Flood Prediction, 20th Asian Conference on Remote Sensing, Hong Kong, China.

Shrestha, M.N. (2003), 'Spatially Distributed Hydrological Modeling Considering Landuse Changes Using Remote Sensing and GIS', International Society for Photogrammetry and Remote Sensing (Kuala Lumpur, Malaysia).

Smith, R.W. (2001), 'A Hydrological Classification of the Embudo Watershed, Northen New Mexico', Geography (University of Alabama).

USDA, Soil Conservation Service, Urban Hydrology for Small Watersheds, Technical Release 55 (TR-55), 1986

Wai, Y.H. (2002). Flood Runoff Estimation of Ungauged River Catchments Using Soil Conservation Service Method, Universiti Sains Malaysia.

Ward, R.C. & Robinson, M. (2000), Principles of Hydrology (Fourth edn.: McGraw Hill).

Wardah, T. & Sahol Hamid, A.B., (2003). Synthetic Unit Hydrograph for Selangor Basins and Enhancement of DeFlood Software, Institute of Research, Developement and Commercialization University Technology MARA. (University Technology MARA).

Yu, B. (1998), 'Theoretical Justification of SCS Method for Runoff Estimation', Journal of Irrigation and Drainage Engineering, 124 (6), 306-310.

ISU-ISU PENGINTEGRASIAN PDUK DAN SPTB

Oleh
M.Gengatharan
Seksyen Penyelarasan dan Dasar Kadaster
Jabatan Ukur dan Pemetaan Malaysia

ABSTRAK

Jabatan Ukur dan Pemetaan Malaysia telah membangunkan Pangkalan Data Ukur Kadaster (PDUK) untuk memenuhi kehendak semasa pengurusan data ukur kadaster yang lebih cekap dan berkesan selari dengan era digital. Dalam waktu yang sama, Jabatan Ketua Pengarah Tanah dan Galian telah membangunkan Sistem Pendaftaran Tanah Berkomputer (SPTB) untuk kegunaan Pejabat Tanah dan Daerah serta Pejabat Tanah dan Galian di setiap negeri di Semenanjung Malaysia. Tujuan SPTB ialah untuk memodenkan proses pendaftaran hak milik dan urusniaga tanah dengan menggunakan sistem komputer yang lebih cepat dan kos efektif. Walaupun kedua-dua sistem ini diuruskan secara digital berlandaskan kepada pangkalan data masing-masing, namun ketiadaan pengintegrasian antara kedua-dua sistem ini menyebabkan faedah besar dalam pengurusan data komponen kadaster tidak dapat dimanfaatkan sepenuhnya secara digital. Tujuan artikel ini ialah untuk membincangkan beberapa isu yang berkaitan dengan pengintegrasian pangkalan data PDUK dan SPTB.

Kata Kunci: PDUK, SPTB, NDCDB dan Internet.

PENDAHULUAN

Pengintegrasian data kedua-dua sistem Pangkalan Data Kadaster (PDUK) dan Sistem Pendaftaran Tanah Berkomputer (SPTB) merupakan dua elemen yang penting untuk mewujudkan Sistem Maklumat Tanah di Semenanjung Malaysia. Walaupun kedua-dua sistem ini berfungsi secara *stand-alone* di bawah agensi berlainan namun dengan adanya kemudahan Teknologi Maklumat dan Komunikasi (ICT) seperti aplikasi GIS, aplikasi berasaskan Web, Internet dan kemudahan infrastruktur *networking* yang sedia wujud memungkinkan maklumat ini boleh dicapai dan dapat diwujudkan pengintegrasian antara kedua-dua sistem ini secara elektronik. Persoalan sekarang ialah bagaimana mekanisme pengintegrasian tersebut dapat dirangka secara konseptual yang melibatkan Jabatan Ukur dan Pemetaan Negeri, Pejabat Tanah Daerah (PTD) dan Pejabat Tanah dan Galian (PTG)?

Dalam pengintegrasian antara PDUK dan SPTB, teknologi merupakan salah satu ciri terpenting untuk membentukkan model konseptual ini. Namun beberapa perkara lain yang terdapat dalam amalan antara kedua-dua agensi ini akan dibincangkan. Sehubungan dengan itu, adalah wajar difikirkan koordinasi dan kerjasama yang perlu ditingkatkan antara kedua-dua agensi tanah dan ukur ini yang merupakan pemain utama dalam rangka kerja kadaster di Semenanjung Malaysia. Pembangunan model konseptual pengintegrasian antara kedua-dua sistem dengan mengambilkira aliran kerja yang melibatkan hubungan di antara kedua-dua agensi berkenaan dalam konteks perkongsian pangkalan data. Apabila disebut pangkalan data perkara yang perlu ditimbangkan ialah kandungan data, format data dan struktur pangkalan data yang berorientasikan konsep GIS terbuka. Dalam hal ini, kedua-dua sistem berasaskan kepada aplikasi GIS dan berlatarkan kepada pangkalan data *oracle* di mana PDUK mengandungi maklumat spatial manakala SPTB mengandungi maklumat atribut lot tanah. Oleh sebab itu, dijangkakan bahawa pengintegrasian kedua-dua pangkalan data tidak akan menghadapi banyak masalah dengan menggunakan aplikasi pengurusan pangkalan data seperti *RDBMS (Relational Database Management Systems)* atau *Object Oriented* aplikasi pengurusan pangkalan data yang menggunakan hubungan *spatial* dan atribut. Apa yang perlu diberi perhatian ialah bagaimana aktiviti-aktiviti penyenggaraan pangkalan data kedua-dua sistem ini boleh mewujudkan satu hubungan maklumat antara kedua-dua agensi ini untuk memperbaiki pengurusan data kadaster secara optimum dan lebih efisien sama ada di JUPEM mahupun di PTD dan di PTG sekaligus dapat meningkatkan sistem pendaftaran dan pentadbiran tanah negeri ke tahap '*State of the art*'.

Sehubungan dengan itu, beberapa isu yang berkaitan dengan pengintegrasian PDUK dan SPTB akan dibincangkan dalam artikel ini untuk mencadangkan model konseptual pengintegrasian pangkalan data PDUK dan SPTB.

ISU-ISU PENGINTEGRASIAN

Pengintegrasian Pangkalan adalah berdasarkan kepada sumber-sumber yang sedia wujud antara ketiga-tiga agensi PTD, PTG dan JUPEM negeri dalam bentuk digital dokumen hak milik dan maklumat-maklumat berkaitan petak lot dapat diuruskan lebih berkesan serta mengelakkan pertindihan dalam pengurusan data. Sehubungan dengan itu, beberapa isu yang perlu dibincangkan adalah seperti berikut:

1. Ketiadaan Mekanisme Perkongsian Data Antara Organisasi

Data SPTB ditawan dan diuruskan oleh agensi kerajaan negeri manakala data PDUK ditawan dan diuruskan oleh agensi persekutuan. Walaupun kedua-dua data set ini merujuk kepada petak lot namun tidak terdapat koordinasi dan mekanisme yang terancang dalam proses kutipan data di mana penggunaan dan pengurusan data yang lengkap saling bergantung satu sama lain. Tiada terdapat satu mekanisme yang mana agensi kerajaan negeri dan agensi pusat menetapkan garis panduan untuk berkongsi data berdigit tersebut.

Maklumat pangkalan data SPTB boleh dicapai melalui terminal komputer yang telah dipasang di pejabat-pejabat PTD dan PTG. Maklumat yang terkandung dalam pangkalan data adalah maklumat dokumen hak milik yang berkaitan yang didaftarkan di pejabat-pejabat tanah dan pejabat PTG berkenaan sahaja. Ini bermakna proses pendaftaran hak milik tanah dan pendaftaran urusniaga tanah dan lain-lain urusan tanah berkaitan hanya boleh dilakukan di PTD atau PTG yang mana dokumen hak milik tersebut didaftarkan. Geran dan Pajakan Negeri didaftarkan di pejabat pendaftar hak milik manakala Geran Mukim dan Pajakan Mukim didaftarkan di PTD berkenaan. Walaupun terdapat jaringan *network online* sesama PTD dan PTG, namun ia terhad kepada tujuan pemantauan dan pencapaian maklumat sahaja.

Hubungan JUPEM negeri, PTG dan PTD merupakan hubungan tiga hala walaupun di setengah-setengah negeri terdapat PTD mengikut bilangan daerah negeri dan juga daerah kecil kecuali Wilayah Persekutuan Kuala Lumpur hanya satu. Aliran kerja antara PTD-PTD dan PTG amat penting berhubung dengan Permintaan Ukur (PU) dan penyediaan Pelan Dokumen Hakmilk (Borang B1). Di samping itu, JUPEM juga bertanggungjawab menyediakan serta mengemaskini syit lembar piawai untuk kegunaan PTD dan PTG. Sebenarnya JUPEM tidak perlu lagi membuat kerja-kerja pengemaskinian syit lembar kerana wujudnya PDUK sekaligus menggantikan semua dokumen yang dahulunya diselenggara dalam bentuk buku rekod, dokumen, jilid kiraan dan pelan kadaster dalam bentuk salinan cetak.

Kini hampir semua operasi teknikal JUPEM negeri dibuat secara digital dan PDUK berkemampuan untuk menyalurkan maklumat ukur ke PTD dan PTG juga secara digital. Koordinasi antara PTD, PTG dan JUPEM untuk mewujudkan *Centeralised Server* atau *distributed server* di jabatan masing-masing boleh berfungsi sebagai *file transporter* dan jambatan kepada penyaluran maklumat digital antara SPTB dan PDUK.

2. Kelengkapan PDUK

PDUK mengandungi maklumat lapisan lot ukur (fail-fail sempadan, tanda sempadan dan lot) manakala lapisan GLMS *(GIS Layer Management System)* mengandungi maklumat lot dalam ukuran kelas tiga, demarkasi, PU atau hak milik sementara, nama jalan, bandar, kampung dan garisan sambungan. Kesemua lapisan ini tidak menggambarkan keadaan sebenar di atas muka bumi. Justeru, lapisan-lapisan seperti berikut perlu dimasukkan sebagai lapisan tambahan ke dalam pangkalan data bagi kegunaan pejabat tanah seperti:

- Lapisan lot Geran dan Geran Mukim
- Lapisan lot Pajakan Negeri dan Pajakan Mukim

- Lapisan lot sempadan semula jadi
- Lapisan tanah pegangan LPS (Lesen Pendudukan Sementara)/ TOL (*Temporary Occupied License*)
- Lapisan Pelan Warta/Pelan pelbagai

Di samping itu, lapisan-lapisan seperti sempadan-sempadan Daerah, Mukim, Majlis Daerah, Sempadan Hutan Simpan, Rizab Tanah Lapang dan lain-lain maklumat spatial didapati masih tidak ditawan sepenuhnya. Maklumat-maklumat ini adalah penting untuk pengurusan tanah yang lebih berkesan berdasarkan kepada keadaan sebenar kegunaan tanah. Maklumat-maklumat tambahan ini sekaligus akan menambah nilai PDUK.

3. Penyenggaraan Data Dan Sistem

Penyenggaraan data dan sistem merupakan satu proses kerja yang berterusan. Dalam persekitaran data digital, ia perlu dikemaskini secepat mungkin agar data sentiasa mencerminkan perubahan yang berlaku ke atas lot melalui pecah sempadan, pecah bahagian dan pengambilan balik tanah. Kelewatan yang berlaku dalam kutipan data ukuran di padang, kerja-kerja pemprosesan di pejabat dan proses penyenggaraan data ke dalam PDUK atau SPTB akan menyebabkan perkongsian data dan pengintegrasian sistem kurang efektif.

4. Penstrukturan Agensi

Struktur agensi semasa tidak mengambil kira unit mana yang boleh diberi tanggungjawab untuk mengendalikan penghantaran dan penerimaan data secara digital dari agensi lain. Perkakasan, perisian, server dan aplikasi untuk mewujudkan komunikasi antara PTD, PTG perlu dibangunkan untuk pengintegrasian data SPTB dan PDUK. Sehubungan dengan itu, struktur agensi yang mengambil bahagian dalam pengintegrasian perlu diubahsuai dari segi membekalkan infrastruktur jaringan piawai dan sumber manusia yang terlatih dalam bidang IT serta yang berpengalaman dalam hal teknikal jabatan.

ISU-ISU PENGOPERASIAN

Isu-isu pengoperasian melibatkan beberapa perkara yang perlu diberi perhatian. Antara perkara-perkara yang memerlukan pengubahsuaian dan penambahbaikan ialah seperti berikut:

- Peraturan dan prosedur
- Penilaian dan pengesahan data kualiti
- Infrastruktur penstoran data
- Pengarkiban data

ELEMEN-ELEMEN PENGINTEGRASIAN

Elemen-elemen pengintegrasian pangkalan data adalah penting untuk menentukan perkara-perkara yang dipersetujui oleh kedua-dua belah pihak meliputi ketelusan perkongsian data ataupun mewujudkan satu mekanisme yang membolehkan pemodelan data dan penstrukturan pangkalan data antara agensi memenuhi keperluan kualiti dan integriti data, fleksibiliti dalam mengurus data, tahap pencapaian data dan penentuan dalam spesifikasi data dan dasar dalam pemilikan serta tahap keselamatan data berdigit terjamin.

KUALITI DAN INTEGRITI DATA

Ketelusan dalam pengesahan kualiti dan integriti data antara pangkalan data perlu dipertingkatkan melalui mekanisme metadata keterangan mengenai data, pemilikan, kaedah pengutipan dan tahap ketepatan data. Kualiti data yang tinggi dan maklumat metadata akan meyakinkan pengguna data untuk menggunakan data berdigit bagi tujuan tertentu tanpa sebarang keraguan.

FLEKSIBILITI

Kemudahan untuk menguruskan dan mengendalikan maklumat dari pangkalan data harus memenuhi fleksibiliti seperti berikut:

- Mewujukan piawaian dalam aplikasi pangkalan data dan sistem pengoperasian.
- Mewujudkan kebolehan menambah data melalui pengintegrasian *seamless* di antara aplikasi pengurusan pangkalan data untuk tujuan analisis, pemodelan (*modelling*) dan pemaparan data.
- Mengubahsuai struktur data yang tidak selari dengan tujuan pertukaran pengintegrasian data.

KEMUDAHAN PENCAPAIAN DATA

Kemudahan pencapaian data boleh diwujudkan melalui aplikasi antaramuka mesra pengguna berasaskan grafik dan teknologi Internet. Pengguna-pengguna yang diberi kebenaran melalui sistem kawalan pusat yang bertanggungjawab kepada pemantauan penyenggaraan dan keselamatan data hendaklah dipastikan agar tidak dicerobohi. Selain dari Internet, VPN (*Virtual Private Network*) dicadangkan untuk meningkatkan tahap keselamatan data berdigit.

HAK PEMILIKAN DATA DAN KERAHSIAAN DATA

Maklumat-maklumat data khususnya dari pangkalan data SPTB seperti pemilikan tanah dan status urusniaga tanah dan lain-lain maklumat yang dianggap sulit perlu dijaga agar tidak dapat diakses oleh pengguna yang tidak berwibawa. Kewujudan data berdigit dalam pangkalan data untuk memudahkan laluan akses kepada pengguna pelbagai (*multi-user*). Sementara mengambil pendirian fleksibel menggalakan konsep penggunaan data berdigit secara meluas, garis panduan mengenai hal-hal berhubung dengan pencapaian data, perkongsian data, pencegahan penggunaan data, data kastodian, harta intelektual dan polisi harga data berdigit perlu diadakan dengan jelas.

PERALATAN

Peralatan *(tools)* merupakan salah satu elemen penting yang boleh digunakan untuk merealisasikan pengintegrasian antara pangkalan data PDUK dan pangkalan data SPTB. Ini boleh dilaksanakan apabila agensi-agensi berkenaan membuat perolehan peralatan baru atau melaksanakan peningkatan ke atas sistem-sistem berkenaan. Walaupun kedua-dua sistem ini berfungsi di bawah agensi berlainan, namun proses perolehan peralatan komputer seperti peralatan *hardware*, *software*, aplikasi GIS, aplikasi pangkalan data dan penggunaan infrastruktur jaringan komunikasi sistem boleh diselaraskan. Dalam hal ini, pihak Kementerian Sumber Asli dan Alam Sekitar boleh memainkan peranan bagi menentukan jenis peralatan yang lebih sepadan (*compatible*) serta membuat penyelarasan dalam perolehan peralatan .

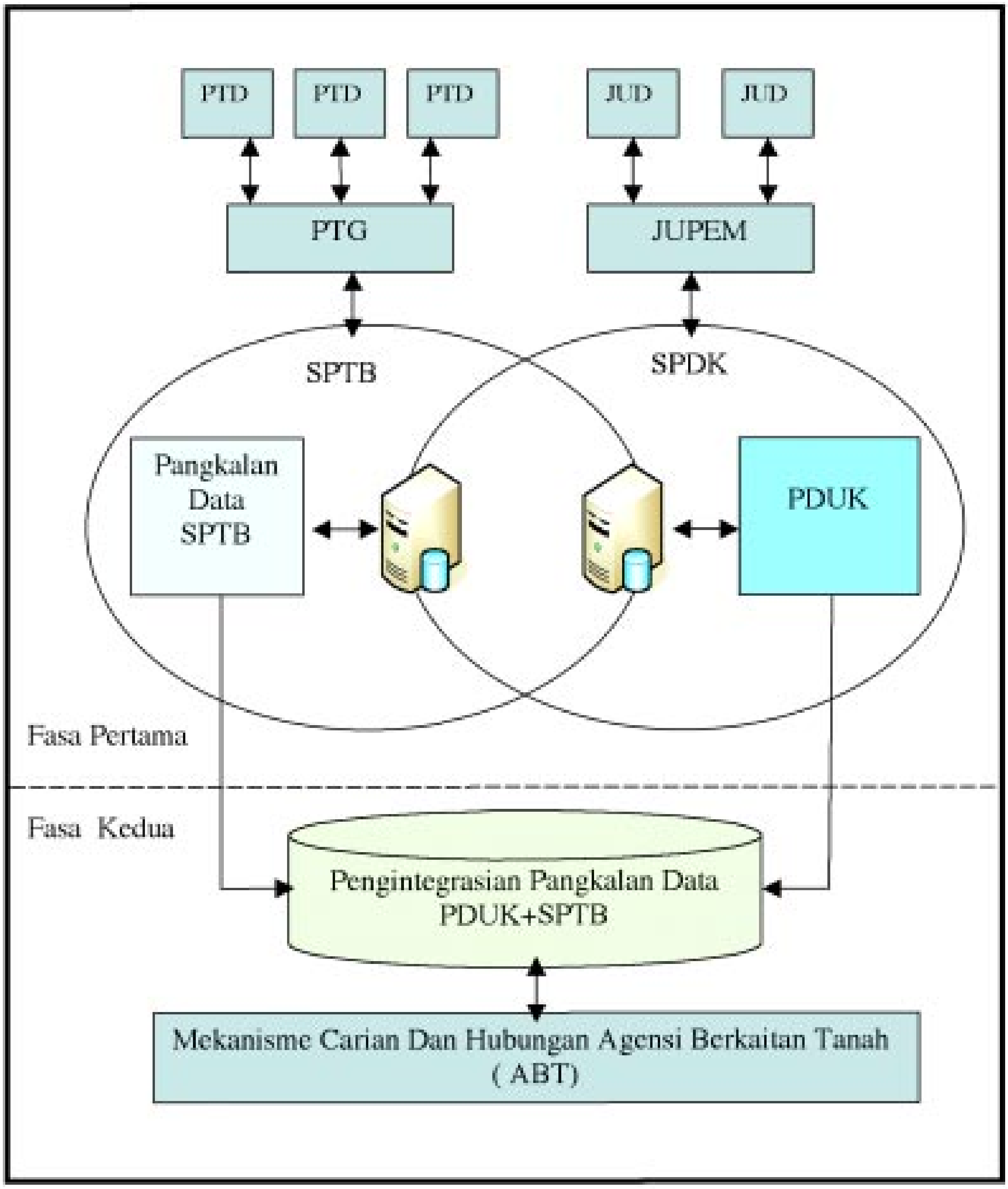
Dalam era teknologi yang sedang berkembang maju, kos peralatan komputer dan infrastruktur jaringan komunikasi semakin berkurangan maka pengintegrasian ini boleh dilaksanakan dengan

mewujudkan koordinasi dan persefahaman di kalangan agensi berkenaan apabila merancangkan program-program ICT. Peralatan yang boleh digunakan dalam pengintegrasian ialah seperti berikut:

- Teknologi GIS
- Sistem pengurusan pangkalan data (*Database management system*)
- Internet
- VPN
- Peralatan komputer dan perisian (*Hardware* dan *Software*)
- Pengubahsuaian atau pindaan undang-undang berkaitan
- Pengubahsuaian peraturan dan prosedur kerja

CADANGAN MODEL PENGINTEGRASIAN

Berdasarkan kepada isu-isu yang dibincangkan di atas, cadangan untuk membangunkan model konseptual pengintegrasian adalah amat penting untuk meletakkan JUPEM sebagai salah satu agensi peneraju kepada pengurusan data kadaster berdigit sepenuhnya dalam aktiviti harian. Cadangan dalam model ini bukanlah bertujuan untuk mengurangkan peranan dan tanggungjawab JUPEM dan PTD atau PTG yang sedia wujud dalam amalan sekarang, malah merupakan satu pendekatan baru dengan menggunakan teknologi semasa untuk mengintegrasikan pengautomasian komputer di agensi-agensi berkenaan. Cadangan model konseptual berkomunikasi untuk merealisasikan prinsip asas ukuran kadaster dan pendaftaran hak milik tanah berfungsi sebagai satu pangkalan data adalah seperti yang ditunjukkan dalam Rajah 1.



Rajah 1: Model konseptual komunikasi pengintegrasian PDUK SPTB

Pengintegrasian PDUK dan SPTB ini boleh dilakukan melalui dua fasa. Fasa pertama, mewujudkan hubungan dua hala di antara PDUK dan SPTB dengan menyediakan infrastruktur komunikasi di antara JUPEM, PTG dan PTD. Perolehan sistem-sistem komputer meliputi *hardware, software*, aplikasi pangkalan data dan aplikasi sistem pengurusan pangkalan data (*database management system*) yang saling serasi (*compatible*) boleh berhubung dengan satu sama lain melalui *Web-Server*. Dengan adanya koordinasi dan kesefahaman yang melibatkan aktiviti yang sama boleh diselaraskan dengan perkongsian maklumat dalam pangkalan data.

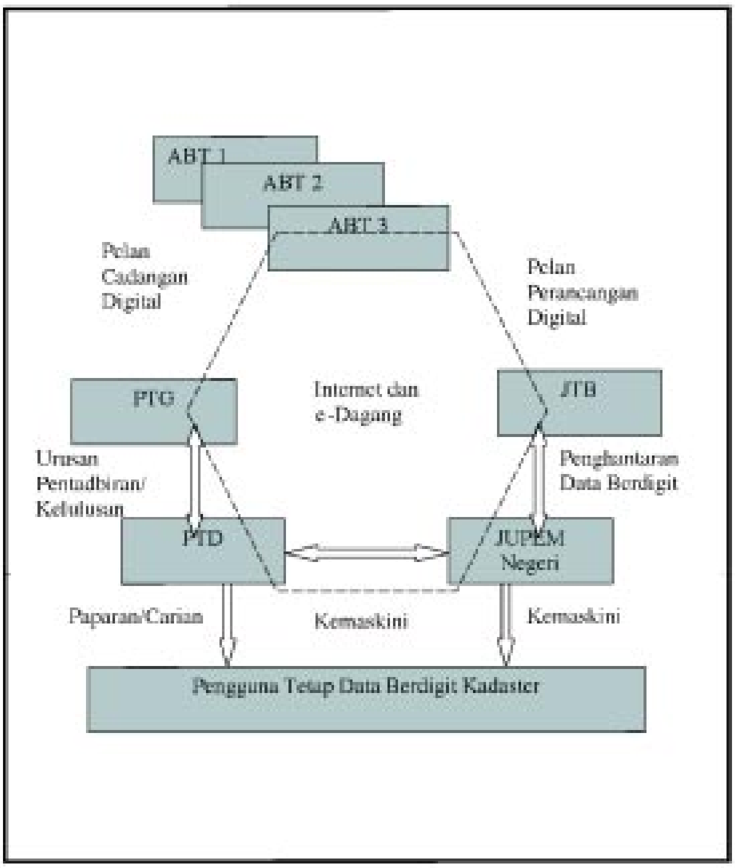
Fasa kedua ialah mewujudkan satu pangkalan data tunggal hasil dari gabungan antara PDUK dan pangkalan data SPTB. Pangkalan data yang telah diintegrasikan tersebut boleh digunakan oleh agensi-agensi terlibat melalui prosedur dan peraturan berasaskan konsep digital sepenuhnya (*fully digital*). Kaedah dan prosedur manual kerja semasa perlu dilihat dan dikaji semula dalam perspektif yang baru selari dan selaras dengan suasana aliran kerja digital dengan menggunakan kemudahan teknologi ICT. Pengintegrasian pangkalan data ini dijangka akan membantu operasi aktiviti pengukuran kadaster jabatan dan memantapkan lagi urusan antara jabatan berhubung dengan penyenggaraan data berdigit. Antara faedah-faedah yang boleh didapati ialah seperti berikut:

- Mengurangkan kos
- Meningkatkan efisiensi
- Menyumbang kepada MaCGDI
- Selari dengan hasrat konsep Kerajaan Elektronik
- Sistem Ukuran Kadaster berupaya mengambil peluang dan mendapat manfaat daripada perkembangan teknologi ICT

MODEL JARINGAN PENYENGGARAAN

Kemampuan teknologi internet yang digunakan secara meluas pada masa kini boleh digunakan untuk penyenggaraan data kadaster dalam persekitaran digital. Dalam hal ini, JUPEM boleh memainkan peranan sebagai agensi peneraju kepada penyenggaraan dan pengemaskinian PDUK kepada lain-lain agensi yang bergantung kepada data kadaster *spatial*.

Rajah 2 menunjukkan bagaimana cara-cara data kadaster spatial boleh dikemaskinikan di kalangan pengguna data dari mula hingga akhir dengan menggunakan kemudahan jaringan Internet dan e-Dagang. Apabila Juruukur Tanah Berlesen (JTB) berurusan dengan pihak berkuasa tempatan atau pemaju, maklumat data digital PDUK seharusnya boleh digunakan untuk pelan perancangan atau pelan cadangan. Pelan cadangan secara digital tersebut boleh digunakan untuk mengemaskini pangkalan data di agensi masing-masing. Sehubungan itu, pengalaman JUPEM dalam penggunaan Sistem Dagangan Elektronik boleh dikembangkan kepada jabatan-jabatan lain yang mengambil bahagian dalam jaringan penyenggaraan data kadaster berdigit.

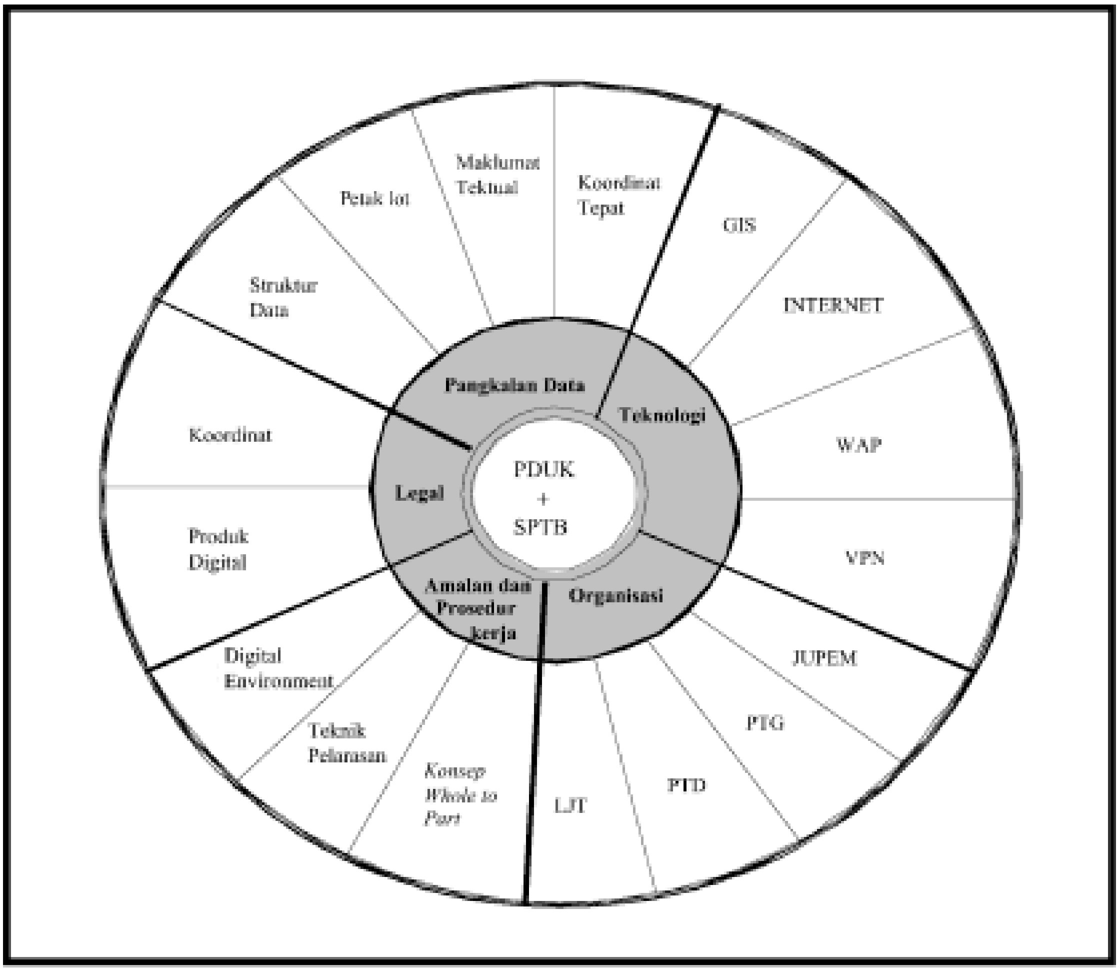


Rajah 2: Model jaringan penyenggaraan data berdigit

CIRI-CIRI MODEL KONSEPTUAL PENGINTEGRASIAN

Terdapat lima aspek utama perlu dipertimbangkan dalam model konseptual pengintegrasian PDUK dan pangkalan data SPTB dengan disokong oleh beberapa elemen yang merupakan atribut kepada ciri-ciri tersebut seperti yang ditunjukkan dalam Rajah 3. Aspek-aspek tersebut ialah:

- Organisasi
- Teknologi
- Pangkalan Data
- Perundangan
- Amalan dan Prosedur Kerja



Rajah 3: Ciri-ciri model pengintegrasian PDUK-SPTB

1. Organisasi

Kerjasama di kalangan agensi-agensi yang terlibat secara langsung untuk mendapatkan akses dan carian, kutipan data dan pengemaskinian pangkalan data bersifat integrasi perlu mencari jalan penyelesaian melibatkan dua perkara. Pertama, bagaimana cara-cara data dalam pangkalan data berintegrasi dapat diakses melalui jaringan (*network*). Kedua, bagaimana tahap kerjasama tersebut boleh dipertingkatkan untuk berinteraksi dalam persekitaran digital. Sehubungan dengan itu, jalinan serta penyelarasan kerja yang bersepadu antara agensi-agensi berikut adalah perlu, iaitu:

- JUPEM
- PTG
- PTD
- JTB melalui LJT

2. Teknologi

Teknologi komputer masakini menyediakan ruang yang meluas dalam sistem kadaster yang mana ia merupakan maklumat berguna bagi sistem maklumat tanah. Sebarang usaha peningkatan yang melibatkan pengoperasian dalam sistem komputer mempunyai ruang untuk menyediakan penambahbaikan maklumat yang berkualiti, berintegriti, bercirikan keselamatan merangkumi aspek perundangan. Pengurusan data berasaskan konsep GIS yang mana data kadaster boleh digunapakai untuk pelbagai tujuan dan penyebaran data digital disalurkan melalui aplikasi protokol Internet, WAP dan VPN. Dalam jangka masa yang panjang, suasana kerja digital sepenuhnya akan menjimatkan kos di samping merupakan saluran untuk mewujudkan penyelarasan dan pertukaran maklumat antara dua atau lebih agensi.

3. Pangkalan Data

Pengintegrasian pangkalan data merupakan satu proses interaktif dan berterusan. Oleh itu, sebagai permulaan, usaha perlu diambil untuk menyelaraskan format data dan pengstrukturan pangkalan data melalui piawaian seragam. Dalam tempoh masa panjang, piawaian dan struktur data boleh dirangka mengikut keperluan pengguna yang lebih luas meliputi peringkat kebangsaan. Pangkalan data perlu mempunyai keupayaan untuk dikendalikan melalui *web-base* atau *online*. Ini boleh dilakukan dengan adanya aplikasi-aplikasi RDBMS yang berupaya untuk menguruskan pangkalan data ke arah lebih berinformasi dan mampu membuat analisis spatial dalam persekitaran GIS.

Pangkalan data SPTB dan PDUK merupakan salah satu komponen kepada infrastruktur data spatial negara. Gabungan set data SPTB dan PDUK ini penting untuk diintegrasikan dengan lain-lain set data spatial. Oleh itu, pangkalan data PDUK hendaklah dilengkapkan dengan koordinat tepat berlandaskan kepada GDM 2000 yang boleh memberi penyeragaman kepada data melintasi negeri. PDUK yang lengkap, tepat dan terkini dengan maklumat-maklumat petak lot aktif dan data *historical* sangat berguna kepada pengurusan dan membuat keputusan tepat. Dari kajian ini, didapati masih terdapat lot-lot demarkasi dan lot-lot bersempadan semulajadi tidak ditawan lagi ke dalam PDUK. Lot-lot ini merupakan sebahagian daripada dokumen hak milik kekal. Lot-lot tersebut perlu ditawan ke dalam lapisan berasingan dan ukuran boleh dijalankan mengikut keutamaan jabatan untuk melengkapkan PDUK dengan maklumat sebenar tanah yang diberi milik dengan hak milik kekal tersebut.

Setiap petak lot mempunyai UPI tersendiri dalam PDUK yang mana ia mampu membentuk hubungkait dengan pelan kadaster lot kepada rekod tanah dalam SPTB. Ini akan memudahkan untuk membuat rujukan silang dengan maklumat-maklumat yang diperlukan oleh pengguna-pengguna seperti agensi kerajaan tempatan, perancang bandar, juru nilai dan pengguna peta utiliti.

4. Perundangan

Semua maklumat lot sama ada grafik atau tekstual yang dahulunya tersimpan dalam bentuk *hardcopy* PA, kini telah ditukarkan dalam bentuk digital dan disimpan dalam PDUK. Kaedah pempopulasian semula PDUK setiap negeri kepada Pangkalan Data Kadaster Kebangsaan (NDCDB) untuk menyokong penyedian pelan dokumen hak milik dari segi perundagan perlu juga diberi pertimbangan. NDCDB yang berdasarkan GDM 2000 akan diwujudkan nanti merupakan data set koordinat spatial yang unik bagi setiap tanda sempadan dan mempunyai nilai ketinggian untuk digunakan sebagai data set piawai supaya analisis GIS boleh dilakukan dengan mudah. Namun demikian, apakah dokumen atau pelan kadaster yang dijana dari PDUK atau NDCDB mempunyai nilai perundangan yang sah? Isu perundangan yang berkaitan mengenai data digital ialah hakcipta, liabiliti disebabkan oleh kesilapan data, kerahsiaan data, hak akses dan hak milik data. Oleh sebab itu, tumpuan hendaklah diberikan kepada isu-isu berkaitan dengan ketepatan, liabiliti dan pengesahan pangkalan data mengikut peruntukan undang-undang yang bakal digubal.

Berhubung dengan isu-isu ketepatan dan liabiliti kemungkinan besar timbul masalah apabila PDUK diintegrasikan dengan set-set data dari pangkalan data lain. Apabila dua set data dari pangkalan data berbeza diintegrasikan akan wujud keadaan yang mana ia mengurangkan kejituan set data asal.

Kekurangan kejituan tersebut mungkin disebabkan oleh kesilapan dalam kemasukan data koordinat atau lain-lain maklumat atribut ke dalam pangkalan data. Untuk mengatasi masalah tersebut, JUPEM hendaklah menyediakan kenyataan penafian (*disclaimer*) kepada pengguna produk digital tersebut. Tujuan penafian ini ialah untuk menarik perhatian pengguna bahawa kemungkinan berlaku kesilapan apabila data spatial kadaster digunakan untuk tujuan selain daripada kegunaan asal iaitu untuk penyediaan suratan hak milik. Ini akan melindungi JUPEM daripada dipertanggungjawabkan sekiranya terdapat kekurangan kejituan atau data liabiliti dalam memenuhi kehendak pengguna.

Pelan Akui yang telah diluluskan oleh Pengarah Ukur negeri dan disimpan dalam bilik kebal JUPEM digelar sebagai *deposited plan* (Seksyen 410 KTN,1965) merupakan dokumen *legal* yang mana menjadi rekod bukti kekal kepada kedudukan sempadan lot tanah. Apabila PA-PA tersebut disimpan dalam PDUK secara digital ia merupakan pemaparan grafik yang berterusan. Dari PDUK tersebut pelbagai pelan mengikut keperluan pengguna boleh dihasilkan. Memandangkan JUPEM sedang berusaha untuk menjana terus pelan dokumen hak milik kekal dalam borang B1 TIFF dari PDUK, maka keperluan untuk memberikan status legal kepada PDUK hendaklah laksanakan dengan membuat pindaan-pindaan kepada seksyen 3969(e) , 396A(1), 398A(1), 410,408,412(c) dan 83(1) KTN (Kanun Tanah Negara) 1965 (Akta 56/1965).

5. Amalan dan Prosedur Kerja

Amalan dan prosedur kerja semasa jabatan mencerminkan aliran kerja yang masih terikut-ikut dengan amalan lama proses kerja secara manual. Tatacara kerja yang ditetapkan dahulu adalah berdasarkan kepada proses-proses yang terlibat dalam amalan kerja secara manual. Sebagai contoh, kaedah merekodkan cerapan di padang adalah mengikut amalan catatan di atas buku kerjaluar. Apabila konsep *field to finish* diperkenalkan, data cerapan padang dapat diperolehi terus dalam bentuk digital (ASCII Format). Peralatan ukur *Total Station* dengan gabungan *Tablet PC* dan Aplikasi *Title Survey Module* (TSM) atau *Total Station* dengan gabungan iPAQ *(Pocket PC)* dan *Title Survey Module* (TSM_CE) serta *Field Communicator* dapat menghasilkan data ukuran kadaster berdigit.

Apabila diperhatikan prosedur kerja bermula dari proses kutipan data padang hingga kepada pengemaskinian data berdigit kepada PDUK, didapati amalan-amalan aliran kerja masih terbawa-bawa dengan amalan kerja manual. Walaupun kutipan data di padang dibuat dengan alat *total station* secara digital, namun proses-proses pembetulan dan pelarasan data masih lebih berdasarkan pada amalan lama. Disebabkan amalan kerja secara manual adalah terlalu rigid maka kegunaan peralatan moden tidak dapat digunakan sepenuhnya untuk menjamin kelancaran kerjaluar dan juga di pejabat.

Amalan di pejabat iaitu dengan memberhentikan pendaftaran fail *hardcopy* permohonan ukur dan pergerakan fail ukur digital dari JUPEM ke pejabat JUD dan sebaliknya selepas ukuran disiapkan adalah satu langkah baik yang meletakkan JUPEM pada landasan yang betul sejajar dengan era digital. Namun demikian, tindakan-tindakan meluluskan PA secara digital dengan meletakan *digital signature* di atas PA yang dijana secara digital masih melambangkan amalan lama meluluskan PA *hardcopy*. Setiap Pengarah Ukur dan Pemetaan telah dibekalkan *private key* oleh DIGI CERT, syarikat yang memegang lesen untuk bertanggungjawab kepada *digital signature*. Dokumen yang diluluskan melalui *digital signature* adalah dianggap sah dari segi Undang-Undang Siber Malaysia *(Cyber Law of Malaysia)* di bawah *Digital Signature Act* 1997 (Akta 562) dan peraturan 1998.

Apabila data digital diproses melalui komputer dengan aplikasi tertentu, hasil akhir *output* tersebut telah melalui beberapa peraturan dan piawaian yang ditentukan mengikut keperluan pengguna. Oleh yang demikian, semakan-semakan yang dibuat mengikut amalan manual tidak selari dengan konsep suasana kerja dalam persekitaran digital.

Amalan mengemukakan pelan PU dan lain-lain dokumen berkaitan dari Pejabat Tanah ke JUPEM masih dibuat dengan *hardcopy.* Proses kerja untuk menukarkan dokumen tersebut kepada bentuk digital dan disimpan dalam GLMS memerlukan masa dan sebarang kesilapan dalam Rajah PU akan mengambil masa yang lama untuk dibetulkan oleh Pejabat Tanah. Tindakan penawanan data PU dan QT dan lain-lain urusan permohonan tanah perlu diurus dan dikemaskini oleh Pejabat Tanah secara digital. Tindakan awal oleh pejabat tanah akan mengelakkan berlakunya kesilapan dalam PU dari peringkat awal lagi. Maklumat PU secara digital tersebut akan membantu JUPEM untuk mengemaskini pangkalan data GLMS dengan cepat dan tambahan pula boleh digunakan untuk penyediaan eSKL untuk kegunaan kerja padang.

RUMUSAN

Model-model konseptual yang telah dicadangkan adalah berasaskan kepada suasana kerja digital dengan menggunakan aplikasi e-Dagang dan teknologi Internet. Oleh itu, pelaksanaan model-model tersebut bergantung kepada Agensi-agensi yang Berkaitan Tanah menyelesaikan isu-isu yang telah dikemukakan serta mencari jalan penyelesaian bersepadu ke arah pengintegrasian dapat diwujudkan di antara Pejabat Tanah, Pejabat Tanah dan Galian dan JUPEM negeri. Malahan konsep tersebut boleh juga dikembangkan kepada lain-lain agensi yang menggunakan maklumat pelan ukur kadaster dan pendaftaran tanah secara digital. Selain dari itu, pengguna tetap seperti Juruukur Tanah Berlesen, Jurutera, Pemaju Tanah, Peguam, Juru Nilai Hartanah dan Pengamal GIS juga boleh menggunakan data kadaster berdigit tersebut dalam urusan seharian.

RUJUKAN

Abd.Majid A.Kadir,Ghazali Desa dan Abdullah Hisam (2000). *Sistem Maklumat Tanah: Prinsip dan Amalan.* Fakulti Kejuruteraan dan Sains Geoinformasi,Universiti Teknologi Malaysia.

Ahmad Fauzi Nordin (2001). *Institutional Issue On The Implementation Of The Coodinated Cadastral System For Peninsular Malaysia: A Study on the Legal and Organisational Aspects.* Universiti Teknologi Malaysia, Skudai. Tesis Projek Sarjana.

Brown, A.G (1996). *Defining the Cadastral Layer of a Municipal GIS Using Registered Land Parcels. Proceeding of GIS/LIS, Annual Conference and Exposistion.* Denver, Colorado, USA, 19-21 November 1996.

DOLA (1995). Technical Report: *Digital Cadastral Database In Australia*, The Australian Surveyor.40 (3).235-244.Deakin: The Institute of Surveyor Australia.

Don Grant, Tadeusz Dawidowski & Ralph Winmill (1997). *New Zealand Tenaure 2000 : Full Integration and Automation of the New Zealand Survey and Title Systems*, Presented at the Annual Conference of GeoComputation '97 & SIRC '97, University of Otago , New Zealand.

KTN(1965). Kanun Tanah Negara (Akta 56 Tahun 1965) dan Peraturan.

KPTG (1998). *Manual Pengguna Sistem Pendaftaran Tanah Berkomputer*, Pejabat Ketua Pengarah Tanah Dan Galian, Kuala Lumpur.

LAPORAN BERGAMBAR

MESYUARAT KE-58 JAWATANKUASA PEMETAAN DAN DATA SPATIAL NEGARA (JPDSN)

Oleh
Hisham bin Husain
Seksyen Perkhidmatan Pemetaan
Jabatan Ukur dan Pemetaan Malaysia

Jawatankuasa Pemetaan dan Data Spatial Negara (JPDSN) telah mengadakan mesyuarat tahunan kali ke-58 bertempat di Kuantan, Pahang pada 29 hingga 30 Mac 2007. Mesyuarat yang dipengerusikan oleh YBhg. Datuk Hamid bin Ali, Ketua Pengarah Ukur dan Pemetaan Malaysia, telah dihadiri oleh ahli-ahli JPDSN dari seluruh negara yang terdiri daripada 38 wakil dari pelbagai jabatan/agensi kerajaan serta Insititusi Pengajian Tinggi Awam (IPTA).

Dalam ucapan pembukaan, YBhg. Datuk Hamid bin Ali menjelaskan bahawa mesyuarat yang telah masuk edisi ke 58 ini, sebenarnya telah menunjukkan kematangan JPDSN serta penglibatan ahli-ahli dalam membantu JPDSN menyediakan garis panduan ke arah penyediaan pangkalan data spatial yang mantap dan lengkap untuk pembangunan negara. Mesyuarat yang diadakan pada setiap tahun ini bertujuan bagi memantau dan mengetahui kemajuan aktiviti yang dilaksanakan oleh Jabatan/Agensi dan Jawatankuasa Teknikal (JT) serta Kumpulan Kerja (KK). Mesyuarat ini juga merupakan forum penting untuk berinteraksi serta mengetahui perkembagan aktiviti jabatan- jabatan/agensi-agensi yang telah dilaksanakan pada sepanjang tahun. Amanah serta tanggungjawab penting yang diberikan oleh kerajaan kepada jawatanakuasa ini akan dapat dipikul bersama-sama oleh ahli-ahli dalam memberikan yang terbaik dalam menyediakan maklumat-maklumat pemetaan dan data spatial khasnya membantu projek-projek pembangunan yang dilaksanakan oleh kerajaan.

YBhg. Datuk Hamid Ali selaku Pengerusi sedang mempengerusikan Mesyuarat ke-58 JPDSN di Hyatt Regency Kuantan Resort, Kuantan, Pahang

Mesyuarat JPDSN ini yang dijalankan sepenuhnya secara *'paperless'* telah dihadiri oleh seramai 38 orang ahli yang terdiri dari wakil-wakil Jabatan/Agensi Kerajaan dan Institusi Pengajian Tinggi Awam

Seterusnya, YBhg. Datuk Pengerusi menjelaskan bahawa banyak kemajuan yang telah dicapai dalam aktiviti-aktiviti pemetaan dan data spatial oleh Jabatan/Agensi termasuk juga kemajuan aktiviti pemetaan JUPEM yang telah, sedang dan akan dilaksanakan oleh JUPEM sepanjang tahun 2006 serta program yang berkaitan pemetaan yang akan dilaksanakan dalam Rancangan Malaysia Ke-9 (RMK9). Beliau menyorot kembali beberapa kejayaan dan program berkaitan pemetaan dan data spatial dalam tahun 2006 serta perlaksanaan dalam RMK9 yang dijayakan oleh ahli-ahli JPDSN. Antaranya ialah projek-projek JUPEM seperti CATMAPS *(Computer Assisted Topographic Mapping System)* Fasa 2; melengkapkan MyRTKNet Fasa 2; perolehan sistem kamera udara digital; perolehan mesin cetak 4 warna; pewujudan JUPEM Geoportal; aktiviti Jawatankuasa Kebangsaan Nama Geografi (JKNG); pengeluaran Garis Panduan Mengenai Pemetaan Utiliti Bawah Tanah; penentuan titik-titik pangkal negara; dan kaedah tapisan keselamatan permohonan maklumat geospatial terperingkat.

YBhg. Datuk Pengerusi selanjutnya menyarankan kepada semua ahli supaya meneruskan usaha-usaha yang telah dilaksanakan agar dapat menjayakan matlamat asal penubuhan JPDSN. Beliau berharap semua JT dan KK agar sentiasa bermesyuarat dan berbincang secara berterusan dalam mencari resolusi dan penyelesaian yang akan digunapakai oleh JPDSN. Beliau juga berharap agar forum ini akan memberi ruang kepada ahli untuk berinteraksi secara informal dan dapat memberikan input dalam menyelesaikan masalah dari jabatan/agensi pelaksana dan JT serta KK yang ditubuhkan.

Antara agenda mesyuarat ini adalah pembentangan laporan daripada Jawatankuasa-jawatankuasa Teknikal dan Kumpulan Kerja Geodetik, pembentangan laporan aktiviti jabatan-jabatan/agensi-agensi dan juga pembentangan kertas kerja. Satu kertas kerja bertajuk "*Launching of RazakSAT*"

Tuan Haji Darus bin Ahmad Pengarah MACRES sedang menyampaikan taklimat kepada rombongan di *MACRES Ground Receiving Station* (MGRS), Mentakab, Pahang

telah disampaikan oleh Dr. Mustafa Din bin Subari, Timbalan Ketua Pengarah Agensi Angkasa Negara (ANGKASA). Tujuan kertas kerja tersebut adalah untuk menerangkan tentang progam satelit negara RazakSAT yang dibangunkan oleh Angkasa untuk perancangan dan pembangunan negara. Pembentangan ini juga melibatkan penerangan mengenai pembentukan Dasar Angkasa Negara *(National Space Policy)* dalam merencanakan bidang angkasa negara.

YBhg. Datuk Hamid bin Ali serta ahli JPDSN sedang tekun memerhati pergerakan satelit di paparan semasa lawatan ke makmal penerima imej satelit di MGRS

Sempena dengan mesyuarat ini juga, ahli-ahli JPDSN telah mengadakan lawatan teknikal ke *MACRES Ground Receiving Station* (MGRS) di Mentakab, Pahang pada 30 Mac 2007. Taklimat telah disampaikan oleh Tuan Haji Darus bin Ahmad, Pengarah Pusat Remote Sensing Negara (MACRES). Antara kandungan taklimat itu, beliau menerangkan mengenai bidang tugas MACRES serta fungsi MGRS dalam menguruskan imej-imej satelit. Rombongan itu juga telah dibawa ke makmal penerimaan imej satelit yang mana semua imej diterima dan diproses. Lawatan teknikal berakhir dengan majlis penyampaian cenderamata daripada pihak JPDSN yang disampaikan oleh YBhg. Datuk Hamid bin Ali kepada Tuan Haji Darus bin Ahmad.

Antara stesen penerima imej satelit yang terdapat di MGRS

YBhg. Datuk Hamid bin Ali menyampaikan cenderamata daripada JPDSN kepada Tuan Haji Darus bin Ahmad

KALENDAR GIS 2007

TARIKH	TAJUK	LOKASI	PENGANJUR	TALIAN PERTANYAAN
17 Januari 2007	KursusPerisisan GIS-MapInfo (Asas) Sesi 1	INSTUN Behrang, Perak	MaCGDI	Cik Zafirah bt. Mohd. Mansor Tel : +603 8886 1157 Fax : +603 8889 4851 E-mail : zafirah@macgdi.gov.my
5 Mac 2007	Mesyuarat Jawatankuasa Teknikal Clearing House MyGDI	Putrajaya	MaCGDI	Encik Yaacub bin Yusoff Tel : +603 8886 1254 Fax : +603 8889 4851 E-mail : yaacub@macgdi.gov.my
29 & 30 Mac 2007	Mesyuarat Jawatankuasa Pemetaan dan Data Spatial Negara (JPDSN) ke 58	Kuantan, Pahang	JUPEM	Encik Hamdan bin Ab. Aziz Tel : +603 2617 0603 Fax : +603 2697 0140 E-mail : hamdan@jupem.gov.my
16 April 2007	*MyGDI Framework Technical Committee Meeting*	Labuan	MaCGDI	Encik Yaacub bin Yusoff Tel : +603 8886 1254 Fax : +603 8889 4851 E-mail : yaacub@macgdi.gov.my
17 April 2007	*Standardisation in GIS Seminar*	Labuan	MaCGDI	YM. Raja Abd. Aziz bin Raja Ali Tel : +603 8886 1253 Fax : +603 8889 4851 E-mail : rajaaziz@macgdi.gov.my
29 Mei 2007	*MyGDI National Coordinating Committe (MNCC)*	Melaka	MaCGDI	Puan Hajjah Mariyam bt. Mohamad Tel : +603 8886 1188 Fax : +603 8889 4851 E-mail : mmariyam@macgdi.gov.my
18 - 19 Jun 2007	Taklimat Penentuan Harga Data Geospatial Bagi Negeri Pulau Pinang, Perak, Perlis dan Kedah.	Pulau Pinang	MaCGDI	Encik Yaacub bin Yusoff Tel : +603 8886 1254 Fax : +603 8889 4851 E-mail : yaacub@macgdi.gov.my
2 - 3 Julai 2007	Taklimat Penentuan Harga Data Geospatial Bagi Negeri Kelantan dan Terengganu	Kota Bharu, Kelantan	MaCGDI	Encik Yaacub bin Yusoff Tel : +603 8886 1254 Fax :+603 8889 4851 E-mail : yaacub@macgdi.gov.my
31 Julai 2007	Jawatankuasa Kebangsaan Nama-nama Geografi (JKNG)	Melaka	JUPEM	Tn. Haji Mazlan bin Hj. Ashaari Tel : +603 2617 0613 Fax : +603 2697 0140 E-mail : amazlan @jupem.gov.my
14-16 Ogos 2007	*Map Asia 2007*	Kuala Lumpur	MaCGDI & GIS Development Sdn. Bhd.	Encik Yacob bin Abas Tel : +603 8886 1209 Fax :+603 8889 4851 E-mail : yaba@macgdi.gov.my

TARIKH	TAJUK	LOKASI	PENGANJUR	TALIAN PERTANYAAN
10-11 September 2007	Taklimat Penentuan Harga Data Geospatial Bagi Wilayah-wilayah Persekutuan (Labuan, Putrajaya dan Kuala Lumpur)	Kota Kinabalu Sabah	MaCGDI	Encik Yaacub bin Yusoff Tel : +603 8886 1254 Fax : +603 8889 4851 E-mail : yaacub@macgdi.gov.my
21-22 Ogos 2007	*Geography 2007 Conference*	Petaling Jaya	UM	Prof. Dr. Hamirdin Ithnin Tel : +603 7967 5540/5504 Fax : +603 7967 5457 E-mail : geoconference07@um.edu.my
26-30 Ogos 2007	*International Conference on Congratulational Science and Its Application (ICCSA 2007)*	Kuala Lumpur	UTM	Dr. Alias bin Abdul Rahman Tel : +607 553 0563/ +6013 749 0452 Fax : +607 556 6163 E-mail : alias@fksg.utm.my
5-7 November 2007	*Joint International Symposium and Exhibition on Geoinformation 2007 & International Symposium on GPS/GNSS 2007 ISG/GNSS 2007*	Johor Bahru, Johor	UTM, ISM, UPM, USM, UiTM dan KLIUC	Assoc. Prof. Dr. Md. Nor Kamaruddin Tel : +607 553 0807 Fax : +607 556 6163 E-mail : md.nor@fksg.utm.my
10-12 November 2007	*Training Workshop on Spatial Planning and Decision Support Systems*	Kuala Lumpur	UPM, ISPRS, ITC dan MRSS	Prof. Dr. Shattri Mansor Tel : +603 8946 7543 Fax : +603 8556 6061 E-mail : shattri@eng.upm.edu.my
12-16 November 2007	*The 28th Asian Conference on Remote Sensing (ACRS)*	Kuala Lumpur	UTM, MOSTI, ANGKASA, ISPRS dan ATSB	Dr. Mazlan bin Hashim Tel : +607 550 2873 Fax : +607 556 6163 E-mail : mazlan@fksg.utm.my
14 November 2007	*GIS Day*	Melaka	MaCGDI	Encik Yacob bin Abas Tel : +603 8886 1209 Fax :+603 8889 4851 E-mail : yaba@macgdi.gov.my
20-23 November 2007	*International Workshop on Earth Observation Small Satellites for Remote Sensing Applications*	Kuala Lumpur	UTM	Dr. Mazlan bin Hashim Tel : +607 550 2873 Fax : +607 556 6163 E-mail : mazlan@fksg.utm.my

SUMBANGAN ARTIKEL / *CALL FOR PAPER*

Buletin GIS diterbitkan dua (2) kali setahun oleh Jawatankuasa Pemetaan dan Data Spatial Negara. Sidang Pengarang amat mengalu-alukan sumbangan sama ada berbentuk artikel atau laporan bergambar mengenai perkembangan Sistem Maklumat Geografi di Jabatan Kerajaan, Badan Berkanun dan Institusi Pengajian Tinggi.

Panduan Untuk Penulis

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

2. Abstrak dalam setiap artikel mestilah berbentuk condong *(italic)*.

3. Format manuskrip adalah seperti berikut:

Jenis huruf	: Arial
Saiz huruf bagi tajuk	: 12
Saiz huruf artikel	: 10
Saiz huruf rujukan/*references*	: 8
Langkau	: *Single*
Margin	: Atas, bawah, kiri dan kanan= 2.5cm
Justifikasi teks	: Kiri
Satu '*column*' setiap muka surat	

4. Sumbangan hendaklah dikemukakan dalam bentuk *softcopy* dalam format Microsoft Word. Semua imej grafik hendaklah dibekalkan secara berasingan dalam format .tif atau .jpg dengan resolusi 150 dpi dan ke atas.

5. Segala sumbangan dan pertanyaan bolehlah dikemukakan kepada:

Ketua Editor
Buletin GIS
Bahagian Pemetaan
Jabatan Ukur dan Pemetaan Malaysia
Tingkat 14, Wisma JUPEM
Jalan Semarak
50578 Kuala Lumpur
Tel: 03-26970600 / 03-26170800
Faks: 03-26970140
E-mel: usetiapp@jupem.gov.my
Laman web: http://www.jupem.gov.my