

GIS

BULLETIN



JAWATANKUASA PEMETAAN DAN DATA SPATIAL NEGARA

BIL.2

2001

ISSN 1394 - 5505



Sidang Pengarang

Penaung

Dato' Hamid bin Ali, DIMP, KMN, PMC, PJC
Ketua Pengarah Ukur dan Pemetaan Malaysia

Penasihat

Muhamed Kamil bin Mat Daud, KMN

Ketua Editor

Cheong Kwok Wai

Editor

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MAKLUMAN

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 Agensi Kerajaan, Badan Berkanun dan Institut Pengajian Tinggi. Segala pertanyaan dan sumbangan boleh dikemukakan kepada:

Ketua Editor
Buletin GIS
Bahagian Pengeluaran Pemetaan
Jabatan Ukur dan Pemetaan Malaysia
Tingkat 3, Bangunan Ukur
Jalan Semarak
50578 Kuala Lumpur.

JAWATANKUASA PEMETAAN DAN DATA SPATIAL NEGARA

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14. Universiti Teknologi MARA (co-opted)
15. Universiti Sains Malaysia (co-opted)
16. Jabatan Laut Sarawak (co-opted)

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Nota: Kandungan yang tersiar boleh diterbitkan dengan izin Urusetia Jawatankuasa Pemetaan dan Data Spatial Negara

DARI MEJA PENGARANG

Kita lihat kini bahawa impak GIS semakin meluas dalam semua bidang yang menggunakan maklumat geospasial misalnya dalam pengurusan sumber, perancangan gunatanah dan beberapa lagi aplikasi geosains. Sesungguhnya kegemilangan teknologi GIS bergantung sepenuhnya kepada teknologi-teknologi yang memberikan tumpuan kepada pengukuran serta perolehan data geografik. Teknologi GIS ini pula perlu bergantung kepada pembinaan pangkalan data, analisis data serta persembahan data. Penyalahgunaan data geografik atau geoinformasi tersebut merupakan tragedi kejatuhan kegemilangan masa depan teknologi GIS. Di sinilah dapat dilihat betapa besarnya peranan yang harus dimainkan oleh pengamal-pengamal GIS. Menyedari hakikat ini, Buletin pada kali ini cuba memfokus isu-isu berhubung profesion GIS dari aspek potensi, kelayakan, skop kerja, kemahiran dan asas pengetahuan yang diperlukan agar ianya dapat diterima selayaknya ke arah memberi sumbangan kepada pembangunan negara.

Selain daripada itu, Buletin pada kali ini turut mengenengahkan perkara berhubung penubuhan, peranan dan usaha Jawatankuasa Teknikal Pemetaan Automatik dan Pengurusan Fasiliti yang merupakan salah satu Jawatankuasa Teknikal di bawah JPDSN dalam mewujudkan keseragaman sistem pengurusan kemudahan awam di antara agensi-agensi kerajaan dan swasta yang terlibat.

Memandangkan minat yang mendalam yang telah ditunjukkan oleh pelbagai pihak terhadap teknologi GIS, ianya merupakan faktor pendorong kepada pihak sidang pengarang untuk meneruskan usaha dalam menyebarkan dan mengumpul maklumat khusus berkaitan GIS. Melalui keluaran pada kali ini disertakan panduan penulisan artikel untuk Buletin GIS untuk rujukan dan panduan kepada pembaca yang berminat untuk menyumbangkan hasil penulisan yang berkaitan GIS.

Sebagai rujukan pembaca, disenaraikan juga buku-buku berkaitan GIS yang terdapat di Perpustakaan Universiti Putra Malaysia.

Dikesempatan ini juga, pihak sidang pengarang ingin menyeru agar mana-mana pihak sama ada agensi kerajaan atau swasta dan para akademik tampil menyumbangkan hasil karya, laporan penyelidikan dan sebagainya yang berkaitan sistem maklumat geografi. Semua sumbangan tersebut hendaklah dihantar kepada Ketua Editor, Buletin GIS sama ada secara bersurat atau e-mail kepada, cheong@jupem.gov.my.

Sekian.

The Pioneering AM/FM Committee
by
Abdul Hadi Abdul Samad
Secretary of AM/FM Committee
Department of Survey and Mapping Malaysia
E-Mail:hadi@juwpkl.gov.my

INTRODUCTION

In late 1994, the Cabinet proposed that all utility providers take initiatives to prepare utility maps which could be used to facilitate the maintenance of utility services. The Cabinet further proposed that JUPEM should be given the task to keep copies of these utility maps. Subsequently, the AM/FM Committee was formed as one of five technical committees under the National Mapping and Spatial Data Committee (NMSDC) which is the highest policy and decision-making central body responsible for planning and managing of spatial data. The Director General of JUPEM, in his capacity as the spatial data technical advisor to the government has been appointed the chairman of NMSDC since its establishment in 1965.

Following the Cabinet's decision, the Implementation And Coordination Unit (ICU) of the Prime Minister's Department had, in early 1995 initiated a subsequent meeting to chart down its course of actions and draw up the implementation strategy. It was decided then that besides keeping copies of utility maps, JUPEM should as well lead and coordinate the preparation of these utility maps. Accordingly, in early 1996 JUPEM called for an internal meeting to discuss the credible guidelines and methodologies to be adopted.

In another related development, the Cabinet endorsed the recommendations submitted by the Ministry of Energy, Telecommunication and Post in early 1998, that:

- i. Utility providers should continuously update their databases and provide relevant information to their contractors or project developers before starting any utility project or maintenance to help JUPEM updating its main databases.
- ii. JUPEM should speed up its computerisation programme throughout the country to be utilised by all utility providers.

Eventually, the AM/FM Committee convened its first meeting on 24 March 1998 which was attended by representatives from one government department,

one local authority agency and three utility providers. The meeting among others, had discussed and endorsed the objectives of AM/FM Committee as follows:

- i. To ensure that policies related to mapping programmes and information systems are standardised to avoid duplication of work among its members.
- ii. To ensure that members can carry out the guidelines and activities efficiently and effectively.

The objectives aim primarily to consolidate and coordinate efforts from various agencies to avoid wasteful duplications of work by utilising data exchange and sharing concept among utility communities via online communication facilities. This concept requires the development of feature standardisation that is considered as most crucial element in achieving these objectives. The Committee eventually aims to establish a Utility Information System and utility maps using GIS and advanced communication facilities.

CONCEPTS AND PLANS

Conceptually, the data custodian responsibility of any utility agency remains untouched. Legally, it is still the owner of data that is responsible for its routine data handling responsibilities such as collection, maintenance, security or storage. However, any data that a utility agency agrees to share with members of the Committee or any other registered members will be resided specifically at a local gateway server, linking it to a clearinghouse proposed to be located at JUPEM. The policy regarding assistance to utility agencies in procuring gateway servers and relevant communication facilities will be considered.

The Committee had drawn up its action plans as follows:

- i. Identification of utility agencies to become members.
- ii. Enhancement of relation and cooperation with utility agencies.

- iii. Support for GIS implementation and training.
- iv. Development of Utility layer.
- vi. Pilot project.

Initially, the identification of relevant utility agencies was not an easy task primarily due to the introduction of the government's privatisation policy. It showed the emergence of several new utility companies which were allocated specific tasks according to regions and types of services. Various utility agencies were grouped according to sectors with each sector having its own leader. Members were then called for meeting where they were briefed on the objectives and functions of the AM/FM Committee.

The Secretariat, with the cooperation of NaLIS (the National Infrastructure for Land Information System) continues its effort to forge closer cooperation and relation with the members hoping that it will enhance their commitments and support to achieve its objectives. They have been invited regularly to attend seminars and workshops. A GIS bulletin has been published to allow members' participations and exchange of ideas. A technical Visit to a GIS installation was carried out once and more regular visits are also being planned.

Since the past two years, the AM/FM Committee has been developing a Utility Layer that will be contributed to NaLIS's main layer. It is the most urgent task that is expected to complete within this year. It is then anticipated that a plan for pilot project using a scale of 1:1 000 can be kicked off in October 2001. A commercial area within Masjid Jamek in the heart of Kuala Lumpur covering 2 km X 2 km has been proposed.

DEVELOPMENT OF UTILITY LAYER

In its effort to develop the National GIS Standard, NaLIS has recategorized the geographical features into nine main layers namely Boundary,

Built Environment, Geosoil, Hydrography, Meteorology, Relief, Transportation, Vegetation and Utility in accordance with the requirements of SIRIM's TC 2 and ISO TC 211.

Several sub-committees were formed to develop these layers. The AM/FM Committee was given the responsibility to develop the Utility layer.

The most crucial and challenging task faced by the AM/FM secretariat was to form a technical sub-committee since the actual agencies involved in providing utility services and maintenance were not certainly known apart from the conventional agencies dealing with basic necessities such as electricity, telecommunication and water supply.

This was mainly due to the new government's privatisation policy where government bodies were privatised or corporatised. Utility services were also allocated to several companies according to designated zones and/or categories of services. A great challenge was encountered in acquiring the cooperation and commitment from utility providers.

Eventually, the Utility Layer was narrowed down to eight main sub-layers or known as sectors namely Electricity, Telecommunication, Water, Oil and Gas, Broadcasting, Sewerage, Waste Management and Others as shown in Figure 1 below. The sector 'Others' was reserved solely for future expansion as Utility Layer was considered highly dynamic.

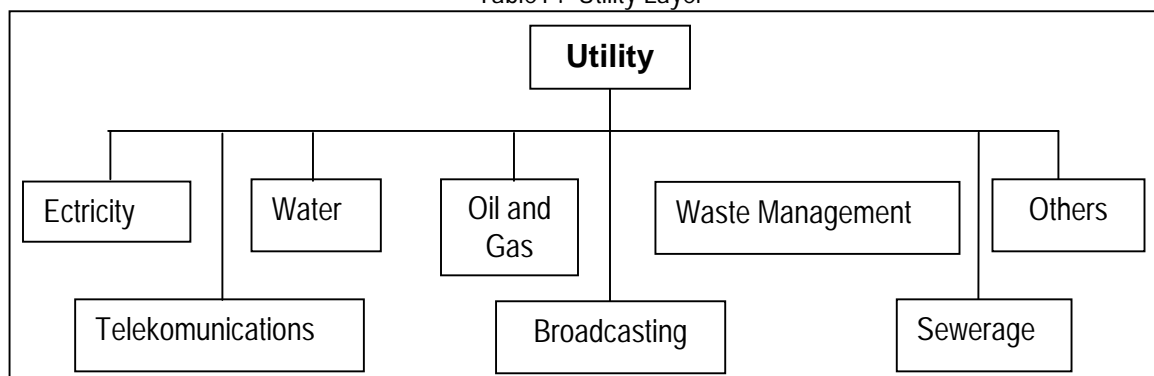
Electricity

This sector is lead by TNB. It has completed the development of electricity sector.

Telecommunication

This sector is lead by Telekom Malaysia. It has completed the development of telecommunication sector.

Table1 : Utility Layer



Water

This sector is lead by the Department of Public Works. It has completed the development of water sector.

Oil And Gas

This sector is lead by Petronas. It has almost completed the development of oil and gas sector.

Broadcasting

This sector is led by a government-owned broadcasting agency, called RTM (Radio Television Malaysia). Its members comprise a number of private radio and television operators. It has almost completed the development of broadcasting sector.

Waste Management

Members of this sector are located all over the country according to allocation of zones and types of services rendered such as solid, scheduled or clinical waste. This sector is lead by Alam Flora. It has completed the development of waste management sector.

Sewerage

This sector is led by the Department of Sewerage Malaysia. It supervises the sewerage project implementation and services undertaken by a private company called IWK which provides sewerage services and maintenance in most parts of the country. It has completed the development of sewerage sector.

VISIONS

The Committee has set out its long-term plan and visions as follows:

- i. Organisational restructure and requirement of office space.
- ii. Continuous R&D and training programmes.
- iii. Expansion to Sabah and Sarawak.
- iv. First trial implementation within one year.
- v. Periodical data updating.
- vi. System design and procurement.

Presently, the Secretariat is too over burdened with skeleton number of supporting staff and faced with shortage of budget. Thus, organisational restructuring programmes are urgently needed. One of the important elements required in the structuring proposal is the inclusion of R&D that is crucial for the successful planning and implementation of Utility Information System.

Eventually, the Committee also aims to expand its function to include Sabah and Sarawak that will be carried out only after the completion of Utility Layer. The detailed concept and methodology of Utility Information System are still being discussed. However, it is hoped that the pilot project can produce some results to pave a way for the first trial implementation in 2002.

PROBLEMS AND CHALLENGES

In the earlier stage, the secretariat had to endure an uphill task to cultivate closer cooperation and management support from the members as the concept of data exchange and sharing were not fully understood and often misinterpreted. However, some members had genuine reasons such as constraints in staffing and budgeting.

The decision making process has always been delayed due to some petty problems. Members who are lack of awareness and understanding of ICT have difficulties to contribute effectively to the AM/FM Committee.

The institutional issue pertaining to legal authority of this Committee needs further fine-tuning to enable it to function effective especially in planning, organising, implementation and controlling of the proposed Utility Information System.

CONCLUSION

The capability of accessing relevant data in any particular area will definitely help avoid accidental destruction of utility features by contractors, leading to proper implementation of utility work. However, there are still several outstanding major issues that are yet to be sorted out before the Utility Information System can be fully realised. The Committee which realises its heavy responsibility and the government's high expectation will continue to play its role satisfactorily in contributing towards the well being of our nation.

Panduan Format Penulisan Bagi Buletin GIS

Guidelines For Papers in Buletin GIS

Sumbangan Artikel/ *Call For Papers*

Buletin GIS diterbitkan dua (2) kali setahun dengan tujuan utama untuk memenuhi keperluan sistem maklumat geografi dan menggalakkan pertukaran pendapat dan pengalaman.

Buletin GIS is published twice yearly. It aims to cater for the needs of geographic information system (GIS) and to promote the exchange of ideas and experiences.

Kandungan/ *Contents*

Penulisan teknikal, ulasan buku, ulasan perisian dan perkakasan, senarai publikasi, berita/ laporan aktiviti di Jabatan tuan beserta gambar-gambar yang berkaitan dalam bidang GIS dan lain-lain bidang geospasial.

Technical write-up, book review, software and hardware review, listing of publication, news/reports about activities in the agencies and photographs related to the reports of GIS and other scopes related to Geospasial.

Kumpulan Pembaca/ *Target Audiences*

Managers, professionals
Students of the Institute of Higher Learning
Government Agencies
Private Sectors

Panduan Untuk Penulis/ *Guidelines For Authors*

1. Manuskrip boleh ditulis dalam Bahasa Malaysia atau Inggeris *Manuscripts can be written in Bahasa Malaysia or English.*
2. Setiap artikel harus diberi sebuah abstrak antara 100-150 perkataan dan disediakan dalam Bahasa Malaysia sekiranya artikel ditulis dalam Bahasa Inggeris dan sebaliknya.

Each article should include an abstract of 100-150 words. An Abstract in Bahasa Malaysia is required for an article written in English Language and vice versa.

3. Kandungan setiap artikel hendaklah di dalam jangkauan antara 2500 – 5000 perkataan.

Article should contain between 2500 - 5000 words.

4. Manuskrip perlu disediakan mengikut size kertas A4 dan ditaip atas satu muka surat dalam langkau dua (2) baris. Semua catatan termasuk nota, rujukan, sebutan, rajah dan appendiks hendaklah ditaip dalam langkau dua (2) baris dan dasingkan di akhir teks.

Manuscripts should be prepared on A4 paper size, double spaced throughout (including notes, references, quotations and appendices) on one side of the paper. References, appendices, table and figure should be on separate sheet of paper at the end of the manuscript.

5. Sumbangan hendaklah dikemukakan di dalam disket atau e-mail menggunakan perisian microsoft word atau page maker.

Contributions should be submitted in a diskette or via e-mail using microsoft word or page maker.

6. Pada mukasurat pertama artikel, butir-butir seperti tajuk artikel, nama pengarang, hubungan profesionalnya, alamat pos, nombor telefon, nombor faks dan alamat e-mail hendaklah disediakan.

The first page of the article should include the title of the article, author's names, their affiliations, postal address, phone and fax numbers and e-mail address.

7. Nota kaki hendaklah digunakan secara minima dan senarai rujukan harus ditempatkan mengikut susunan abjad pada penghujung artikel.

Footnotes should be kept to the minimum. All references should be listed alphabetically at the end of the article.

2001 ANNUAL GEOINFORMATION SEMINAR

By
Abdul Hadi Abdul Samad
JUPEM WPKL
hadi@juwpkl.gov.my

The "2001 Annual Geoinformation Seminar" was successfully held at the Berjaya Hotel, George Town, Penang for 2 days from 12 to 13 November, 2001. A total of 120 participants, including speakers and exhibitors took part in this seminar which was officiated by Yang Berbahagia Dato' Dr. Hilmi bin Haji Yahaya, the Deputy Chief Minister of Penang. The Land Survey Division, Institution of Surveyors Malaysia (ISM) and Universiti Sains Malaysia (USM) jointly organized this annual event which had witnessed such a diverse gathering of GIS players and users from the institutions of higher learning, government agencies and private organizations.

In line with the current topics being hotly discussed and debated especially among the various professional bodies, the organizing committee had chosen the seminar theme as "Bringing Geoinformation Into Multi Disciplinary Spatial Decision Making For Sustainable Development". Its objective was principally to enhance and intensify the use of GIS as a tool for modeling, planning, managing and analysis of spatial data in the multi-disciplinary environments. The seminar which had attracted many GIS experts from all over the country could also become an effective forum for extending the discussion and mutual understanding of the current as well as the future potential of GIS technology at the local, state, national and international levels.

On each day, prior to the presentation of papers, two keynote lectures were addressed by the invited guest speakers who were well-known personalities in the geoinformation community. The organizing committee had to run the seminar simultaneously in two parallel sessions in order to accommodate and expedite the presentation of papers. It was really inspiring to note that 25 papers were presented in each session. At the same time, the 10 poster sessions was held outside the seminar rooms along with 5 booths exhibiting variety of geoinformation products and services.

In the first keynote lecture entitled "Recent Development In GIS Application", Dr. Nordin Ahmad, the Principal Consultant of the Geoinfo Services Sdn. Bhd. outlined the current and future development of GIS applications.

He noted that currently, only 5% of the GIS services were effectively utilized for analysis. The main bulk of in efforts or 70% had to concentrate on data conversion and an other 25% for the attribute tagging. However, he was very optimistic that the near future trend would change remarkably where analysis would exclusively play a major role. According to Dr. Nordin, the limiting factors in the hardware and software development did pose real challenges for efforts to translate the spatial processes into algorithms. He concluded that the future and prospect of GIS lied on its particular strengths such as the multi-disciplinary applications, decision-making system and complete integration.

In the second keynote lecture, Yang Berbahagia Dato' Abdul Majid bin Mohamed, the President of ESRI South Asia Group spoke exclusively on the roles of ESRI as a leading GIS software vendor in building GIS communities and its contributions towards the development of GIS. On the second day, the third keynote lecture was addressed by Tuan Haji Abdul Mutalib bin Jelani, who was the Deputy Director General (Development) of the Department of Town and Country Planning, Peninsula Malaysia. He spoke on the need for the establishment of the National Spatial Data Center and outlined its strategy.

The last keynote address was delivered by Yang Berbahagia Dato' Hamid bin Ali, the Director General, Department of Survey and Mapping Malaysia (JUPEM) on the topic entitled "The Dissemination Of Geospatial Data In Malaysia: With Special Reference To Department Of Survey And Mapping Malaysia". He began by highlighting the fact that the adequate and accurate information through GIS was very vital and would greatly help the country in the direction towards achieving the vision 2020, which the Prime Minister had set out a national agenda with emphasis on the long term development.

Yang Berbahagia Dato' added that JUPEM, being the national custodian of survey and mapping data had taken the enormous tasks of creating and managing both digital spatial databases such as Digital Cadastral Database

(DCDB) and digital topographical database, as well as the dissemination of these data to end users. To achieve these objectives and to fulfill the requirement of the national development, he outlined the various steps taken by JUPEM to modernize both its field and office machineries. On the integrity of the JUPEM's datasets, he further stressed that stringent measures were enforced to maintain the quality assurance. JUPEM also believed that it had an obligation to provide leadership to improve better use of government resources in GIS/LIS, survey and mapping since the Director General formally chaired the National Mapping and Spatial Data Committee. Yang Berbahagia Dato' concluded his lecture by giving assurance that JUPEM's commitments towards GIS development in Malaysia through its databases and services would continue and its contributions had been proven beyond doubt.

The papers presented in this seminar were largely related to GIS applications in multi-disciplines such as Land Use, Environment, Management, Forestry, Agriculture, Utility Education and Politic. In addition, there were also papers on survey and mapping applications which touched specifically on Photogrammetry, Remote Sensing, Hydrography, Cadastre, GPS and Geodesy. Other papers presented included topics on the information and communication technology involving data management, application software, networking and system design. There were also papers concerning health and motivational forces such as ways for improvement of self-esteem and managing stress.

The papers presented in this seminar were largely related to GIS applications in multi-disciplines such as Land Use, Environment, Management, Forestry, Agriculture, Utility Education and Politic. In addition, there were also papers on survey and mapping applications which touched specifically on Photogrammetry, Remote Sensing, Hydrography, Cadastre, GPS and Geodesy. Other papers presented included topics on the information and communication technology involving data management, application software, networking and system design.

There were also papers concerning health and motivational forces such as ways for improvement of self-esteem and managing stress. The GIS academicians who participated in the seminar as speakers, participants or committee members took the opportunity to establish the National Committee of Geomatic Academicians (NCGA). The paper which was presented by the Universiti Teknologi Mara outlined the rationale for its establishment and listed down several strategies to achieve its objectives. After a lengthy discussion, a pro-tem committee was successfully formed to formulate and steer its future direction.

Judging by the overwhelming response from the various organizations and the number of papers presented, it would be appropriate to mention that the seminar was successfully organized and conducted. Members of the organizing committee obviously deserve commendation for their dedications and efficiencies in ensuring that all requirements were promptly met and went down well according to the scheduled programs although some minor hitches and shortcomings were occasionally encountered. Generally, the participants were very delighted and undoubtedly satisfied with the new exposures, experiences and benefits gained from this seminar. UTM, which has been given the task to organize the "2002 Annual Geoinformation Seminar" will shoulder the heavy responsibility in ensuring that this year's standard of organizing will be further improved not only in terms of the participation but also on the quality of working papers and presenters.

KEARAH MENEMPATKAN PENGAMAL-PENGAMAL GIS KEDALAM SATU PROFESYEN YANG SESUAI

Oleh

*Profesor Madya Ghazali Bin Desa
Jabatan Geoinformatik
Fakulti Kejuruteraan dan Sains Geoinformasi
UNIVERSITI TEKNOLOGI MALAYSIA
Skudai, Johor*

PENGENALAN

Kemunculan Geographic Information System (GIS), baik di agensi-agensi awam mahu pun swasta, merupakan hasil daripada gelombang kepesatan teknologi komputer. Teknologi GIS telah menjadi satu fenomena dan yang pastinya ia akan terus kekal serta berkembang maju. Menyorot kembali kepada peringkat awal pengenalan GIS, ianya hanyalah merupakan satu "new tool" bagi menyediakan penyelesaian kepada masalah-masalah maklumat yang wujud di agensi-agensi tadi. Pada ketika itu, kehadiran "tool" baru yang serba canggih telah menyebabkan tumpuan kepada perkembangan teknologi baru dalam fotogrametri, GPS, remote sensing, kartografi berdigit, pengurusan pangkalan data, dan lain-lain telah beralih secara tidak disedari dan mungkin juga dengan tidak disengajakan. Walau pun demikian, kemajuan dalam teknologi-teknologi fotogrametri, remote sensing GPS, kartografi berdigit serta pengurusan pangkalan data dilihat sebagai pencetus kepada terbentuknya satu fokus antara disiplin terhadap GIS. Fokus antara disiplin itu telah menyebabkan laluan GIS terbuka dengan lebih luas lagi untuk terus berkembang pada kadar yang lebih pantas. Penjelasan oleh Chrisman (1997) terhadap kemajuan GIS bertitiktolak daripada kemampuan GIS mengintegrasikan maklumat dari pelbagai sumber serta keupayaan mengeksploitasikan teknologi-teknologi baru.

Kegemilangan masa depan GIS bergantung penuh kepada teknologi-teknologi yang memberikan tumpuan kepada pengukuran serta pemerolehan data geografik. Selain dari itu, GIS juga banyak bergantung kepada pembinaan pangkalan data, analisis data dan persembahan data yang tepat. Antaramuka pengguna yang telah dibaiktingkatkan juga telah menjadikan GIS dan teknologi-teknologi berkaitan mudah digunakan serta mampu dicapai oleh segenap lapisan pengguna.

Sungguh pun demikian potensi salahguna **geoinformasi** boleh menjatuhkan GIS. Bagi mengelakkan tragedi kejatuhan teknologi GIS ini maka tanggungjawab mereka-mereka di dalam **profesyen GIS** sangat berat. Soalnya ialah (i) adakah wujud satu profesyen yang disebut sebagai profesyen GIS itu?, (ii) siapakah pengamal-pengamal GIS layak menganggotai profesyen GIS?, (iii) adakah tempat/jawatan yang sesuai, baik dalam agensi-agensi awam mahu pun swasta, untuk profesyen GIS ini? (iv) apakah kemahiran-kemahiran yang diperlukan bagi kerja-kerja GIS?, dan (v) apakah asas pengetahuan (knowledge base) pengamal-pengamal GIS?

Tujuan kertas kerja ini adalah untuk cuba mengwujudkan satu perbincangan atau forum yang akhirnya dapat memperjelaskan lagi kedudukan profesyen GIS di Malaysia. Perbincangan melalui kertas kerja ini akan melihat dan cuba memperjelaskan beberapa terminologi terutamanya pengertian geoinformasi (Geoinformation). Keduanya ialah cuba merumuskan proses umum (generic process) kerja-kerja GIS. Dan yang akhir sekali ialah cuba untuk mengenalpasti kemahiran-kemahiran serta pengetahuan yang perlu ada pada pengamal-pengamal GIS.

TERMINOLOGI

Geomatik lawan Geoinformatik

Terma Geomatik (Geomatics) dan Geoinformatik (Geoinformatics) sekarang ini telah digunakan secara meluas di mana-mana sahaja di dunia ini. Perkataan Geomatik mula diperkenalkan di Kanada yang dimaksudkan sebagai satu disiplin merangkumi disiplin-disiplin kadastra, ukur dan pemetaan, remote sensing dan geographical information systems. Manakala di Belanda pula terma Geoinformatik pula merupakan pilihan yang popular di mana terma itu bermaksud disiplin yang memfokus kepada keseluruhan spektrum pemprosesan dan analisis maklumat geografik.

Banyak universiti yang dulunya menawarkan program-program ukur tanah telah mengambil langkah menukarkan nama program mereka kepada Geomatik bagi memperlebar skop ukur tanah supaya merangkumi remote sensing, GPS, fotogrametri dan GIS. Sedangkan bagi sesetengah universiti pula di mana fokus pengajaran dan penyelidikan mereka tertumpu kepada menganalisis maklumat geografi, universiti-universiti itu sudah tentu memilih terma Geoinformatic. Keadaan yang sama turut berlaku di Universiti Teknologi Malaysia di mana Jabatan Ukur Tanah telah ditukar kepada Jabatan Kejuruteraan Geomatik. Universiti Teknologi Malaysia juga turut menubuhkan Jabatan Geoinformatik. Fokus kedua-dua jabatan ini adalah sejajar dengan kerangka definasi yang diberikan di atas.

Melihat kepada berbagai definasi yang banyak terdapat di merata-rata tempat, terdapat persamaan dan juga perbezaan pada terma-terma tersebut. Perbezaan yang sangat ketara ialah pada asas Fokus Geomatik (traditional surveying and mapping) dan Geoinformatik (geographic information management and analysis)

Geografi lawan Spatial lawan Geospatial

Apabila dianalisis definasi-definasi geoinformasi (geoinformation) ianya menjadi bertambah jelas bahawa terdapat sedikit perbezaan pendapat dan bahawa banyak juga definasi-definasi itu mempunyai pendekatan yang luas berbanding yang lain-lainnya ANZLIC (1999) mendefinisikan geoinformasi sebagai "*geoinformation is any information linked to a specific location under, on or above the surface of the earth*". RAVI (1995) pula memberikan definasinya sebagai "*all information linked to a locality on the earth – information about object with an essential or geographic component plays an important role*". Ada juga definasi lain menyatakan bahawa geoinformasi ialah informasi yang mengenalpasti kedudukan geografi dan ciri-ciri objek yang berbentuk semulajadi atau buatan manusia.

Berbeza dengan pendefinisan di atas, Masser (1998) mengwarwarkan fakta bahawa geoinformasi menyediakan satu **kerangka rujukan umum** bagi mengintegrasikannya dengan lain-lain set data. Ini merujuk kepada entiti geografi yang "tangible" atau pun "intangible". Mengikut sesetengah definasi data geografi membawa maksud data yang memperihalkan *the physical locality of a physical feature*. Walau bagaimana pun, definasi-definasi itu menyebut bahawa bagi informasi yang hendak

diklasifikasikan sebagai geografi, peraturan geografi dan perhubungan di kalangan entiti-entiti fizikal mestilah dianggap penting.

GISSA (2000) mendefinisikan geoinformasi sebagai sains dan teknologi pengumpulan, pengukuran, pemprosesan, analisis, penafsiran, penggunaan, penilaian dan pengurusan *geographically related and spatially referenced information*. Walaubagaimanapun, definasi GISSA tersebut mengelirukan geoinformasi sebagai objek dan pengurusan geoinformasi sebagai proses.

Berdasarkan perbincangan di atas terdapat beberapa unsur yang sama yang boleh digunakan untuk mengkategorikan geoinformasi kepada satu hirarki maklumat bermula dari data geografi tulin (*data required to locate the physical entity*) di satu segi dan data tematik di segi yang lain.

- Teras hirarki geoinformasi ialah Sistem Rujukan Geografi atau Datum Geodetik, dijadikan piawaian asasi untuk membolehkan pengintegrasian.
- Kategori kedua ialah Data Topografi Kategori ketiga ialah Sektor Khusus atau Entiti-Entiti yang boleh dipetakan
- Kategori keempat ialah Sektor Khusus Data Tematik.

PROSES PENGURUSAN GEOINFORMASI

Walaupun apa sekali pun terminologi serta definasi-definasi tentang geoinformasi, fokusnya adalah terhadap **Proses Geoinformasi**. **Proses Geoinformasi** merupakan satu pengurusan aktiviti yang sistematik dalam *memperoleh, mengurus dan memanipulasi* data geografi supaya dapat menyediakan maklumat bagi pembuatan keputusan.

PENGURUSAN GEOINFORMASI

Maksud pengurusan adalah *merancang, mengorganisasi, melaksana, mengawal* dan *menyelenggara* sistem atau projek. Proses pengurusan geoinformasi merangkumi:

- Perancangan Strategi Geoinformasi
- Pembangunan Aplikasi
- Pembinaan Pangkalan Data
- Pengurusan Pangkalan Data
- Analisis Data
- Penghasilan Output

Organisasi di mana Pengurusan Geoinformasinya masih baru biasanya pengurusan itu digabungkan

ke dalam organisasi sebagai sebahagian daripada strategi maklumat korporat. Ini memerlukan **perancangan strategi geoinformasi**.

Bagi organisasi yang telah pun mempunyai pengalaman lalu dalam pengurusan geoinformasi, pembangunan aplikasi mesti dibangunkan dengan mengambilkira keperluan-keperluan pengguna. Perkara ini memerlukan satu proses pembangunan yang lebih berstruktur. **Proses pembangunan aplikasi** ini melibatkan:

- **Pendefinisian Skop Projek**
 1. Objektif
 2. Outcomes
 3. Keadaan
 4. Kekangan
 5. Organisasi
 6. Peruntukan Kewangan
 7. Jadual Pelaksanaan
- **Penentuan Keperluan Data**
 1. Menganalisis Proses Bisness
 2. Menentukan entiti-entiti spatial
 3. Menentukan atribut
- **Penentuan Parameter**
 1. Menentukan resolusi minima entiti-entiti spatial
 2. Menentukan skala peta
- **Mendefinisian Sistem-Sistem Rujukan**
 1. Spatial
 2. Atribut (Norminal, ordinal, interval, radio)
 3. Temporal

Proses pembinaan pangkalan data melibatkan banyak aktiviti. Pangkalan data pula terbahagi kepada dua iaitu Pangkalan Data Spatial (atau pun Map Database) dan Pangkalan Data Atribut. Ada empat aktiviti yang melibatkan proses pembinaan **Pangkalan Data Spatial**:

- **Perolehan Data**
 1. Ukur
 2. GPS
 3. Remote Sensing
 4. Fotogrametri
- **Kemasukan Data**
 1. Pendigitan
 2. Pengimbasan
 3. Bulk/Batch Loading
 4. Georeference
- **Penukaran Format Data**
 1. Vector/Raster

2. Raster/Vector

- **Validasi Data**
 1. Pembedulan ketidakpastian topologi
 2. Pembedulan format data jadual

Pembinaan Pangkalan Data Atribut tidak melibatkan banyak aktiviti seperti proses Pembinaan Pangkalan Data Spatial tetapi adakalanya pembinaan pangkalan data itu boleh juga menyukarkan pembangunan sistem. Aktiviti-aktiviti yang terlibat dalam proses pembinaan Pangkalan Data Atribut adalah:

- **Pemerolehan Data**
 1. Environmental atributs survey
 2. Socio-economic survey
 3. Utilities survey
- **Merekabentuk Jadual-Jadual**
- **Data Capture**
- **Validasi Data**

Proses yang ke empat merupakan Pengurusan Pangkalan Data. Proses ini juga terdiri dari Pangkalan Data Spatial dan Pangkalan Data Atribut. Manakala aktiviti-aktivitinya ialah:

- **Inventori**
 1. Create/save database views
 2. Pertanyaan atribut/peta
 3. Analisis perubahan
- **Permodelan**
 1. Analisis proximiti
 2. Spatial joins (tindihan)
 3. Analisis rangkaian
 4. Analisis Raster (algebra peta)
 5. Generalisasi
 6. DTM
 7. Simulasi

Proses terakhir dalam Pengurusan Geoinformasi ialah Output Data. Proses ini mengandungi penghasilan Visualisasi dan Peta/Laporan.

- **Visualisasi**
 1. Zoom/Pan/change view
 2. Redraw/refresh display
 3. Feature symbolization
 4. Feature Filtering
 5. Background image

- **Peta/Laporan**

1. Menjana Statistik Rumusan
2. Menjana Laporan Teks dari Pangkalan Data Atribut
3. Menjana Simple Map
4. Menjana Complex Graphic Product

KATEGORI KEPAKARAN DALAM PENGURUSAN GEOINFORMASI

Proses geoinformasi memberikan satu mekanisma bagi menentukan kepakaran dalam melakukan aktiviti-aktiviti yang terdapat dalam setiap proses. Titik tolaknya ialah perbezaan kepakaran yang terlibat dengan data geografik atau spatial atau pun geospatial serta bagaimana maklumat digunakan mengikut tujuan atau aplikasi.

- Ukur Kadastra menyediakan data kadastra untuk tujuan keselamatan pemilik hartanah
- Ukur dan Fotogrametri menyediakan peta-peta topografi bagi tujuan perancangan
- Ukur menyediakan maklumat pengukuran yang tepat bagi tujuan pembinaan, kejuruteraan, perlombongan dan hidrografi
- Kartografi menyediakan peta-peta untuk tujuan navigasi
- GIS menyediakan data dan maklumat geografi untuk tujuan membuat keputusan.

KETRAMPILAN PENGURUSAN GEOINFORMASI

Berdasarkan proses pengurusan geoinformasi yang

telah digariskan tadi beberapa bentuk ketrampilan sudah boleh dikenalpasti. **Ketrampilan** adalah merupakan *kemahiran-kemahiran yang perlu ada bagi melakukan kerja-kerja yang membabitkan tiap-tiap aktiviti dalam proses pengurusan geoinformasi manakala pengetahuan juga diperlukan bagi memahami asas-asas kemahiran dan mestilah relevan dengan output yang dihasilkan melalui pemakaian kemahiran tadi.* Dalam hal ini, ketrampilan dapat digolongkan kepada dua jenis:

- Kemahiran (skill base)
- Pengetahuan (knowledge base)

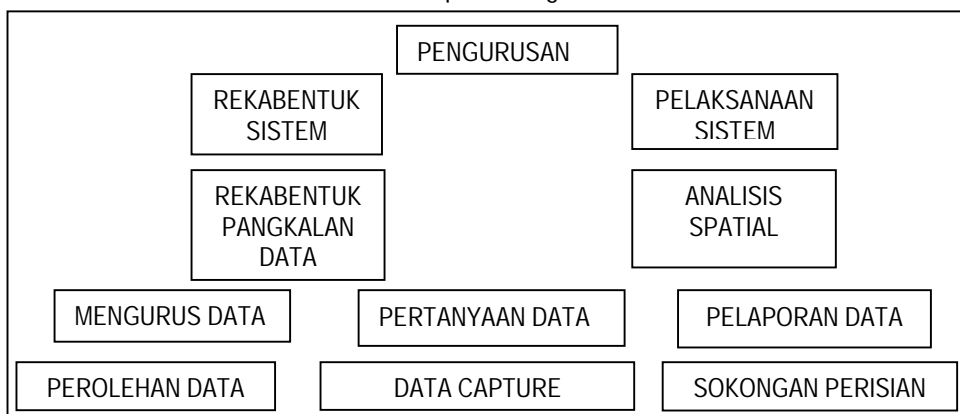
Penggunaan kumpulan jawatan boleh memudahkan proses mengketegorkan ketrampilan

- **Teknikal** (ukur, pemetaan, permodelan, dll.)
- **Kepengurusan** (pengurusan, kewangan, prosidur tender, undang-undang, dll.)
- **Personal** (kemahiran komunikasi, etika professional)

Rajah 1 merupakan satu piramid kumpulan jawatan bagi mengenalpasti asas ketrampilan untuk pengamal GIS. Peringkat atau lapisan bawah piramid merupakan kumpulan teknikal manakala bahagian teratas pula memerlukan kemahiran-kemahiran bisness dan pengurusan. Mengikut peringkat atau lapisan piramid di atas umumnya boleh dikategorikan pengamal GIS sebagai:

1. **Juruteknik GIS**
2. **Pengamal GIS**
3. **Pengamal Profesional GIS**
4. **Pengamal Pakar GIS** (penyelidik GIS yang mempunyai pendidikan peringkat pasca ijazah)

Rajah 1
Asas Ketrampilan Pengamal GIS



PENUTUP

Perbincangan dalam kertas kerja ini ialah tentang pengurusan geoinformasi yang merupakan satu proses umum (generic) yang dilaksanakan oleh pelbagai kepakaran dalam beberapa domain. Domain yang ada sekarang adalah ukur kadestra, kejuruteraan, alam sekitar, bisnes, utiliti, kerajaan tempatan dan lain-lain. Bagi membuat satu rumusan awal perlu dibezakan di antara domain (bidang aplikasi) dan aktiviti geoinformasi samada ukur dan pemetaan, fotogrametri, analisis data remote sensing, pembinaan pangkalan data atau pengurusan pangkalan data dan lain-lainnya.

Ukur dan pemetaan hanyalah satu daripada unsur-unsur dalam peroses pengurusan geoinformasi. Aktiviti yang dilakukan oleh jurukur tanah pula terkeluar daripada amalan GIS. Walaupun pengamal GIS diperlukan mempunyai pengetahuan tentang pemerolehan data dan faham tentang konsep ukur, tetapi ukur tidak semstinya menjadi sebahagian daripada aktiviti-aktiviti biasanya. Pengamal-pengamal ukur tanah biasanya menumpukan pengkhususan dalam:

1. Ukur Kadastra
2. Ukur Kejuruteraan
3. Ukur Industri

4. Ukur Hidrografi
5. Ukur Topografi

Untuk peringkat awal ini, mungkin profesyen-profesyen yang agak sesuai untuk diletakkan pengamal GIS ialah:

- Pengamal Fotogrametri
- JuruKartografi
- Pengamal GIS
- Juruanalisis GIS
- Jurutera GIS

Satu perbincangan yang lebih terperinci lagi amat diperlukan bagi meletakkan Pengamal GIS di dalam satu profesyen yang sangat sesuai. Isu-isu yang perlu diperincikan termasuklah melihat semula peringkat pengetahuan dan kemahiran, penempatan pengamal-pengamal GIS dalam institusi/ pertubuhan professional sedia ada seperti Pertubuhan Jurukur Malaysia, dan kod etika Profesyen GIS.

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