

GIS BASED PLANNING SUPPORT SYSTEM FOR THE STATE OF NEGERI SEMBILAN, MALAYSIA

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Abstract

Planning Support System is often an important feature of countries undergoing rapid economic development such as Malaysia. In this context, the task of monitoring and reviewing plan progress involves the assembly and integration of geographic information. The State of Negeri Sembilan decided to develop its own planning support system to monitor the implementation of its development plans over time. A distinctive feature of the Negeri Sembilan GIS (GIS9) that was developed for this purpose is that it is capable of operating on two distinct level of planning – the state and district level. GIS9 also provides updating facilities and interactive data display. It was developed as a planning support system to consider alternative spatial development strategies as well as visualise development potentials involved in land use planning. In addition, the monitoring system that has been developed for both the state and district levels make it possible to evaluate the success of plan implementation. The use of GIS as a major component of the planning support system is significant as spatial information concerning planning and development needs to be organized and updated frequently. The database is constructed through collaboration and data sharing effort from various government departments and agencies. The data sharing framework is seen as a strong basis for extension of GIS database development in all the other state agencies. This paper will discuss the approach and strategies employed in the preparation of GIS9 database and development plans monitoring systems for the State of Negeri Sembilan.

Introduction

The evolution of sciences and technology has effected the change of planning decision method. Planning support system (PSS) and decision support system (DSS) are among tools for achieving planning quality in optimum development. They combine traditional tools for urban and regional planning with other technologies such as expert system (Han and Kim, 1989), decision support aids such as multi-attribute utility theory (Lee and Hopkins, 1995), hyper media systems (Shiffer, 1992), and group decision support systems (Armstrong, 1993; Finaly and Marples, 1992). However, Geographical Information Systems (GIS) still remain as the core of these systems. The use of GIS as a major component of the planning support system is significant as spatial information concerning planning and development needs to be organized and updated frequently. As such, GIS technology has long been applied in planning activities which essentially include plans formulation as well as development control.

The Need For PSS For The State Of Negeri Sembilan

Planning Support System is often an important feature of countries undergoing rapid economic development such as Malaysia. At present, the advancement of geo-information technology (GIT) has considerably affects the dynamic nature of urban and regional planning in Malaysia and consequently improved decision-making, planning and management concerning urban areas. The Town and Country Planning Act, 1976 (Act 172) in its latest amendment in year 2001, manifested the concern of adopting GIS in the development planning process, especially in the preparation of development plans. Federal Town and Country Planning Department had published the manual for preparation of development plans at various levels, with provision that all plans need to utilise GIS technology in their formulation. As such, many local/planning authorities have embarked on small scale, multi-faceted GIS applications to suit their functions and work procedures. In this context the tasks of monitoring and reviewing plan progress involves the assembly and integration of geographic information from a wide range of sources. While geospatial information are being used daily by almost every agency of the federal government and local governments, regional governments, as well as public authorities, much concern is given to effective methods of creating, obtaining and distributing information.

The State Government of Negeri Sembilan had taken an early initiative toward the implementation of ICT in its administrative management through the preparation of *Negeri Sembilan ICT Strategic Plan* in 2003. Among others, the plan identified the operational supports in term of information systems to be implemented by the state government base on priorities for facilitating project implementation. Realising the need for a more dynamic development planning management system at the state level, the State of Negeri Sembilan decided to develop its own planning support system to monitor the implementation of its development plans over time. Integration and coordination of data developed to bridge the gap between state policies and local circumstances is crucial for planning at state level. This would certainly need a common base of information and data which can help coordinate planning and development programmes at the local authorities level. The development of Geographical Information System for Negeri Sembilan (GIS9) is apparently a significant contribution to the planning field and conventional planning practice especially in the aspects of development management and implementation as the prepared data can be utilised for development programmes studies/reviews both at the state and local levels.

Development of GIS for Negeri Sembilan (GIS9)

GIS9 accommodates geospatial data that allows for presentation of information according to locations and attribute tables for the whole state of Negeri Sembilan. GIS9 was developed primarily for execution of Town and Country Planning Department of Negeri Sembilan (JPBDNS) functions but will soon be extended to support the functions and requirements of all technical department of the state. Development of GIS9 was approached in three phases

to ensure the successfulness of its implementation and future sustainability especially in the aspects of hardware, software and human resources.

GIS9 Approach for State Level Planning

Negeri Sembilan is a small state (665,374.77 hectares) that forms the southern part of the greater KL conurbation identified in the National Physical Plan as the main growth engine of the Malaysian economy. Negeri Sembilan is made up of 7 Districts with 8 Local Authorities namely Seremban Municipal Council (MPS), Nilai Municipal Council (MPN), Port Dickson Municipal Council (MPPD), Kuala Pilah District Council (MDKP), Tampin District Council (MDP), Jelebu District Council (MDJ), Rembau District Council (MDR) and Jempol District Council (MDJ).

Development of GIS9 components which comprise the database and system integration essentially took into consideration the different functions and roles of the stakeholders involved, namely JPBDNS and other technical departments. As each department or agency applies rather different administrative and management procedures, GIS9 approach for planning at the state level took into account the needs and functions of JPBDNS as well as other technical departments concerned with planning, implementation, maintenance and management of development programmes in Negeri Sembilan. This is to ensure that the developed data can be shared in attempt to strengthen the development planning management system at the state level.

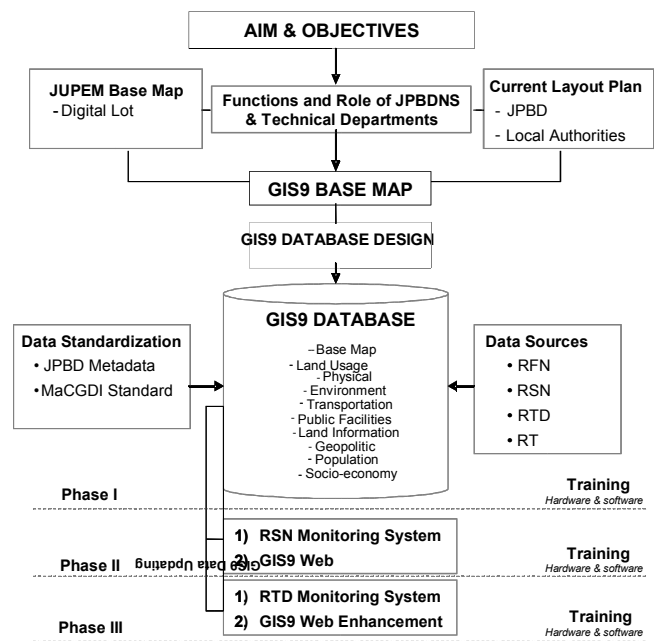


Figure 1: GIS9 Development Approach

Database Development

The development of GIS9 database involved the routine process of data collection, manipulation, standardization, updating and storing. The base for GIS9 data development is the lot cadastral map from Department of Survey and Mapping Malaysia (JUPEM), which was further enhanced based on to the layout plans provided by JPBDNS. Based on assessment of the requirement of various planning agencies, the database was designed base on the geodatabase model approach. The database was developed using data from various sources which is channelled through JPBDNS with the support of other technical departments. Other data providers include the local authorities which supplied data concerning the development plans and planning applications and various technical

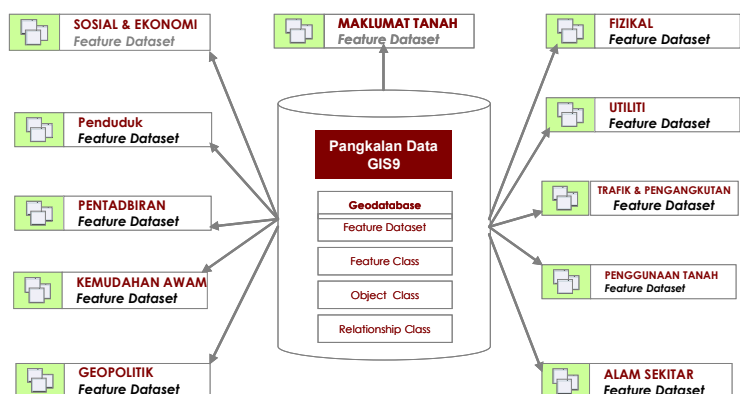


Figure 2: Basic components of GIS9 Database

Other data providers include the local authorities which supplied data concerning the development plans and planning applications and various technical

departments. Data from multiple sources was standardized based on the GIS9 database format and structure. GIS9 database structure was designed to conform to JPBD's metadata as well as MaCGDI's data standard (MS1760). The GIS9 base map was adapted to include other elements of data.

Altogether, a total of 12 datasets and 64 feature classes were built for the macro database in GIS9. The database contains generalised data sufficient for state level planning. While the micro database which accommodates detailed data consists 8 datasets and 20 feature classes for each district.

Planning Applications In GIS9 for JPBDNS

Planning analysis is imperative to ensure that development is well-controlled and comply with the policies and guidelines, both at the state and local level. The application for analysis is developed to facilitate JPBDNS in organising data for analysis and retrieving analysis results when needed, for the purpose of monitoring development in Negeri Sembilan. GIS9 can be applied to various planning activities including preparation and monitoring of development plans as well as development control.

Planning Analysis and Development Plans Preparation

The comprehensive database constructed has made it easier for modeling and analysis based on predetermined criteria which is required in the formulation and review of development plans, such as identifying 'potential areas for development' (Figure 3).

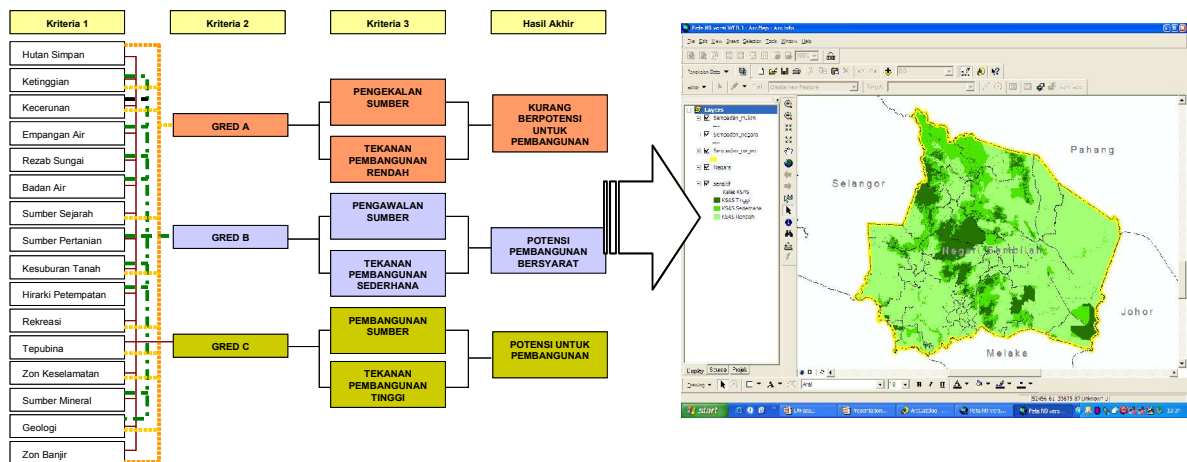


Figure 3: Modelling and Analysis of Potential Areas for Development

Development Plans Monitoring System

The development plans monitoring system was developed based on the crucial need for assessment of the progress and effectiveness, as well as, review of development programs and policies. The module for development plans monitoring supports the State's Town and Country Planning Department in controlling and monitoring development projects. The accomplishment of development targets will be evaluated in terms of specific indicators and a particular time frame. The implementation is strongly supported by the GIS9 database which provides the planning information needed through continuous data gathering, updating and, storage.

- The State Structure Plan Monitoring Module (SPRSN)





Figure 4: Compliance to RSN

SPRSN provides means for assessing the accomplishment of the state structure plan (Figure 4). It translates gazetted structure plan policies into achievement and compliance units. The State Structure Plan (RSN) involves the general policies, subject policies and specific strategies. The policies can be translated into qualitative and quantitative form of measurement.

The accomplishment of RSN is demonstrated through the assessment of changes in development scenarios based on evaluation of the outlined strategies through comparison with the key diagram.

- The Local District Plan Monitoring Module (SPRTD)

SPRTD emphasizes on physical planning involving spatial data, location and land use activities of proposed development. It will be possible to check whether land use development in the district complies with the zoning strategies in the district and local plans (RTD) by comparing current land use development with that proposed in the district and local plans (Figure 5). Development projects implementation progress at the district level can be constantly monitored and development control can be carried out more systematically.

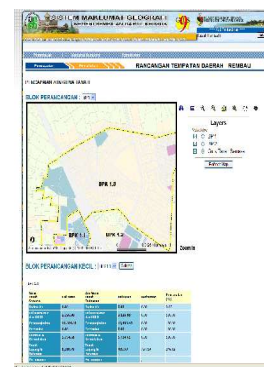


Figure 5: Achievement of RTD

GIS9 Data Sharing Framework

For the time being, GIS9 data is made available to state technical departments within the same building (Wisma Negeri) through the local area network (LAN). The data sharing framework in GIS9 provides a more efficient, more effective, and less expensive method of sharing and coordinating information between stakeholders.

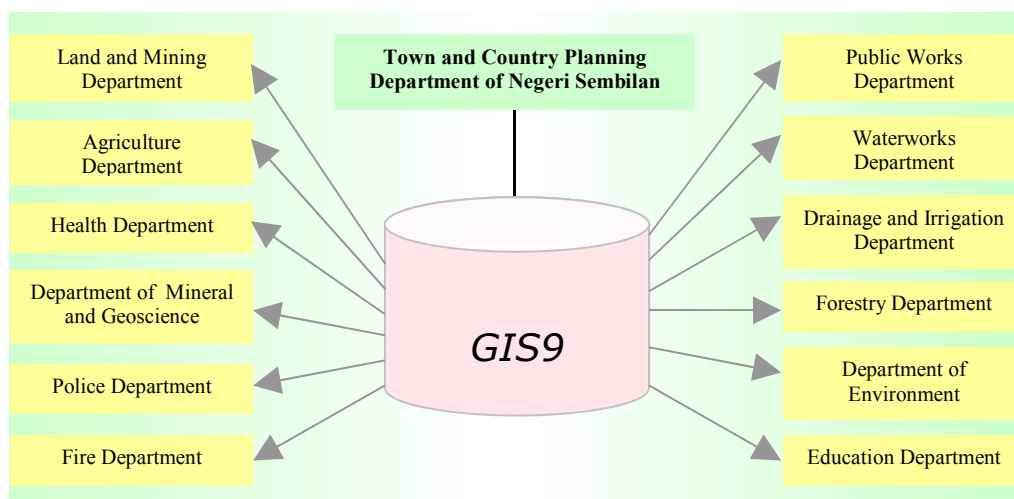


Figure 6: Stakeholders of GIS9

GIS9 Accessibility

GIS9 provides two alternatives for access of its data i.e through the customised user interface and the web.

i) System Customisation and User Interface

The development of GIS9 customised system and user interface is to ease and make data accessible to all level of users in JPBDNS. It serves as an executive information system for data display. GIS9 interface is equipped with several security features to prevent unnecessary exploitation and corruption of data. The user 'login' component for instance, would make the system more protected and reliable apart from simplify the management and maintenance process.

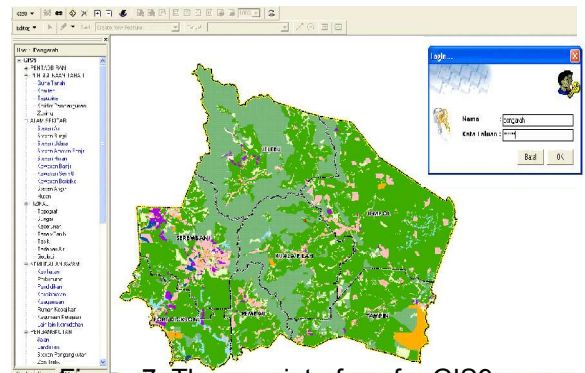


Figure 7: The user interface for GIS9 customised system

ii) GIS9 On-line

The web-based GIS was designed to enable distribution of information both through intranet and internet. Access of information through the web is less time consuming and reduces the need for manpower, apart from enables smooth management and administration flow in government agencies in Negeri Sembilan.

Generally, six main modules were developed namely the main page, articles, stakeholders, login, activities and public's interactive maps. The main page provides brief information on GIS9 and main access to the GIS9 database and applications for stakeholders as well as the public. Among the GIS functions provided include *zoom in*, *zoom out*, *pan*, *full extent* and *identify* which facilitate user in retrieving the required information. The web pages were developed stage by stage based on the updating of information in the GIS9 database. For the time being, Web GIS9 is attached to the JPBDNS 'server' and made accessible to all department within the building of Wisma Negeri.

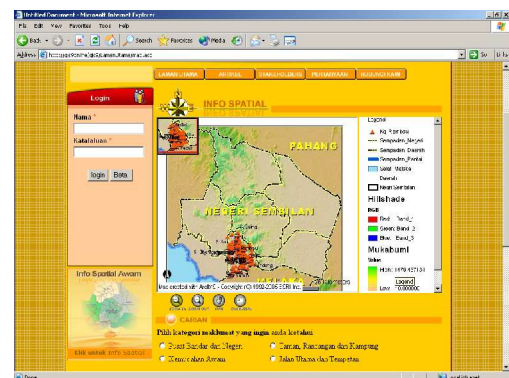


Figure 8: Public's Interactive Maps

Challenges and Future Direction

Apparently, the implementation of GIS9 help reduces the cost of RSN/RTD studies and preparation due to data availability. It enables smooth process of development management and implementation due to the data-sharing framework adopted. It can be used by various departments/agencies for the purpose of data updating and enhancement due to common data structure/format.

However, successful implementation relies on the overall information management strategy which takes account of data availability, computing capabilities and management requirements. Management and maintenance are the key activities in the implementation of GIS9. Among the important aspects of management and maintenance of GIS9 include the preparation of hardware and software for handling large pools of accumulating data as well as system configuration and network capabilities for supporting data sharing procedures between technical departments and data quality and security control. The aspect of data standardization across departments should also be given due attention including in terms of data format, database structure, as well as the planning guidelines applied.

Apart from system development and maintenance, preparation of human resources is also crucial. Programmes should be outlined for users to acquire the appropriate knowledge and skills. This include workshops and trainings to ensure smooth technology transfer to users for effective system implementation.

All in all, acquiring and updating of data tends to be the biggest challenge in the implementation of GIS9 as it influences the accuracy of data. Data availability would very much depend on the cooperation of various agencies involved either at the regional or local level. The understanding and commitment from all staffs involved in the use of GIS data in all technical departments would speed up the process of acquiring and updating of GIS9 data.

Conclusion

A distinctive feature of the Negeri Sembilan GIS (GIS9) that was developed is that it is capable of operating on two distinct level of planning – the state and district level. GIS9 also provides updating facilities and interactive data display. It was developed as a planning support system to consider alternative spatial development strategies as well as visualise development potentials involved in land use planning. In addition, the monitoring system that has been developed for both the state and district levels make it possible to evaluate the success of plan implementation. GIS9 responds to the monitoring needs of development progress by allowing comparison of current and existing development with the proposed development plans. It provides easy access and query of data, which can mostly be done through the web and user interface especially developed to create standard data sharing procedures and transparency across government agencies. It is hoped that the implementation of GIS9 could be extended to benefit all technical departments government agencies of Negeri Sembilan toward the vision of a developed State by 2015.

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