GIS As New Tools And Approach In State Planning And Monitoring: The Experience of Negeri Sembilan, Malaysia

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Abstract

Malaysian planning methodology has changed over the years as emphasis has shifted from producing plan, which described a state of affairs expected of some future date, to one which acknowledged the continuous and cyclical nature of planning. Thus planning should be based on the identification of needs and goals, the formulation and evaluation of alternative courses of action and monitoring of adopted programmes. Using examples from current Geographical Information Systems (GIS) implementation projects, this paper will discuss GIS development and application for planning and monitoring of development in one of the Malaysian states, Negeri Sembilan. The development include a well-integrated and comprehensive database which is part of the important elements that could determine the ultimate success of GIS application in plan making. 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 levels of planning – the state and district level. It is used to assist decision-making, taking into account among other things, the current scenarios of the proposed development, physical constraint and future impacts. The monitoring system that has been developed for both the state and district levels make it possible to evaluate the success of plan implementation. While the adopted data sharing framework is seen as a strong basis for extension of GIS development as well as integration and coordination in all state and local agencies involved in ensuring the success of the implementation of state development plan. The implementation of GIS9 has also contributed to raising recognition of the importance of vertical integration of the developed and maintained datasets at regional and local levels. This paper will discuss the approach and overall strategies employed in the preparation of GIS9 database and development plans monitoring system for the Negeri Sembilan State.

Introduction

Monitoring the implementation of development plans are crucial to ensure that activities are in line with the implementation schedule and whether the resources or implementation procedures are used effectively. Monitoring procedures enable timely action to be taken to correct the deficiencies detected. While the planning and management process involves many stages of decision-making and expertise from various fields and hence necessitates for collaboration among the parties involved. In addition, public participation is essential as a means of improving information and to facilitate the adaptability of the planning system.

The State Goverment 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 implementation of projects (MAMPU, 2003). Realising the need for a more dynamic development planning management system at the state level, the State Government of Negeri Sembilan had decided to develop its own GIS-based planning support system to monitor the implementation of its development plans. 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 (Yaakup *et al.*, 2006).

State Level Planning Approach And GIS9 Data Sharing Framework

The State of Negeri Sembilan forms the southern part of the greater KL conurbation identified in the National Physical Plan as the main growth engine of the Malaysian economy. It is made up of 7 Districts with 8 Local Authorities.

The development of GIS components for Negeri Sembilan (GIS9) comprise the database and systems integration. GIS9 was developed primarily for execution of the functions of Town and Country Planning Department of Negeri Sembilan (JPBDNS). However, the overall planning, implementation, maintenance and management procedures require the involvement of stakeholders such as the technical departments and agencies at the state as well as local level. As each technical department or agency concerned applies rather different administrative and management procedures, GIS9 approach for state level development planning and monitoring took into account not only the needs and functions of JPBDNS but also all the stakeholders (Figure 1). This is to ensure that the developed geodata can be shared in attempt to strengthen the development planning management process at the state level. This is to ensure that the developed geodata can be shared in attempt to strengthen the development planning management process at the state level. Development of GIS9 was approached in three phases to ensure the success of its implementation and future sustainability especially in the aspects of hardware, software and human resources.

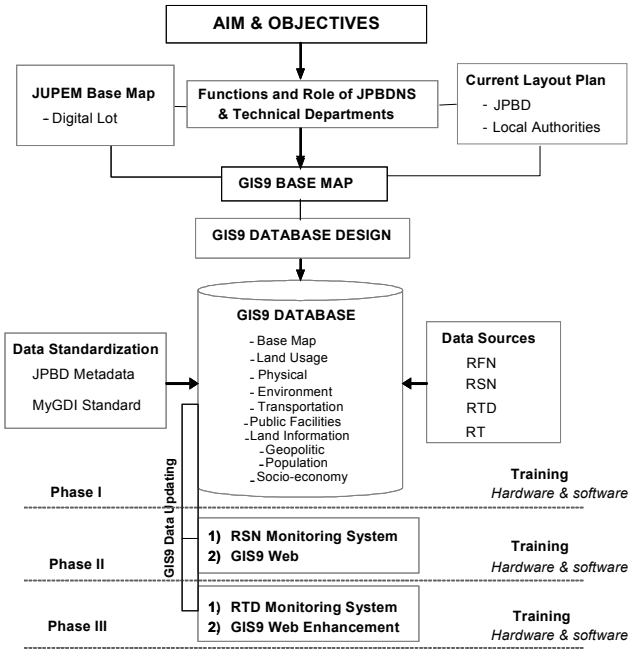

Figure 1: GIS9 Development Approach

GIS9 accommodates geospatial data for the whole state of Negeri Sembilan. The development of GIS9 database involved the routine process of data collection, manipulation, standardization, updating and storing. Due to the requirement of various stakeholders, the database was designed base on the geodatabase model approach and developed using data from various sources which was channeled through JPBDNS with the support of the other technical departments. The base for GIS9 data development was the lot cadastral map from Department of Survey and Mapping Malaysia (JUPEM), which was further enhanced with reference to the layout plans provided by JPBDNS. Other data providers include the local authorities which supplied data concerning the local plans and planning proposals, and various technical departments. The data from multiple sources was standardized base on the

GIS9 database format and structure, which was designed to conform to JPBD's metadata as well as MyGDI data standard (MS1760).

GIS9 Accessibility

GIS9 was developed primarily for executing the functions of the Department of Town and Country Planning of Negeri Sembilan (JPBDNS) but was meant to be extended to support the functions and requirements of all the state technical departments. These include the Land and Mining Department, Agriculture Department, Health Department, Department of Mineral and Geoscience, Police Department, Fire Department, Public Works Department, Waterworks Department, Drainage and Irrigation Department, Forestry Department and Department of Environment. The data sharing framework in GIS9 provides a more efficient, more effective, and less expensive method of sharing and coordinating information between stakeholders.

GIS9 provides alternatives for access of its data i.e via intranet as well as internet through the development of several user interface systems. These include the main systems, comprising the Development Plans Monitoring System (state and district level) and GIS9 Online as well as the supporting systems, comprising the Customised System for Database Access, Planning Proposals Registration System and Village Profile System. The GIS9 systems is equipped with several security features to prevent unnecessary exploitation and corruption of data.

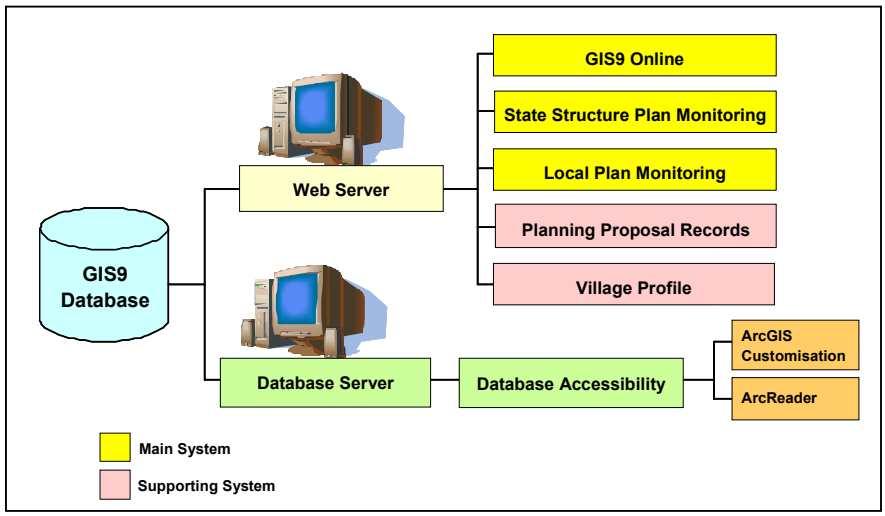

Figure 2 : Components of GIS9

The customised system for database access was initially developed to ease and make data accessible to all levels of user within JPBDNS base on the feature dataset components provided, through the local area network (LAN). The developed application serves as an executive information system for data display and organisation to facilitate users in manipulating data for analysis purposes and retrieving analysis results when needed for development monitoring, plans preparation as well as development control. As planning analysis is imperative and needs to be carried out from time to time, the user interface was designed to provide flexibility for user to retrieve and organise the data components based on specific analysis requirements, for instance, in identifying 'potential areas for development'.

The GIS9 web-based application or *GIS9 Online* (Figure 3) was designed to enable dissemination of information both via intranet and internet. It provides the JPBDNS's users with improved accessibility to the developed systems such as the Development Plans Monitoring System and the Planning Proposals System. The online planning applications prepared for JPBDNS include the modules of Monitoring; Technical Review; Analysis/Modelling; Planning Proposals; and Executive Information System (EIS). Access of information through the web would also enable smooth management and administration flow across government agencies. Generally, the modules developed include the main page, articles, stakeholders, login, activities and public's interactive maps. The main page provides brief information on GIS9 apart from access to the GIS9 database and applications for stakeholders and the public. GIS functions such as *zoom in, zoom out, pan, full extent* and *identify* were provided to assist user to retrieve the required information. The web application was developed and updated in stages based on the updating of information in the database.

Figure 3: Public's Interactive Maps Application

The web application has also contributed to better means of public participation. Public participation is essential as a means of improving information and to facilitate the adaptability of the planning system. In Malaysia, the preparation of the development plans called for participation as a value consensus mechanism, not only from the public at large but other agencies to allow data sharing and to ensure more informed decision.

Monitoring System for Development Plans' Implementation

The development plans monitoring system for Negeri Sembilan was designed base on the crucial need for assessment of the progress and effectiveness, as well as, review of development programs and policies. The monitoring framework had considered the issues of coordination, institutional responsibilities and linkages, indicators and timeframe to establish mechanism for measuring performance against targets.

The modules for development plans monitoring in GIS9 supports the State Town and Country Planning Department in controlling and monitoring development projects. The accomplishment of development targets is evaluated in terms of specific indicators and a particular time frame. The analysis will result in the form of the compliance as well as accomplishment matrix and the system allows for generation of report summary. The implementation is strongly supported by the GIS9 database which provides the planning information needed through continuous data gathering, updating and, storage. The system which was developed to operate at both the state and district levels make it possible to evaluate the success of plan implementation.

The State Structure Plan Monitoring Module provides means for assessing the accomplishment of the state structure plan. It translates gazetted structure plan policies into achievement and compliance units. The policies can be translated into qualitative and

quantitative form of measurement. The State Structure Plan (RSN) involves the general policies, subject policies and specific strategies. The accomplishment of RSN is measured through the assessment of changes in development scenarios based on evaluation of the outlined strategies such as by comparing to the key diagram.

The District Local Plan Monitoring Module emphasizes on the monitoring of physical planning which essentially involves the area size, 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. While the status of achievement is indicated in terms of the percentage and size of the developed area base on land use, as compared to its allocation in RTD. Thus, the progress of projects' implementation at the district level can also be constantly monitored (Figure 4) and development control can be carried out more systematically.

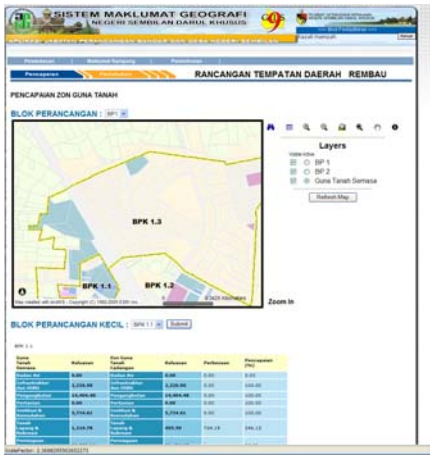

Figure 4: Checking on achievement of RTD implementation

Future Enhancement - Geoportal for Negeri Sembilan

The GIS portal or Geoportal is a solution proposed as one of the geodata infrastructure for Negeri Sembilan. The geoportal will play the role of a one-stop website enabling retrieval, transfer and use of geodata as well as mapping services, that could be operated and managed from any location via internet. The Geoportal for Negeri Sembilan is based on the concept of wide enterprise application. It will serve as a support tool for the state government to effectively plan, implement and monitor development plans.

The portal will benefit the whole state government's administration task force either at the federal, state, district or community level. It will encompass the *collaboration*, *searching*, *categorization* and *reporting* functions. The enterprise wide application concept applied will serve as a tool to support back office processes. Other advantages include in terms of resources sharing, enhanced ability and quality of decision making, providing information and basic analysis regarding particular issues and increased productivity and efficiency of the state government.

Discussion

It is particularly important to have an effective planning and decision-making process. This can be achieved through the availability of information that is valid, of good quality and handled with appropriate, effective and efficient method. Up-to-date and reliable information is apparently needed at all levels of planning and monitoring, from the national level right through the local authorities, to facilitate administrative procedures of policy planning and plan implementation. As such, database development and system implementation need to consider requirements for data integration and sharing between relevant agencies and

departments involved. In addition, the system must expand correspondingly if anything like effective understanding and control is to be achieved.

In the case of Negeri Sembilan, the comprehensive GIS macro and micro level database and planning applications developed for JPBDNS such as the Development Plans Monitoring System, Planning Proposals Registration System and Village Profile System would very much help to ensure that development at both the state and local level is well-controlled and complies with current policies and guidelines. While the web-based interface has provided enhanced system accessibility and better means for data dissemination, collaboration and public participation through the online public and stakeholder applications. In addition, the Geoportal for Negeri Sembilan will enable effective flow of data and information between the state and federal agencies such as MaCGDI through the use of a standard SDI. It will allow for agencies to share and retrieve data, make queries and generate digital report online.

However, for smooth and effective implementation of GIS, institutional arrangement is also imperative for directing implementation and monitoring proper and timely execution of development plans. To facilitate co-ordination of development efforts at various levels, respective development committees at various levels were proposed. Apart from system development and maintenance, preparation of the human resources is also crucial. As such, programmes were outlined for users to acquire the appropriate knowledge and skills. These include series of workshops and trainings to ensure smooth technology transfer to users apart from receive feedbacks to further enhance the GIS9 components wherever appropriate for effective system implementation.

All in all, acquiring and updating of data tends to be the biggest challenge in the implementation of a planning support system such as GIS9 as it influences the accuracy of data. Data availability would very much depend on the cooperation from all stakeholders involved either at the state, regional or local level. In addition, the understanding and commitment from all staffs involved would help speed up the process of acquiring, updating and use of data. The training modules prepared also serve as a supporting factor to GIS9 capacity building which essentially cover aspects of competency, infrastructure, procedures and resources crucial for overall implementation.

Conclusion

In planning, obtaining relevant information is crucial for the purpose of decision-making and good information would certainly lead to better decision. However, relevant information is usually unavailable due to factors such as lack of effectiveness in information sharing and communication between stakeholders and inadequate institutional support for communication among stakeholders as well as lack of effective means for public participation, and thus do not allow for effective spatial planning. An information system is part of the mechanism for reducing uncertainty in the knowledge and understanding of the environment and can contribute to a much clearer understanding of real planning problems as well as prescriptive planning scenarios to enhance the quality of planning. Thus, the information system developed should be able to provide solutions to those issues and support the procedures of planning and monitoring as well as decision making.

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