Integrated land use planning information system (I-Plan) applications in urban planning and management

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Abstract. As the custodian of land use data, PLANMalaysia in 2015 developed a system called the Integrated Land Use Planning Information System (I-Plan) to improve the quality of service delivery by facilitating on-line access of land use information in Peninsular Malaysia. The system was developed using open source software and its implementation involves collaboration between the federal, state and local authorities. I-Plan facilitates the management, storing and updating of land use data through an integrated land use database and on-line smart sharing. With I-Plan, an integrated database system has made possible for land use data collection and updating activities to be standardised and help to produce more accurate and reliable land use data. It also facilitates data sharing between agencies in which all land use data is stored and made available in I-Plan. The introduction of I-Plan provides tremendous benefits not only to PLANMalaysia but also to the government, private sectors and the public. Land use information is updated by I-Plan on a regular basis hence contributes to more up-to-date land use information. I-Plan also helps to reduce cost and save time on geospatial data development planning as it avoids duplication of work previously done by various parties. More importantly, I-Plan helps to facilitate decision-making and also to monitor physical development and land use changes in the country.

1. Introduction

PLANMalaysia (Department of Town and Country Planning) is a federal government department under the purview of the Ministry of Urban Wellbeing, Housing and Local Government, Malaysia. PLANMalaysia was established under the Town and Country Planning Act 1976 (Act 172) to regulate development, use and conservation of land and also to formulate planning policies and guidelines. The Department’s main functions among others are to advise the Federal Government on all matters related to the use and development of land; to encourage comprehensive, effective and efficient planning laws, methodology, research, standards, procedures and planning rules; and to assist state governments, local authorities and government agencies in preparing development plans (structure plans, local plans and special area plans). Under Act 172, PLANMalaysia only operates in Peninsular Malaysia whereas Sabah and Sarawak are governed under separate planning laws. Being the central agency responsible for town and country planning, PLANMalaysia is the custodian of land use data in the country. Land use data comprises of current, committed and zoning land use. The Department publishes national Land Use Report every two (2) years as a reference by all interested parties including government agencies, private sectors and members of the public.

2. GIS and the Development of I-Plan in PLANMalaysia

The use of GIS started in PLANMalaysia in early 1990s to facilitate preparation of development plans. One of the important components of development plans preparation is land use data. The use of GIS has helped spatial information including land use data to be created, stored, manipulated,
analysed and mapped for development plan proposals. The use of GIS has also tremendously helped to improve land use data management. As such, GIS has been recognized by the Department not only as an important tool in plan making but also in data management. All Project Offices under the Development Plan Division in PLANMalaysia have been equipped with workstations and GIS software for this purpose. Land use data collection and updating are done by Project Offices with the help from states and local authorities. Local authorities, being the main source of land use data will verify the land use data and the verified data will become a guide for future land use proposals or zoning. However, some states and local authorities have also undertaken their own land use data collection and updating in different format and approaches from the Project Offices. In addition, they have also developed their own land use database. This has given rise to the issue of non-standardisation in land use data collection and updating activities and thus inconsistency in land use information. Thus, PLANMalaysia in 2015 developed the Integrated Land Use Planning Information System or simply known as the I-Plan in order to overcome these issues. In addition, with the increase in data volume and size every year there is a need for a system that could handle and store bigger data size.

3. I-Plan Development Phases

The National Land Use Information Division under PLANMalaysia was entrusted to develop the I-Plan that would also enable access to land use information on-line. I-Plan development was undertaken in 3 phases from 2013 until 2015 involving a cost of RM4.15 million. It started with a series of meetings and consultations involving various stakeholders at the federal, state and local authority levels. I-Plan was officially launched by the then Minister of Urban Wellbeing, Housing and Local Government, Malaysia on 3rd November 2015 in conjunction with the World Town Planning Day 2015. The system requires a minimum bandwidth of 5MBps in order for users to access land use information on-line.

I-Plan contains geo-database and web-based applications that show integrated land use planning information covering current, committed and zoning land use. I-Plan facilitates the management, storing and updating of land use data through an integrated land use database and on-line smart sharing. In the past as described above, various agencies collected their own land use data and developed their own land use database. With I-Plan, an integrated database system has made possible for land use data collection and updating activities to be standardised and help to produce more accurate and reliable land use data. It also facilitates data sharing between agencies in which all land use data is stored and made available in I-Plan. In short, the system provides a comprehensive database platform to enable collection, monitoring, verification, integration and sharing of data between agencies on-line.

Through I-Plan, it serves as a platform for PLANMalaysia to achieve its vision as a National Land Use Information Centre responsible for coordinating land use data throughout the country for urban and rural planning. It also supports the United Nations’ 2016 New Urban Agenda (NUA) with regards to geospatial information system; to improve long-term integrated urban and territorial planning and design, land administration and management. One unique aspect of I-Plan is that the system was developed using open source technology as an alternative to licensed software and this has helped to minimize the system development cost.
### Figure 1: I-Plan Development Phases, 2013-2015

| Phase 1 (2013) | Phase 2 (2014) | Phase 3 (2015) |
|---------------|---------------|---------------|
| 1. Inception Report | 1. Database Development for 5 States | 1. Database Development for 6 States |
| 2. User Requirement Study and Information Architecture (IA) Reports | - Perlis | - Johor |
| 3. LDM Template and RDMS Database | - Kedah | - Negeri Sembilan |
| 4. Hardware and Software Delivery to PLANMalaysia and PLANMalaysia@States | - Pulau Pinang | - Terengganu |
| 5. Training | - Kelantan | - Pahang |
| | - Selangor | - Melaka |
| | 2. I-Plan Application Development | 2. I-Plan Application Development |
| | - Main Page | - Interactive Mapping Module |
| | - Verification Module | - System Integration Module |
| | - Data Management Module | - Repository Module |
| | - Administration Module | - Online User Module |
| | - Login and Logout Module | |
| | 3. Installation and Configuration of Hardware and Software | 3. Configuration of Hardware and Software |
| | 4. Training | 4. Training |

### 4. I-Plan Implementation Phases

I-Plan implementation phases started in 2016 until 2020 throughout the 11th Malaysia Plan period involving a cost of RM3.14 million. The implementation phases are critical in determining the success of I-Plan. The first two (2) years of implementation phases ie. 2016 and 2017 main concern were to ensure that all the technical departments involved were adequately equipped with hardware (servers and workstation pcs) to undertake data updating activities. Some upgrading of the applications were also undertaken in 2017 in which additional sub-modules ie. Planning Permission and Land Use Analysis were incorporated. The third year focus in 2018 is to evaluate I-Plan implementation during its first two (2) years of operation. This will involve surveys on all stakeholders, technical departments and also the public. The remaining two (2) years ie. 2019 and 2020 will involve additional application modules to I-Plan.
Figure 2: I-Plan Implementation Phases, 2016-2020

| 2016                     | 2017                      | 2018                              | 2019                                      | 2020                                      |
|--------------------------|---------------------------|-----------------------------------|-------------------------------------------|-------------------------------------------|
| Additional Hardware      | Additional Hardware       | Impact Study                      | Additional Application Modules            | Additional Application Modules            |
| • 4 Servers–Project Offices | • 3 Servers              | Evaluation of I-Plan Implementation Effectiveness | Horizontal Linkages (Export & Import) Programmes | Advanced Geo Spatial Modelling Module     |
| • 23 Workstation PCs     | • 93 Workstation PCs     |                                   |                                           |                                           |
|                          | • 5 Laptops               |                                   |                                           |                                           |
|                          | • Applications Upgrading  |                                   |                                           |                                           |

5. I-Plan Applications in Urban Planning and Management

Land use data is very important in order to regulate development and use of land and natural resources in the country. Land use data helps urban planners to understand the current situation and future scenario of development in the country and how best to regulate, but at the same time not hindering development.

I-Plan has been acknowledged as an important system that helps in urban planning and management. More agencies and the public have referred to I-Plan as a source of land use planning information in their daily work. Through the system, land use data is updated twice a year; between January and June, and between July and December involving 11 states, 2 federal territories and 99 local authorities in Peninsular Malaysia. The periodical land use data updating involves joint efforts between PLANMalaysia at the federal and states and also local authorities and technical agencies. Land use data verifications are undertaken before the final data is uploaded to the system to ensure that quality, accurate, up-to-date, complete and integrated data is made available to the public.

Anyone as a non-registered user can access land use information through the system but can only view current and zoning land use. Interactive, responsive and user-friendly are the unique features of I-Plan and users’ experience is further enhanced by the display of statistical information, maps, charts and graphs. However, all stakeholders concerned including technical departments which are involved in land use data collection and updating are granted registered users and they have full access to the land use data in the system including committed land use.

The introduction of I-Plan provides tremendous benefits not only to PLANMalaysia but also to government and private agencies as well as public users. For instance, users do not have to physically visit PLANMalaysia to get information on land use since I-Plan is a web-based database and applications which allows users to view and access land use information on-line.
As of 1 March 2018, 117,348 visitors have visited the I-Plan website. The number of land use data requests have also increased every year. I-Plan received about 200 requests from 2015 to 2017. Land use data requests come various government agencies, private companies, universities and the public. Data requests involving government agencies are provided free of charge while others will have to pay according to the data size as fixed by the Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) guidelines.

### 5.1 Land Use Data Management, Integration and Repository

I-Plan has enabled land use data management in a more integrated manner. All land use data is stored in the system and can be retrieved at any time. Land use data from various sources at the federal, state and local authorities are integrated in the system through an integrated land use database system. I-Plan has also increased productivity in land use data management system. In the past, land use data collection for preparation of development plans required at least a month on average to complete. With I-Plan, it has managed to save the time required by providing land use information through the system thus has also reduced the use of workers for field work. In the past, a development plan study easily required at least 5 workers in field work to do site visits for land use data collection. Moreover, vendor cost is saved since land use data verification activities are done in house and has saved about RM2.4 million annually.

I-Plan also allows integration with other systems which can be made through the web map service (wms). Thus, data sharing with other agencies and ministries are now made easier with the system. Another feature of I-Plan is the repository function which allows for data related to urban planning to be stored in the system. This helps especially divisions or sections within PLANMalaysia to request for related data for their projects undertaking.
5.2 Plan Making and Decision-Making Process

Land use data from I-Plan has been used to carry out physical planning and project feasibility studies at various levels including the federal, state and local authorities. Apart from development plan preparation in which land use data is used to help local authorities to identify the needs and requirements of the local area, land use data from I-Plan has also been used by authorities involved in highway and rail planning. Among the recent major data requests came from the Mass Rapid Transit Corporation and East Coast Rail Line Project which required land use data for the purpose of their projects.

The recently added sub module on Planning Permission assists local authorities in performing their function in development control; in terms of making decisions in approving a proposed development within their administrative areas. In addition, I-Plan is capable of providing feedback on land use information quickly, especially to policy makers in line with the role of PLANMalaysia as an advisor to the federal, state and local authorities on all matters pertaining to the use and development of land.

5.3 Monitoring of Land Use Changes

Land use changes are important determinant in land use planning. With I-Plan, it has helped PLANMalaysia and all parties concerned to observe and monitor land use changes. The system easily generates statistical information, maps and charts of all thirteen (13) categories of land use for analytical purposes; year to year basis. The Department publishes national Land Use Report every two (2) years. With the introduction of I-Plan in 2015, anyone since then can have access to land use information on-line including land use statistics. The recently added sub module on Land Use Analysis allows for analysis to be done on land use trends.

5.4 Collaboration with Agencies

The development of I-Plan has increased collaborative efforts between PLANMalaysia and other technical agencies and ministries. For instance, PLANMalaysia and the Department of Survey and Mapping (JUPEM) signed a MOU in 2017 to further enhance collaboration between the two departments. This is due to the fact that the I-Plan system is heavily dependent on JUPEM for their cadastral lots (NDCDB lots) which are used as the base plan. In turn, land use data updating activities have helped JUPEM to update their NDCDB lots.

PLANMalaysia has also collaborated with agencies such as Malaysian Centre for Geospatial Data Infrastructure (MaCGDI) to develop the 1Malaysia Map (a Malaysia Map as an alternative to Google Map) and the Ministry of Urban Wellbeing, Housing and Local Government, Malaysia to develop the iKepoh (a system to lodge complaints to local authorities) and the TEDUH (a system to display public housing projects). All these collaborations have enriched land use data in I-Plan and more collaborations are expected with agency partners in the future.
In summary, the I-Plan applications and their benefits in urban planning and management can be listed as follows:

- Improve the effectiveness of the delivery system of land use information to the public through the use of advanced information technology and GIS;
- Speed up and simplify the process of updating land use data;
- Provide land use database that supplies the latest information (up-to-date) in line with changes in land use thus create more up-to-date land use information;
- Promote the use of ICT for data sharing purposes with various agencies in order to tackle the problem of data and work duplication between departments and agencies which also contribute to cost reduction and time saving on geospatial data development planning; and
- Facilitate the monitoring of changes in land use thus help to monitor and control land use activities more effectively and also to facilitate decision-making.

6. Conclusion

There is still potential for expansion of the I-Plan to meet future needs in urban and rural planning. With its readily available land use data, I-Plan could be a powerful system to assist in planning at micro or city level. Building Information Modelling (BIM) or 3D GIS for instance could be incorporated into the system to enable decision makers to visualise proposed development of an area including building height, orientation, massing etc within the context of surrounding development and thus to make informed decision on what could be the best urban design for the area.

Without doubt, I-Plan has played an important role in urban planning and management in Peninsular Malaysia and contributed to its factor in winning the National Geospatial Award in 2016. I-Plan has helped urban planners, agencies and the public to get land use planning information on-line. The integrated database system has made possible for land use data collection and updating activities to be standardised and help to produce more accurate and reliable land use data. The system also enables agencies to share information on-line for the benefits of all parties concerned. In short, I-Plan is a very useful integrated land use planning information system that serves as a guide for what best to plan for development in the country.

References

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[2] United Nations 2016 *New Urban Agenda*

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