

Leveraging Geospatial Technology in Asset Management

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ABSTRACT

Indah Water Konsortium Sdn Bhd (IWK), a national sewerage company wholly-owned by the Malaysian Government, is responsible for providing sewerage services in most of Peninsular Malaysia, operating and maintaining 10,242 sewage treatment plants (STP including communal septic tanks) and 15,639 km of sewer networks. IWK's operational coverage includes most parts of Peninsular Malaysia, providing sewerage services to nearly 20 million people. The operational assets managed by IWK are estimated to have a replacement value of about RM20 billion. It is therefore essential for IWK to have effective and systematic asset management to economically and efficiently manage the physical assets and deliver quality services to satisfy the stakeholders on a sustainable basis.

IWK has adopted publicly available British Standard Specification PAS55:2008 as a basis of asset management development. This standard is an internationally accepted reference standard for optimal management of physical asset that provides the definition of good practice in the whole life cost management of assets.

In line with this, IWK has implemented asset profiling in order to identify the critical assets for asset risk management. Asset profiling is a process of examining and auditing the assets performed through two indicators, namely static and dynamic criticality profiling. In order to visualize and analyze the asset criticality in spatial environment, the critical assets were mapped and geocoded in GIS. This is particularly useful for the sewer network assets, where the geographical location of critical assets can assist to establish appropriate strategies.

By using GIS, users are able to perform multi-criteria analysis on critical assets and thematic outputs can be created. Spatial querying and visualization can be performed by manipulating criteria of static criticality profiling. Besides, various GIS based outputs can also be made such as repeat location and hotspot incident modeling for visualizing the dynamic criticality assets based on complaints and compliance for better decision making and asset strategic planning.

This paper presents a brief outline of the usage of Geospatial Technology in IWK in mapping assets, their criticality and other relevant data, analysis using thematic and

modeling, in order to facilitate informed and data based decision making for effective asset management.

INTRODUCTION

As a national sewerage company, Indah Water Konsortium Sdn Bhd (IWK) is responsible for providing sewerage services in most parts of Peninsular Malaysia, operating and maintaining over 10,000 sewage treatment plants including communal septic tanks and 15,000 km of sewer networks. IWK's operational area covers most of Peninsular Malaysia and Labuan and providing sewerage services nearly 20 million people. The operational assets managed by IWK are estimated to have a replacement value of about RM20 billion. Table 1 shows the statistic of IWK physical asset.

Table 1: Statistic of IWK Asset

Asset	Total (NOS)
STP	5768
Sewer Pipeline Length	15639 km
Manhole	263302
Pump Station	842
CST	3632
PE	19531018

(Source: Data from AMIS as per Jan 2012)

IWK nature of business is totally asset based oriented. The information of the asset like asset data, condition, location and criticality is very crucial for operational and planning purpose. It is therefore essential for IWK to have an effective and systematic asset management to economically and efficiently manage the physical assets and deliver quality services to satisfy the stakeholders on a sustainable basis.

Geospatial technology has played a significant role in asset management development in IWK in order to provide a comprehensive asset mapping to support IWK business in terms of operation and planning. The implementation of IGIS in 2009 had been a catalyst of the development of geospatial technology not only to provide geospatial information but to leverage its tools and capability in total asset management development in IWK.

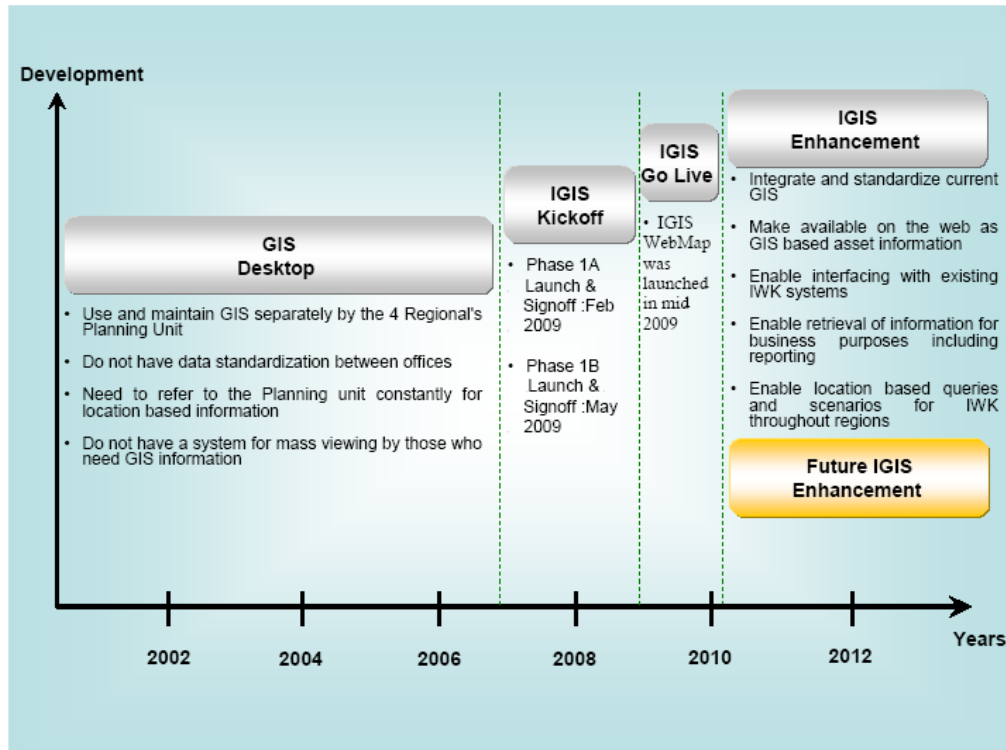


Figure 1: Development of Geospatial Technology in IWK

ASSET MANAGEMENT PRACTICE

Asset Management is a systematic process of providing, maintaining, upgrading, and operating physical assets cost-effectively. It combines engineering principles with sound business practices and economic theory to provide tools to facilitate a more organized and logical approach to decision making. Thus, asset management provides a framework for handling both short term and long term planning. An integrated approach towards asset planning and management will enhance IWK to deliver quality asset based services efficiently and effectively.

IWK has adopted and implemented the publicly available British Standard Specification PAS55:2008 as a basis of asset management development. This standard is an internationally accepted reference standard for optimal management of physical asset that defines good practice in the whole life cost management of assets. Figure 2 shows the Asset Management System Structure being adopted within IWK.

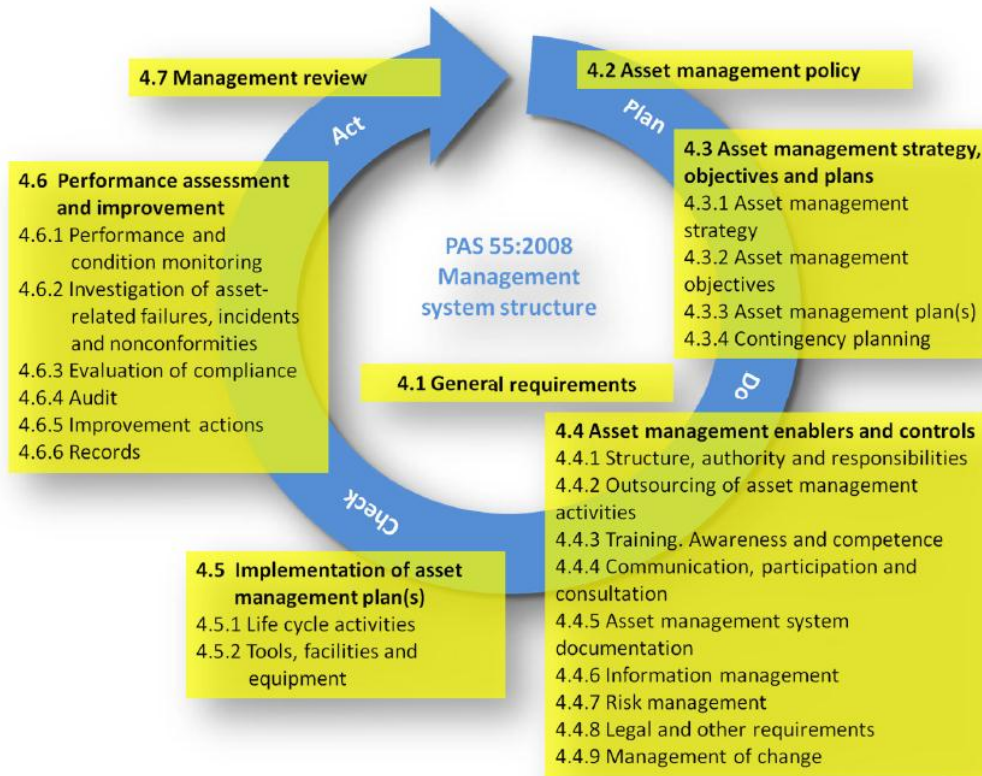


Figure 2: PAS 55:2008 Management System Structure
(Source: Asset Management Documentation Report)

In Asset Management Enabler and Control System Structure, the need of efficient information system of assets need is very crucial. Therefore, IWK have several asset management systems to handle the assets in term of financial, operation, registration and information of the assets such as;

1. AMIS (Asset Management Information System)
2. IFS (Industry Financial System)
3. IGIS (Integrated Geographical Information System)
4. COEDS (Customer Operational Enquiry & Desludging System)
5. LMS (Laboratory Management System)
6. BRAINS (Billing Record and Information Systems)

All these systems provide information of the particular assets for user to understand about the condition and information as well as related information with attached to the asset. Thus, using the integrated data and information enable user to undertake and plan appropriate strategy for particular assets.

GEOSPATIAL TECHNOLOGY APPLICATION IN ASSET MANAGEMENT

IGIS (Integrated Geographical Information System) was successfully embarked in 2009 enterprise GIS integration with existing information system in IWK for one stop centre geospatial information. Since then, it has been largely used by IWK from various departments for obtaining geospatial information related to the assets. Figure 3 shows the IGIS System Solution Architecture.

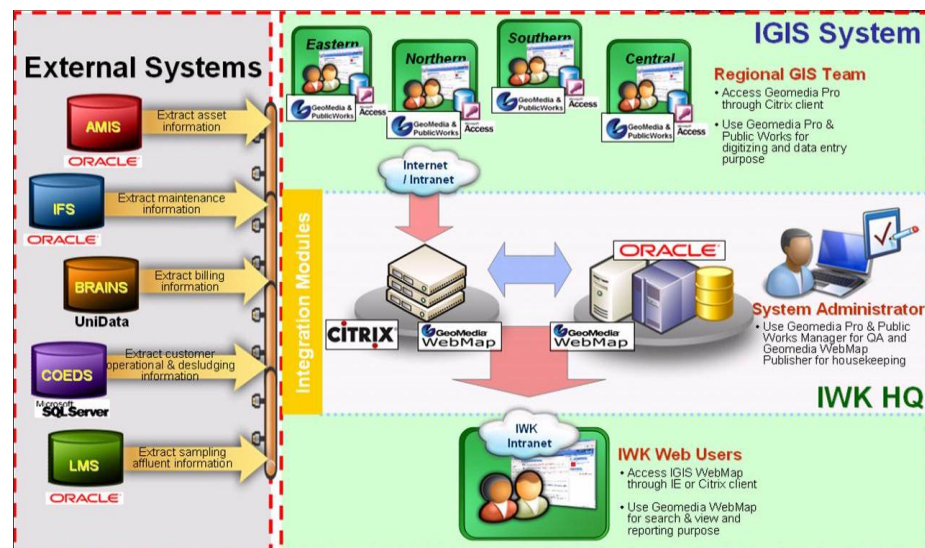


Figure 3: IGIS System Solution

IGIS consists of two components which are IGIS Desktop and IGIS Web Map. IGIS Desktop is used by GIS teams for their day to day work like asset registration, data entry, data editing, data manipulation, spatial query and GIS output creation. Meanwhile, IGIS Web Map is a web based GIS for IWK users to view and obtain asset information in geographical environment as well as the information attached to particular asset derived from other systems. The IGIS Web Map Screenshots are shown in Figure 4.

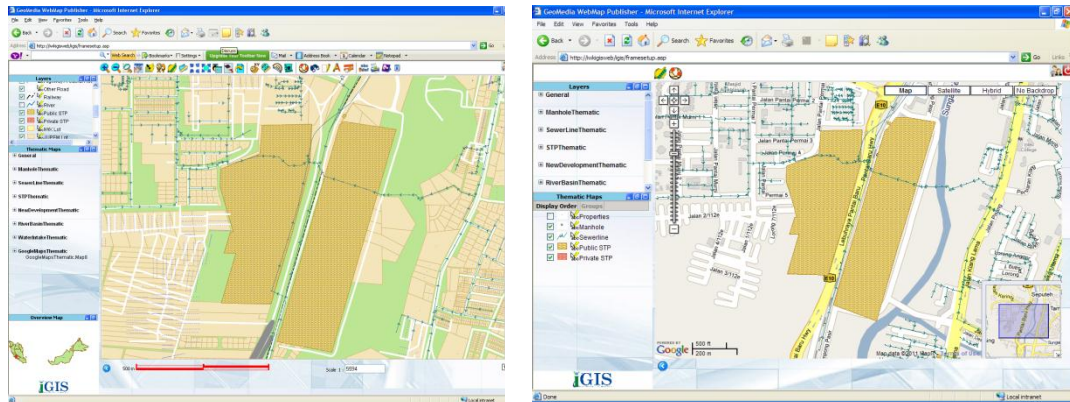


Figure 4: IGIS Web Map Screenshots

ASSET CRITICALITY

IWK has implemented asset profiling in order to identify the critical assets for asset risk management. Asset profiling is the process of examining and auditing the assets like sewage treatment plant and sewer pipeline as well as collecting valuable and accurate information and documents regarding the selected assets. The purpose of asset profiling is to gather all relevant information, identify missing or unreliable information, examine the asset current condition and analyze all data and information obtained as well as understanding the asset in order to provide a proper asset management plant. Asset profiling was performed through two indicators, namely static criticality and dynamic criticality.

Static Criticality

The static criticality exercise aimed at analyzing all aspects of the asset in relation to parameters which will not change over time such as age, material, asset location, location, slope issues etc. These factors should be considered when taking into account the potential risks associated to the asset. In order to visualize and analyze the asset criticality in spatial environment, the critical assets have been mapped and geocoded in GIS. This is particularly useful for the sewer network assets where the geographical location of critical assets will help determine appropriate strategies. The static criticality of sewer networks are presented in various thematic maps according to criteria such as age, material, road crossing, slope condition and many more. Besides, multi criteria analysis also can be performed to visualize the level of asset criticality. Figure 5 and 6 show the thematic map produced and multi-criteria analysis using Geomedia Desktop.

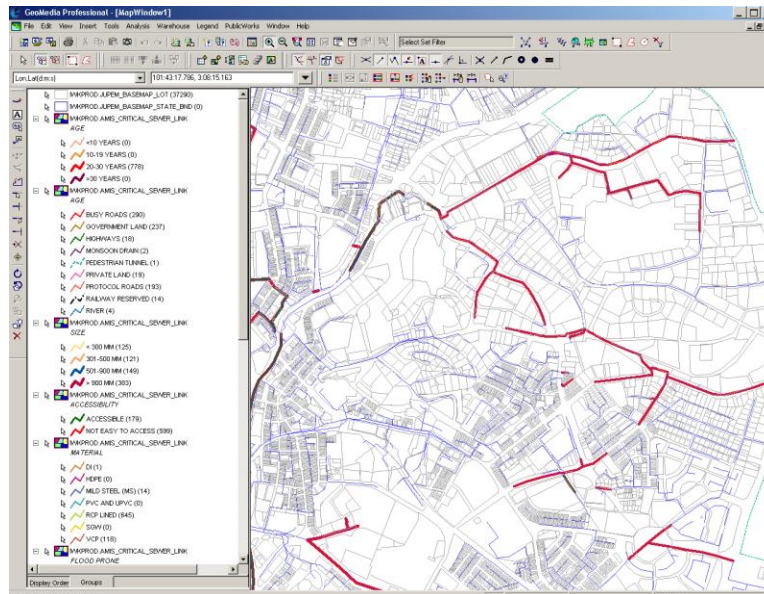


Figure 5: Thematic Map of Static Criticality Sewer

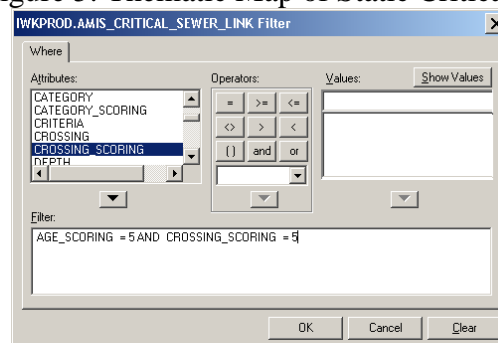


Figure 6: Attributes Query for Multi Criteria Analysis

Dynamic Criticality

Dynamic criticality profiling involves analysis of complaints received relating to the assets. The types of complaints analyzed are odor, noise, overflow/flooding, sewer blockage, sewer collapse and overflow. The objective of this exercise is to identify assets which are problematic in terms of compliance, investigate root causes of problem, identify the most suitable solution and estimate the cost in order to resolve the problem. Sewer pipelines with complaints due to incidence like overflow, blockage and collapse are mapped in GIS. Repeat location output and hotspot of problematic sewer pipeline can be produced in order to give collective understanding of the problematic sewers to user and plan for appropriate preventive strategy and asset management plan accordingly. Examples of dynamic criticality of sewers are shown in Figure 7.

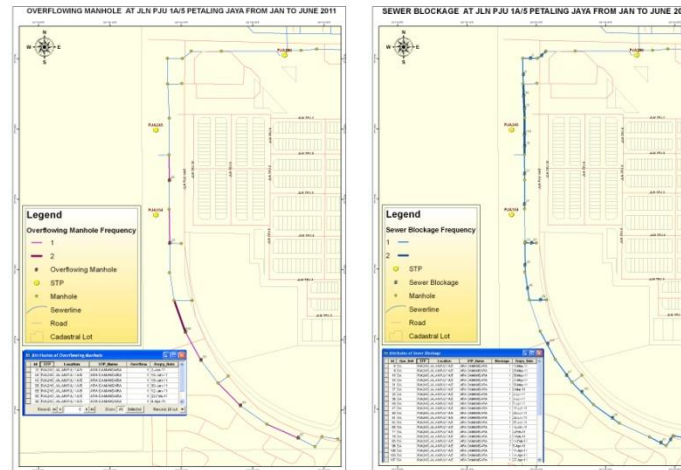


Figure 7: Sewer Blockage and Overflow at Jalan PJU 14/5 Petaling Jaya

FUTURE DIRECTION

The application of geospatial technology is expanded to the Mobile GIS Workforce which to be used by IWK operation team for work order management. The operational team will able to receive and close work order as well as do red lining and asset updating and mapping at the site using the mobile device. With application of this technology, paper works can be reduced and faster and better decision making can be made based on real time data and historical data of assets.

CONCLUSION

The geospatial technology capability has been largely utilized in IWK asset management. The implementation of IGIS as a one stop centre of geospatial data and information and its capability has been leveraged in asset management development reflect the importance of geospatial technology in IWK business today and beyond.

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