GIS for Utility Asset Management

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Abstract:
Efficient integration of utility asset data with geographical information system is the key to successful water supply and sewerage system. Location is the most important information in water supply and sewerage network. With GIS integration we can better visualize our data and can keep check on the performance of utility data. In proficient asset management system can result to poor strategic polices and week long term planning. GIS (Geographical Information System) helps water and sanitation authorities to overcome the challenges of data integration and management for effective decision making.

This paper describes the approach to develop the GIS based asset management system through spatial and non-spatial data integration, field verification and final analysis results. GIS based asset management system is the combination of data, processes, software, field verification and final analyzed output such as risk level identification, cost analysis, condition assessment, renewal time required. The final data output in case of analysis maps is shared with all the asset management authorities and policy making departments. This exercise is done initially in twenty seven water supply and sewerage sub-divisions of Lahore and then in other major cities of Punjab.

The process of schematic mapping and data conversion using paper records, CAD maps, focal person information entered in GIS based asset management system will ensure the accurate and sufficient information and data for effective management.

Key Words: *GIS (Geographical Information System), asset management, data integration, schematic mapping.*

Introduction

Water and Sanitation utilities cost effective maintenance is one of the major concerns of responsible administrative authorities. All utilities consist of assets and assets are needed to be sustained rather than replacing them again and again to provide people with quality service. Better asset management is necessary otherwise it leads to incomplete, inaccurate and unreliable asset records. With the use of effective asset management, it is possible to reduce overall infrastructure costs instead of waiting until the assets fail incurring higher than necessary costs (Shamsi, 2005).

Spatial location of assets in utility management system is need of the time to better understand the geographical context of an asset. With the use of GIS positions of utilities assets cab be exactly located and visualized with the help of maps. GIS is an effective and powerful tool for water supply distribution and sewerage system. Raster and vector-based data can be used within a GIS framework to produce maps indicating areas of potential hazard to water quality (Foster, J. A., & McDonald, A. T, 2000)

This paper describes the approach to develop a GIS based asset management system for Lahore City Area water supply and sewerage network by integrating spatial and non-spatial data. Lahore is one of the major cities of Pakistan and capital of Punjab province with a population of 5.143 million. In Lahore WASA (Water and Sanitation Agency) is responsible for providing water supply and sewerage services. Most of the population

has access to water and sanitation facilities. The water demand change with the season change (Barber, at al, 1996). However, still many challenges exist and plenty of improvements are required to achieve successful asset management.

Performance of asset management system can be improved by integrating with GIS by supporting spatial analysis and locating spatially dispersed facilities in water and sanitation system. Developments in GIS technology offer new options to realize fast and cost effective management of water supply and sewerage infrastructure. Large amounts of spatially related data can be analyzed effectively by using GIS technology. Cost of operation and maintenance for water and sanitation utilities can be controlled by developing asset management system. An effective asset management system must include an effective maintenance management system which is focused on reducing the maintenance cost while extending the useful life of the asset (Shamsi, 2005).

Decision making regarding infrastructure maintenance requires large amounts of diverse information like what assets are to be installed, when to replace them and when to carry out maintenance work on a continuing basis. Information from different resources can be integrated into one manageable system by using GIS which enables better and informed decision making.

In this study an inventory of utilities assets is created by using paper records, maps and staff knowledge of WASA Lahore and through field verification. An asset management program will enable a community to have a record as to the capital assets of a community (Tallman,2005). Inventory of water supply infrastructure includes water distribution pipelines, tube wells, valves, water filtration plants and overhead reservoirs while sanitation infrastructure consists of sewerage pipes, manholes, disposal stations, waste water treatment plants and lift stations. GIS was used for visualization and spatial analysis in decisive steps (Wienand at all,2009). Spatial and attribute information of above mentioned assets is maintained by creating spatial database. Current status of assets and level of service provided is investigated and evaluated by performing spatial analysis. All assets are classified based on their condition, useful life, risk level and maintenance cost.

Objectives:

The Objective of the GIS Based Utility asset management system

- To develop a brief descriptive system for resource planning.
- Periodically assessment for changes in current system.
- Plan for phase extension for service delivery.
- Map the condition risk assessment and other requirement to improve the service delivery.
- Report the compliance to WASA and all stake holders.

Methodology

Lahore is a metropolitan city. It has 28 subdivisions and in each division has a complete water and sewerage system. The Millennium Development Goals aimed at halving the share of people without sustainable access to an improved water source and improved sanitation by 2015 compared to 1990.Service provision is the responsibility of the government.in the largest cities of the Pakistan there are Semi-autonomous utilities called water and sanitation Agencies (WASA's). These WASA are the wings of City Development authorities. A number of innovative sanitation approaches have been piloted in Pakistan. These include participatory sanitation infrastructure projects. This asset management system is develop for improve the poor sanitation condition this exercise is replicated by ADB and WASA in the other cities of Punjab. This is a component sharing model for policy making.

The First Step in developing the utility asset management system is an assessment of all current infrastructures. This process is completed by WASA and with the support of urban unit through the developing of asset management system. This developing system carry out the mapping network for all Sub divisions both of water supply and sewerage Systematic process for capital investment planning was built around a comprehensive asset information base of WASA Assets that helps to determine the categorization of assets as per

Systematic process	Expansion.
	Their Level Of Service.
	Replacement .
	Need For Renewal
	Even Retirement Of The Current Inventory Linked With GIS.

The current level of service and conditions of asset in WASAs provides the platform for determining future investment spending

The phased extension of services was carried out as a two-step approach. This is an ongoing Process

I.   Planning of existing assets and their replacement in the service delivery areas.
II.   Planning of new assets in the un-served areas.

It is important that the areas in the un-served areas are identified so that trunk or major infrastructure can also be planned.in Fig Shows the major purpose full indicators of utility mapping (Fig:1).
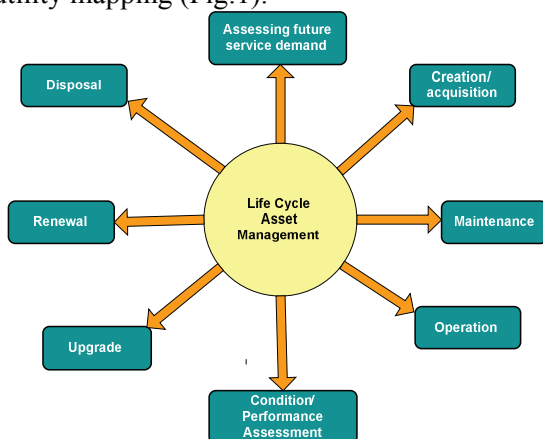

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Fig: 1

Drinking water and sanitation is the responsibility of the provisional government. Municipal utilities are accountable to both provisional and local government. To overcome the little regulation and performance a number of analysis performed for the assessment.

The defined parameter categorize with the availability of the service, quality, condition, risk assessment, remaining useful life required replacement year for the reduce cost and minimize risk. . The condition for the planned asset and unplanned asset are different. Expenses on the maintenance are consider as operational cost of the asset.
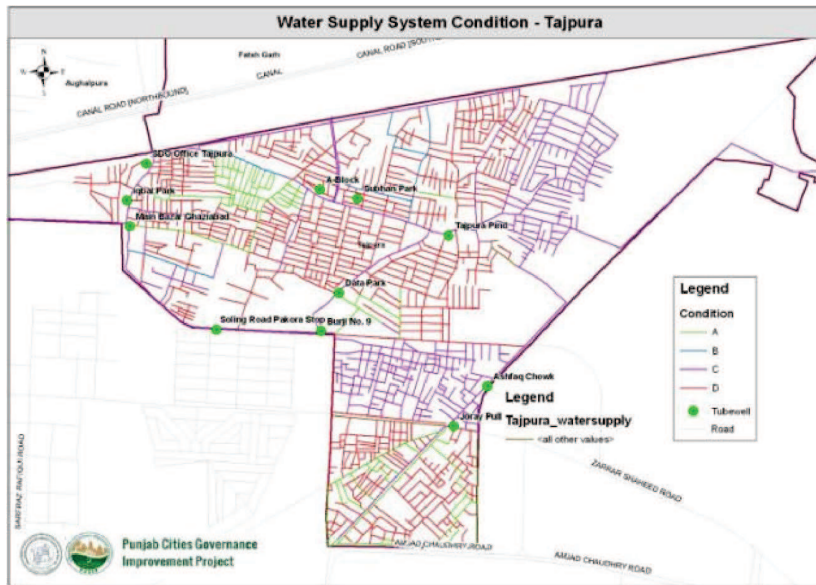
Fig: 2

Suppose we have a parameter of condition for the water supply condition. Fig.2 shows the detail mapping of condition. The symbol a show the excellent condition and no need to replacement, no risk and no action required for these asset, condition B means to a good some improvement required. C is the satisfactory condition; it required some corrective action and last is D which required urgent replacement higher at risk and condition is poor.so the thought this way map the asset utility of the water and sewerage network and analysis the other parameter for policy making and future planning.

Results and Discussion:

WASA Lahore is committed to ensuring that the health and safety of our people, contractors or anyone who enters our work areas is not compromised by our activities. We will continue to work towards zero injuries. This Asset Management system will ensure the health safety accountabilities and provide the appropriate information and education about the water and sewerage system. This will ensure the health and safety and acting to improve performance.

Water Supply and sewerage system in Pakistan is one of many challenges. High Population growth has increased the water user. Poor water supply service and sanitation lead out break water disease like dengue and hepatitis c and each year millions Pakistani faces these diseases. In the other hand many of the service providers do not cover the cost of operation and maintenance due to the poor efficiency. Consequently, the service providers strongly depend on government subsidies and external funding. In Lahore the 17 hours of continuous supply of water. In our system map the existing situation of water supply network and sewerage system and aligned with a city boundary. The second parameter is risk. Risk show the which line is urgently required replacement or some seriously decision required for this and phase map show which asset have preferable replacement required at first 5 years and next 5 years and so on. Periodically systemized data help to make a long term management for both of the public assets.

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