ESP Journal of Engineering & Technology Advancements (ESP-JETA)
ISSN: 2583-2646
Special Issue: International Conference on Modern Engineering and Future Technologies (ICMEFT-26)

Original Article

Asset Mapping For Water Pipe Line, Storm Water Network and Underground Sewerage System For Rajapalayam Town

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Abstract: *Rapid urbanization has increased the demand for efficient management of municipal infrastructure, particularly water supply, drainage, and sewerage systems. Asset mapping provides a scientific approach for documenting and monitoring urban utility networks. This study presents GIS-based asset mapping of water pipelines, storm water drainage networks, and underground sewerage systems in Rajapalayam. Spatial and attribute data were collected through field surveys, GPS observations, municipal engineering records, and satellite imagery. Infrastructure components such as pipelines, valves, manholes, pumping stations, and drainage channels were digitized using QGIS and organized into thematic GIS layers. The developed database supports infrastructure inventory preparation, maintenance planning, leakage detection, flood management, and future expansion planning. The results indicate that GIS-based digital asset mapping significantly improves municipal infrastructure management and contributes to sustainable urban development.*

***Keywords*:** *Asset Mapping, Geographic Information System, Water Supply Network, Storm Water Drainage, Underground Sewerage System, GPS Survey, Urban Infrastructure Management*.

I. INTRODUCTION

Urban infrastructure networks form the backbone of municipal service delivery. Water supply systems ensure the delivery of safe drinking water, storm water drains reduce flood risks during rainfall, and underground sewerage systems protect environmental sanitation. In rapidly growing towns such as Rajapalayam, maintaining updated infrastructure records is essential for efficient planning and maintenance.

Traditional paper-based records often create difficulties in locating underground utilities and updating infrastructure data. GIS technology provides a modern digital platform for storing, analyzing, and visualizing utility assets. Through GIS-based asset mapping, municipal authorities can monitor network performance, identify failures, and prioritize rehabilitation works.

This project focuses on selected wards of Rajapalayam town where water pipelines, storm water drains, and sewerage assets were surveyed and digitized to create a reliable infrastructure database.

II. STUDY AREA

Rajapalayam is located in Virudhunagar District at the foothills of the Western Ghats. It is an important industrial and commercial center known for textile activities and agriculture. The municipality covers about 11.36 square kilometers and contains 42 administrative wards.

Population growth has increased pressure on municipal utilities. According to recent estimates, the town population is approximately 155,000–156,000, creating higher demand for water supply, drainage, and sewerage systems. Proper digital asset management is therefore essential for sustainable urban planning.

III. OBJECTIVES OF THE STUDY

The main objective of this study is to develop a comprehensive understanding of existing urban utility systems, including water supply pipelines, storm water drains, and sewerage networks. The study aims to prepare a detailed inventory of these assets and collect their spatial coordinates using GPS surveys for accurate mapping. It also focuses on digitizing the utility networks using GIS software to create organized and layered maps. In addition, a database is developed to store important physical and operational details of each asset. Overall, the study supports effective maintenance planning and helps in future infrastructure development and expansion.

IV. MATERIALS AND METHODOLOGY

The study was carried out using both primary and secondary data collection methods. Primary data was collected through field visits to selected wards, where GPS devices were used to record the exact locations of pipelines, drains, manholes, and valves. During the field survey, important details such as asset condition, material type, and dimensions were also observed and noted.

Secondary data was obtained from municipal engineering records, ward maps, utility drawings, and satellite images, which helped in verifying and supporting the field data. For spatial analysis, GIS digitization was performed using QGIS software. Separate layers were created for water pipelines, storm water drains, underground sewer pipelines, manholes, valves, and pumping stations to ensure proper organization of data.

An attribute database was then prepared for each infrastructure component. This database included essential details such as pipe diameter, material type, length, installation year, and condition rating. This structured approach helps in efficient management, analysis, and maintenance planning of urban infrastructure systems.

V. WATER SUPPLY PIPELINE MAPPING

The water supply pipeline mapping involves identifying and analyzing the transmission and distribution network that carries treated water from reservoirs to residential areas. During the study, different types of pipeline materials such as PVC, DI (Ductile Iron), CI (Cast Iron), and HDPE were observed. The commonly used pipeline sizes include 63 mm for household connections, 90 mm for street-level distribution, 110 mm for residential areas, and 160–300 mm for main distribution lines.

Using GIS, the pipeline network was mapped to understand its alignment and overall layout. This mapping helps in identifying leakage-prone zones, analyzing pressure distribution across different areas, and planning future extensions of the water supply system. Thus, GIS-based mapping improves efficient management and maintenance of the water distribution network.

VI. STORM WATER DRAINAGE MAPPING

Storm water drainage mapping was carried out by digitizing drainage lines as line features in GIS. Both open and closed drains were included in the mapping process. Important attributes such as drain width, depth, material type, flow direction, and condition status were recorded for each drainage segment.

This GIS-based mapping helps in identifying flood-prone areas and understanding the efficiency of the existing drainage system. It also supports better planning and improvement of storm water management infrastructure.

VII. UNDERGROUND SEWERAGE SYSTEM MAPPING

The underground sewerage system mapping involves identifying and recording the network of sewer pipelines and related infrastructure. This includes assets such as sewer pipelines, manholes, lift stations, pumping stations, and sewage treatment facilities. All these components were mapped using GIS to understand their location and connectivity.

GIS-based sewer mapping helps in identifying blockages, monitoring system performance, and improving wastewater management. It also supports efficient maintenance and planning of the sewerage network.

VIII. RESULTS AND DISCUSSION

The GIS-based asset mapping successfully created a digital inventory of utility infrastructure in the selected wards of Rajapalayam. It enabled accurate identification of the location of water supply lines, drainage systems, and sewer networks. This improved the efficiency of maintenance scheduling and reduced the chances of data loss related to infrastructure.

Additionally, the digital mapping system enhanced emergency response and supported better planning by municipal authorities. It also improved coordination between different departments, leading to more effective management of urban infrastructure.

IX. ADVANTAGES OF GIS-BASED ASSET MAPPING

GIS-based asset mapping provides an accurate and well-organized inventory of urban infrastructure. It allows easy updating of utility records and reduces the time required for maintenance activities. By enabling better resource allocation and planning, it supports efficient urban development. Overall, it contributes to sustainable infrastructure management by improving monitoring and decision-making processes.

X. CONCLUSION

GIS-based asset mapping is a reliable and efficient approach for managing urban water infrastructure. The digital database developed for Rajapalayam town enhances utility monitoring, maintenance, and future planning. This method can be effectively adopted by other municipalities to improve infrastructure management and governance.

XI. FUTURE SCOPE

Future developments in GIS-based asset mapping may include integration with real-time monitoring sensors to provide live data updates. The use of mobile GIS applications can improve field data collection and accessibility. Additionally, hydraulic modeling and smart city infrastructure integration can further enhance system efficiency and support advanced urban management solutions.

XII. REFERENCES

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