To Study Management and Monitoring of Water Pipeline

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ABSTRACT: The water is that the life line for nature and human. The water wastage is main Concern across the country. The most important reason behind the water wastage is poor water system and dangerous management. Recently the importance of the management technologies for prevention   will increase. There are several types of pipelines below the bottom of cities that have pipelines for waterworks, wastewater, oil, gas, electronic power, communications, energy, and so on. And these underground pipelines have totally different roles in offer the essential resources for citizens of cities and can be a lot of necessary for citizens more and more. So we call these pipelines as "LifeLine."And it is very important to manage these pipeline systems to avoid water loss. This paper presents a summary of the research and implementation works carried out by the authors in their research.

KEYWORDS: Water Wastage; Pipelines; Essential Resources; Lifeline

I. INTRODUCTION

Drinking water distribution systems carry potable water from water sources like reservoirs, water tanks to industrial ,and residential customers through complicated pipe networks. An adequate water supply in terms of availableness and quality is significant to acting several daily tasks, and disruptions to a water supply through planned maintenance or leakage repairs can cause significant problems. A potable distribution system's operation is planned and managed by a department of engineers and physically maintained by field crews. These groups work along to resolve immediate system failures like pipe leaks and bursts and longer-term upgrades. many selections regarding however best to manage the network ar advanced and can't readily be automated; in these cases engineers should have faith in their expertise, information of this state of the system and call support tools to assist them build educated decisions regarding the most effective courses of action [1].

A variety of pipeline-related accidents take place in urban areas, which are mostly related to the lack of the pipeline operation and management under the ground. Concerning water supply, ruptured pipes bring about different leakage accidents. These deadly accidents increase serious causalities as well as social overhead costs, directly and indirectly. Thus, it is considerably required to preemptively spot and settle those issues through the real-time management of underground pipelines as the nation's most critical infrastructures [2].

Municipal bodies in Asian country, significantly those accountable for managing installation and sewerage systems, area unit slowly adapting processed management and knowledge systems to handle their regular operations and maintenance tasks, plus inventory management and client grievance redressal systems. Factors like funding issues, structure problems and body constraints have had a control on adopting best practices within the past, however with the given pace of development and embrace technology to empower the present systems, these bodies try to boost operational and industrial performance through accrued specialize in institutional strengthening and capability building parts[3].

Kind of water losses in municipal water distribution system

Leakages: leakage through the crevice of the pipelines,uncontrolled overflow of the accumulation tanks,leakage of the

hydrant shaft , leakage of the fittings (valves, connections)

Authorized unmeasured water consumption: fire department,municipal connections, hydrant's net ,street washing and sewer cleaning ,processing water in water plant

Errors: human factor (wrong reading of the water gauge and/or, calculated consumption) **,**faulty individual water gauge of the consumer **,**faulty main water gauge of the utilities

Unauthorized unmeasured water consumption: unauthorized connection to the pipelines, connections without water gauge**,** unauthorized uses of hydrants**,** bypassing the water gauge [4].

In GIS, the pipelines area unit typically modelled by lines and nodes by dots. Incorporating GIS into the decision making process for utilities provides insights that may have an effect on that approach is chosen and therefore the outcome obtained. However, there is no standard data model for water or sewer systems, so every utility has developed its own methodology for storing data; this has created advanced issues related to multi-jurisdictional coming up with activities, research, and oversight. the worth of employing a customary information model for drawback finding will increase with the size and complexness of the matter because the decisions created can have profound and long-run consequences. Challenges presently 'faced by utilities like leak detection, resource shortages, repairs, rehabilitation, replacement of pipes need considering competitive interests and interdependencies [5].

II. RELATED WORK

Considering most accidents in terms of pipeline management for waterworks, pipelines area unit for the most part broken by extra or completely different constructions around wherever waterworks pipes area unit buried and people influences. Also, the pipeline accidents come back from lack of the management system for bar. supported the figures and table, this system has not have bar management technologies nonetheless. Thus, it's additional necessary and important to work out or observe the circumstance that takes place in advance [2].

What Causes Pipes To Leak
A number of things will work alone or together to have an effect on the speed of corrosion in any piping system. Depending on the quantity and degree of those factors, even a brand new piping system will show signs of corrosive wear in as few as 2 years when installation. The issues are most acute in properties that are in commission fifteen years or a lot of, however. The corrosive result the supply water will wear a piping system doesn't mean water quality is poor, if truth be told even those areas wherever the drinkable has been rated among the most effective within the country.

An Intelligent System For Underground Pipeline Assessment, Rehabilitation And   Management
Author Sunil K Sinha states the information about the Intelligent system which is a progressive idea that performs information acquisition, information interpretation and utilization of the information for intelligent renewal of pipeline infrastructure systems. It may be utilized by knowledgeable municipal engineer in performing arts condition assessments and identification of appropriate rehabilitation method and a few maintenance ways. It uses completely different approaches to condition information acquisition and additionally offers style of techniques for process information and signals [6].

Wireless Water Sentinel platform for monitoring and control of water distribution systems
WaterWiSe (Wireless Water Sentinel) could be a platform for water distribution systems operators that has period of time watching and call support tools that may be accustomed facilitate improve system management and operation. WaterWiSe uses a mix of model-based prediction and information stream analysis as a basis for its call support tools. The first information supply could be a Wireless Sensor Network (WSN) that's deployed on the pipes inside the distribution system, providing on-line updates of the fluid mechanics and water quality. Increase of deployment density, number of parameters and on-line data collection enabled by deploying the WaterWiSe. WSN permits a water utility to possess a lot of elaborate image of the water distribution system across a spread of vital applications, like leak detection, water quality watching, on-line hydraulic calibration and others [7].

The overall project is directed towards 3 main goals:

- The application of low price WSN for high data rate, on-line observation of hydraulic parameters at intervals an outsized and large urban water distribution system;
- The development of systems to alter or enable remote detection of leaks and prediction of pipe burst events;
- The integrated observation of hydraulic and water quality parameters.

III. METHODOLOGY

A. A Web-Based GIS Application For Gulshan-E-Iqbal Underground Water Pipelines Network

For decades, paper-pen based mostly information collection has been the quality methodology for collection and maintaining water distribution/transmission pipelines information by karachi management. This culture has caused many issues for the water system managers their designing and engineering employees, and has led them to uncertainties in designing, coming up with and in operation water system to fulfill customer's demands. Moreover, it jointly includes data entry errors and therefore the high prices of storage.

Therefore, this led to a concept of developing a web-based GIS application so as to boost and systematize this information management observe of Karachi water management. This new system can assist field engineers and planners with completely different level of GIS data and potentially save time and energy. This application can facilitate meet the challenges faced by the Karachi's water management with following goals:

(1) A GIS based solution
(2) A user-friendly environment for pipelines field data
(3) Store a large amount of spatial data
(4) Easy to evaluate and process
(5) Up to date
(6) Development of Geo database of water distribution network

The aim of this work is to form a user-friendly web application for Karachi's water management, through that users will gather all potential underground water distribution pipelines information data to create constructive choices. It became very necessary to develop a web-based GIS application that has progressive practicality, a pretty look, and easy for the general public. This Paper demonstrates regarding this application that configures a server to distribute data to the end users of Gulshan-e-Iqbal and its Water Management. Relationship changing into stronger between the web and GIS, the event of web-based GIS applications is changing into quite easy. Architecture of server/client is set up at intervals Arc GIS Server; all the GIS feature classes, and every one of the underground water distribution pipelines information, are uploaded into a geo info. The geo database then plays a role of a storage container for the Arc GIS server to form an web service. This service is then accessed via a uniform resource locator through that the application will call. This study created an Adobe Flex application. Flex is additional modern in its design and interface, as compared to the default Arc GIS server internet application. It had been created as a cross-platform and open source application builder [8].

B. Architecture for Web-based Water Supply & Sewerage Asset Management System

This Project discusses the structure of web based GIS architecture planned for implementation of asset management module and creation of customer database for water supply and sewerage systems within the municipalities of one of the Indian states. This GIS based asset management system shall exploit the ability of web GIS to search asset records /information database and performing user friendly queries which is able to be important for adopting modern system of financial planning for asset management.

Workflow diagram shown in Fig demonstrates the varied parameters and stages that are concerned in planning this system. Water Supply Pipelines, controlling valves, sewerage lines and manholes/chambers are most of the assets of water supply and sewerage departments which require regular operations and maintenance. Since these assets are widely spread geographically, it's troublesome to manage and keep a record of them unless the plus layouts/maps are obtainable [9].
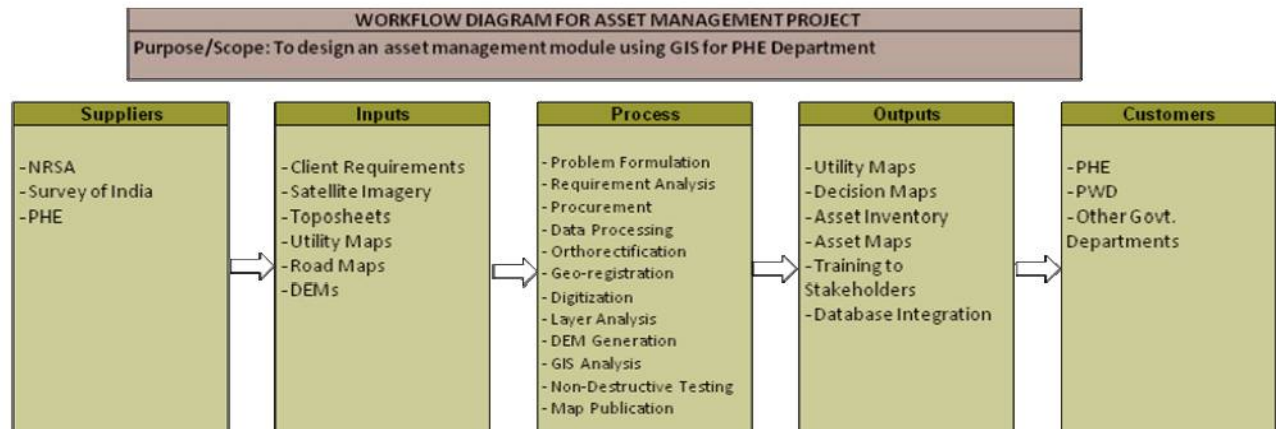
Fig 1.Workflow Diagram For Asset Management

C. A Web Based Spatial Decision Support System for Management and Monitoring of Water Utility Assets

GIS plays a crucial role in water utility services delivery like asset mapping, management, network analysis, planning etc. In the present study a pilot project on monitoring and management of assets associated with water management for Dehradun city is attempted using open source geo-spatial technologies. An internet based mostly centralized management and watching is most popular over manual and distributed approach within the situation like asset management at city level. Web GIS is that the latest technology that is capable of providing management of assets in spatial domain. A user friendly Urban Water Information system (UWIS) has been developed using open source tools. UWIS provides functionalities for visualization and editing of spatial knowledge associated with water utility at town and zonal level. Web Mapping Services (WMS) are used for the visualisation whereas Web Feature Services (WFS-T) are used for the spatial data editing and to perform vector based mostly GIS analysis.

The main objective of this study is to develop a web portal for management (visualization, editing, query etc.) of urban water supply utility network data at completely different levels using FOSS(Free And Open Source Software) 4G approach.[10]

Tools And Technology

The technologies used in the event of the web portal area unit listed in table1. Being a web based solution the system is fitted to each Windows and UNIX operating system platform. The spatial data referring to the study space has been published within the GIS server i.e. Geoserver. The GeoExplorer extension of OpenGeo suite along side Asp.NET server side scripting languages area unit used for designing the web portal. IIS is employed as an Web server and PostGIS is employed to store the geospatial data in Geoserver.

Architecture

The data accessible at varied formats and scale was converted to common format as GIS layers using QGIS software . Then the whole data/GIS layers were imported to the POSTGIS data base to form use of the advantages of the DBMS. POSTGIS information was then published to web as WMS and WFS layers using Geoserver. In the front end portal, provision has been created for the data access to completely different users. Solely approved user area unit ready to visualize the data as WMS whereas administrator is allowed to form use of the WFS layers further.

Table 1: Technology overview

S.no	Component	Specification
1	GIS/Map Server	GeoServer 4.0.2
2	Portal Front-End designing	GeoExplorer
3	Library	Open layers API 3
4	Database	PostgreSQL 9.3.5
5	Web Server	Internet information system (IIS)
6.	Scripting Language	Asp.net
	Client Side application	Web browser (any browsers can be used i.e. Mozilla, IE. Etc.)

Results

The web portal developed using free and open source software for geospatial (FOSS4G) approach facilitates the users for visualizing the water utility network of Dehradun City. The web portal consists of following 3 modules.

- Authentication
- Visualization & Query
- Data Editing

The web portal developed for urban water utility network (WIS) using open source software is associate integrated platform for the management and observance of water utilities assets. All the water utility assets are mapped and published as WMS and WFS-T layers. correct data security mechanism has been provided through totally different authentication right for various users. The portal provides visualisation moreover as data editing facilities over the web. Thus will be associate efficient tool for various level of management in civic body responsible for water within the town. The portal will be helpful within the day to management and working level activities it will be useful for notice the exact location of asset once employees are planning to repair or exchange the pipelines or any asset of the utility network. The portal is exclusive in itself because it has all the info needed for the water utility assets management as a centralized repository with tested security mechanism inbuilt in it.

IV. CONCLUSION

Management and Maintenance of underground water pipeline is very difficult task. Many researchers have worked on this problem. As Leakage and burst in water pipeline causes billions of litres water loss. Thus, this article of water pipeline management demonstrates the kind of work can be done to minimize the problem of leakage and water wastage. It contains case studies about Web-based Water Supply & Sewerage Asset Management System, Development of Real-Time Pipeline Management System for Prevention of Accidents and Web-Based GIS Application For Gulshan-E-Iqbal Underground Water Pipelines Network. Also describes Development of Standard Geo database Model and its Applications for Municipal Water and Sewer Infrastructure and Wireless Water Sentinel platform for monitoring and control of water distribution systems.

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