SMART WATER MANAGEMENT FOR TRADITIONAL INDIAN CITIES

Ar. Surekha Yadav
Doctoral Student, B.Arch, M.Plan, DCRUST Murthal, Haryana, India
Ar. Ashish Sharma
Doctoral Student, B.Arch, M.Plan, DCRUST Murthal, Haryana, India

Abstract: Indian cities are organically formed and being traditionally developed, they lack the capacity to intake the rapidly growing population. According to India's Ministry of Urban Development, 60% of India's population will live in cities by 2050. This calls for intelligent & smart infrastructure systems which can take care of the growing population influx while judiciously & effectively optimising the resources.
With the growing population, water demand has increased multifold while supply is decreasing. These traditional cities now need uninterrupted supply to cater such huge population and at the same time saving water. This paper proposes solutions for traditional cities to smartly cater the demand while being sustainable.
In such urban areas, it is challenging to provide 24*7 water supply system because 38% of the water that is pumped through the distribution grid, accounts for transmission loss, so it is very important to take measures to secure water through efficient water management systems.
The study reveals that using intelligent and smart systems of water management for a small city having 1.5L population can save huge costs as well as water.

Keywords: GIS (Geographical Information System), SCADA (Supervisory Control and Data Acquisition), Smart Water Management, Traditional Cities

Introduction: Indian cities are organically formed and being traditionally developed, they lack the capacity to intake the rapidly growing population. Traditional cities were not planned for the level of population they are catering today. According to India's Ministry of Urban Development, 60% of India's population will live in cities by 2050.

Considering all the issues of Urbanization & growing population, there will always be an incremental pressure on the city & its limited resources. Seeing this pressure, effective utilization and management of resources is the need of the hour. We need a system which gives smart and sustainable solutions to such an extreme problem so that we can make judicious use of our limited available resources.
For this, we require intelligent & smart infrastructure systems which can take care of the growing population influx while judiciously & effectively optimizing the resources.

And this is only possible by the help of Information and Communication Technology (ICT). This will help us in reducing the cost, energy consumption and have a sustainable and energy efficient lifestyle with a low carbon foot print. This is how Smart Cities concept came into picture, which ultimately aims to tackle all these issues and increase quality of life of people. The UK Department of Business, Innovation and Skills considers smart cities a process rather than as a static outcome, in which increased citizen engagement, hard infrastructure, social capital and digital technologies make cities more livable, resilient and better able to respond to challenges.

This paper tries to convert a traditional city into a Smart city with regards to Water Supply.

Need of The Study: Water has been the only source of survival on this planet. It is the most crucial resource for sustenance of our habitation. All the civilizations have flourished close to sources of water.

Looking at the current prospects of water, there are lot of challenges in distribution, quality and demand fulfilment. Indian water resources are under stress due to unprecedented growth of population and the decreasing availability of water resources. This calls for an integrated, smart and sustainable solution that promotes coordinated development and management of water, land and related resources.

Figure 1: Map showing Rewari's Depth to Water Level

Methodology: This research paper aims at finding a solution to the water supply issues in a traditional Indian city. For the research, a case study of Rewari city (Haryana) has been taken. The paper describes existing situation of water supply of the Rewari city. Primary surveys were done to get the basic information & status of the water supply from the citizens. Other relevant secondary data was collected from government authorities of the Rewari city like number of authorized connections, number of metered connections, amount of water supplied per day, water demand, water loss, leakages etc. All the available existing scenario data of Rewari city was then compared to the standards given by Central Public Health and Environmental Engineering Organization (CPHEEO), a technical wing of Ministry of Housing and Urban Affairs, Govt of India. After identifying the gaps, Smart & sustainable solutions were proposed for the problems.

Case Study: Rewari is one of the district of Haryana State & also a part of Delhi -NCR. It is located south- west of Haryana. Rewari is connected by NH- 8(Delhi-Jaipur Highway), NH-71 (Rewari-Jind) & NH-71B (Rewari-Palwal). Rewari is situated at a distance of 80 kilometers from Delhi towards its South-West. As per 2011 census, it has an Urban population of 1,40,864.

Groundwater: The town faces acute shortage of ground water. Around 45% of the geographical area of the district falls with the 10-20m depth of water-table range. In the past three decades (June 1974 - June 2004), the water table is receding at an alarming rate of 30cm per annum in the district.

Surface Water: The Rewari Town gets drinking water from Jawahar Lal Nehru (JLN) Canal originating from Yamuna serving Panipat, Sonipat, Rohtak, Jhajjar and Rewari city (Fig.2). The JLN canal is 3 kms from Rewari Town. 17.16 Million Litres per Day (MLD) water is drawn from the canal and collected in a reservoir and then treated at the Kalka Water Treatment Plant which goes through Rapid Sand Filter process which is then supplied to the main Boosting Station of the town that is at Dharuheda Gate and

from there the water is then supplied to further 14 Boosting Stations to supply water to the city. These boosters are located based on the population of the zone. These boosters have a pumping station and storage tanks which stores water.

Figure 2: Process of Water Supply for Rewari City

Table 1: Service level Benchmarking of water supply of Rewari

Indicator	Service level Benchmarking		Gap
	Desired	Current	
Water Supply Coverage	100	84	16%
Per Capita Water Supply	135	120	8.50%
Extent of Metering of Water Connections	100%	2.7 %	97.30 %
Continuity of Water Supply	24 hours	1 to 2 hours	92%
Quality of Water Supplied	Potable as per CPHEEO	Potable (There are several places where Electrical Conductivity (EC) values of ground water is greater than 10000 µS /cm at 25oC, making the water non-potable)	
Cost recovery in water supply services	100%	80%	20%
Efficiency in collection of water charges	90%	80-90%	10-20%

Existing Scenario – Water Supply of Rewari Town: The water from JLN canal serves 21,220 households (Domestic connections) and 200 Commercial Connections. The water supply network covers 84% of the total population of the town including commercial, and institutional areas. Taking an average household of 5.5 persons for one connection, the population officially connected to piped water supply system is 1,16,710. The actual water supplied to this whole population is 17.16 MLD which accounts for 110 Liters Per Capita per Day (LPCD). Out of the 84% coverage, 10% connections (2890 connections) account for unauthorized (illegal connections or theft cases). 35% of the population extracts ground water (have installed individual submersibles) as they do not depend on the Government water supply since the water is being supplied for 1-2 hours per day. The town has total 10 stand posts, 2 of which are near Railway Colony which has urban poor population residing. There are only 500 metered connections (2.7% of the population) in the town and rest of the connections are being charged at a flat tariff Rs. 120 per connection per month. The Public Health Engineering Dept (PHED), Rewari, is working for installing meters for every connection and making people aware for the same. 5% of the population don't pay for the service. This whole process of water supply from Canal to the user goes through various stages and estimated to lose about 40% of water during the cycle.

PROPOSED SCENARIO – Water Supply of Rewari Town: Smart Water Management with SCADA (Supervisory Control and Data Acquisition) and 24x7 water supply: SCADA is a technique for quickly and accurately identifying the operational status of water supply facilities. Automatic control allows

smooth and smart operation of the facilities, making it easy to achieve the target water quality and conserve energy.

The main components of Smart water System are:

1. GIS- Geographical Information System-based solutions helps in collecting and analyzing spatial aspects of distribution and movements of water supply system
2. Water Quality Monitoring -can save upto 70% of quality monitoring costs; enable utilities to automatically sample and test for water quality and intervene quickly to mitigate potential issues
3. Hydraulic Modeling- Water network management through data collection, measurement and operational & maintenance analysis—ensuring effectiveness, permanence and reliability
4. Energy and process management- Advanced meter reading (AMR) - to help meet demand, maximize resources, reduce costs and emissions, and ensure regulatory compliance
5. Leakage & Pressure Management- Water loss management, pressure and leak detection using real-time data to identify and resolve problems—improving service

Parameter	Indicators
ICT integration in Water supply system (Monitoring & Measuring) /SCADA	Detection of problems like leakage, contamination, pressure related issues etc
	Central Monitoring & Control
	Measuring equipment (flow meter, level meter, chlorine analyzer)
Responsive	Automatic & quick response to the problem detected
	Overflow detection & response to it
Online services	Web Portal & Mobile App, User account/ Billing/ payment
	Complaint registration & redressal
Institutional setup	Integrated staff & services

Figure 3 : Benchmarks for SMART Water Supply System

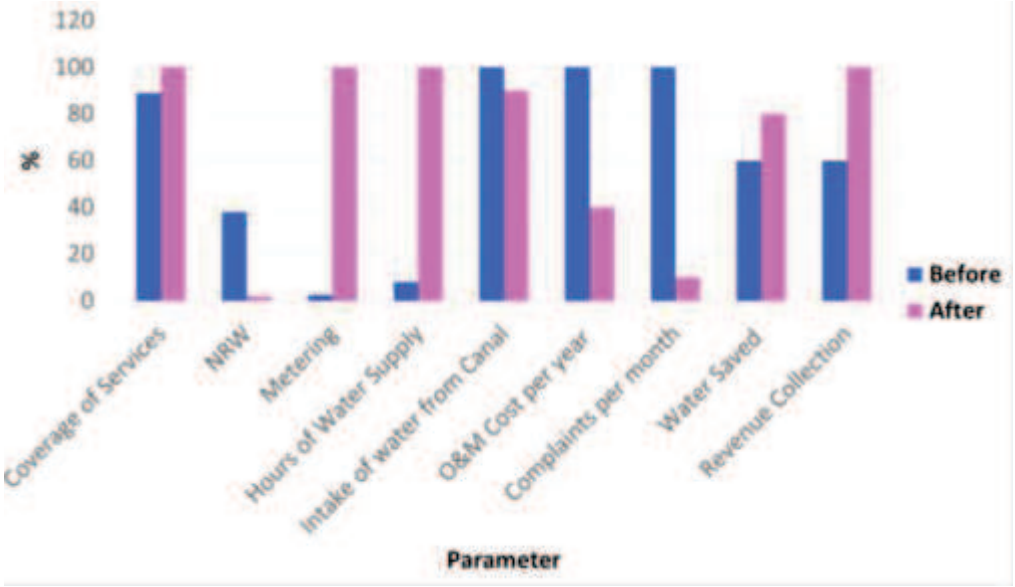

Figure 4 : Graph Showing Difference Of Using Smart Water Systems

Conclusion : To promote this dream of smart, livable, sustainable cities with an improved quality of life for its citizens, an overarching plan has to be drawn up. This plan should take into account the future needs of the city or development. This attempt will further coagulate the initial structure on which future cities may be based and provide a resemblance of permanence to the notion of smart city keeping in mind the ever changing environments of the cities.

This study has shown how an ordinary city's infrastructure has become smart thus leading to a better quality of life (Fig 4). The graph below depicts the difference achieved in a traditional city using SMART water systems. It clearly shows the increase in coverage of services, metering increased which led to increase in revenue of the state. Wastage of water decreased, intake of water from canal decreased, and also O&M costs decreased. Number of complaints came down and ultimately more water is saved than before. The study has changed the notion of a smart city being expensive and hypothetical specially an existing city to implement in real life. It doesn't take much effort for a traditional city to become a smart city, it just takes a vision of its people, stakeholders and government with ICT playing a key role.

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