

Opportunities for smart water supply systems in Surat

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Abstract

Surat “the fastest growing city”, as declared in 2001, is developing multifold so far. On the other hand, the technological advancement and use of cloud-based systems are increasing. The administrators with support from willing citizens have so far keep achieving the demand-supply match in water supply services. SMC has partially been successful in implementing the use of IT in many of its departments. Water treatment plants are equipped with SCADA as well as city-wide GIS platform is under development. The future demands estimation will be very much based on data-driven approaches with availability of open source and cloud-based applications. Water is a scarce public resource which need wisdom at each stage of utilization. Growing population and comfort centric lifestyle changes will demand more water which is limited with existing and only source Tapi river. A multiple millions of money invested in establishing present state of service delivery mechanism will end up in the supply as well as system crisis if not integrated with technological support. Data-driven approaches prior to taking up of which needs data generation and integration using Internet and network tools. Later on simulation and designs will utilize the data and the same can very well help in the decision-making process. Such an approach will lead to convert existing city into Smart Surat on the front of Water Supply Services. Present paper discusses briefly in concept, a case, existing situation and opportunities for smart water supply systems in Surat.

Keywords: Smart cities, SMC, Surat, Urban Governance, Water supply system

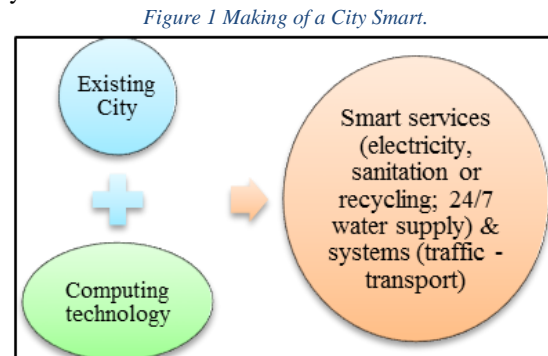
1. Introduction

India is expecting the urban population to cross 590 million by the year 2030. Following the ongoing rapid urbanization trend, the cities having population of a million plus will be more than 60 across the nation from 42 at present. The Government of India (GOI) is anticipating an investment of about US\$1.2 trillion to match the development. Keen areas of development include ports and its management, building cities smart, skill development, and water resource solutions.

Recently, it was announced for phase out ongoing JnNURM and initiate planning through launching of "100 Smart Cities" in India keeping the anticipated urbanization and projected growth. The GOI has already allocated US\$1.5 billion (about INR 76 billion) in recently declared Union Budget 2014-15 to develop 100 smart cities. GOI is looking forward taking a helping support from France and Singapore in the task. Development of 100 smart cities includes developing existing mid-sized cities and satellite towns of larger cities through employing modernization. Development of new cities is essential as the existing cities with limited land and infrastructure may not be able to serve the rising population. If the horizon for progress is considered to take 20 to 30 years, the works need to take a jump start now.

The IT sector based companies are pushing to play a lead role in developing smart cities. The reason is simple as shown in Figure 1. Computing Technology believes to improve efficiency of infrastructure and public services. Underlying aim is to enable cities to have a merger with technological

advancements bringing in “smartness” within the system.



Efficient solutions can well be delivered Using the data analytics, in easing commutation, building surveillance and security systems having minimal human intervention and wireless empowered open spaces ensuring high-speed connectivity all the time. Sectors of electricity, water supply, sewage and sanitation, recycling, traffic management and such services in the IT enabled framework.

Present paper discusses the scopes and opportunities that are lying ahead in the water supply services in the urban area considering one of the fastest growing cities on the globe namely Surat. The city location is in the western state of Gujarat in India with a population of around 4.46 million recorded in 2011. The geographic spread of the city administration is on 326.51 Sq. Km. The Surat Municipal Corporation is affirmatively matching manifold demands by an adequate supply ensuring citizen satisfaction. However, following section deals with a brief discussion of two selective cases where the water supply system are under operation, smartly.

2. Literature review

Focus Group on Smart Sustainable Cities formed under International Telecommunication Union is carrying out a study since 2013 exploring Smart Water Management for Smart Sustainable Cities. The study suggests to include following components to include within the umbrella of smart water supply system:

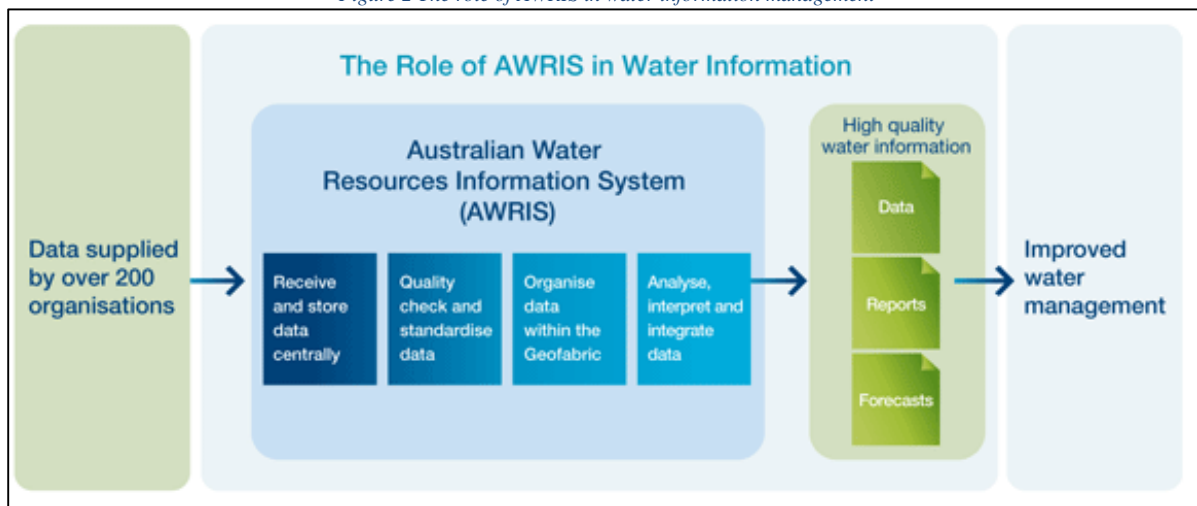
- Smart pipes and sensor networks
- Smart metering (LAN-HAN-WAN) having Pre-paid/ Post-paid arrangements for end-user
- Communication modems
- GIS mapping and relational database
- Cloud Computing (analytics)
- Supervisory Control And Data Management (SCADA)
- Models, optimization, and decision support

- Web-based communication and information system tools

3. AWRIS case

A tool namely Australian Water Resources Information System (AWRIS) is under development by the Australian Bureau of Metrology. It is managing and displaying operational details delivering water information from more than 200 organizations of the Australia. It serves as a secure repository of data related to water and provides high-quality water information to the public. In the Australia, policy decision-making and water management are improving in terms of quality and efficiency due to AWRIS availing data standardization and integration of many organizations in the loop. Figure 2 illustrate the role of AWRIS in water information management.

Figure 2 The role of AWRIS in water information management



(Source: http://www.bom.gov.au/water/about/publications/document/InfoSheet_3.pdf)

Workflow comprises the data supply in standard formats from organizations. Once received these data, it is stored and checked for quality for standardization. AWRIS carry out the analysis, interpretation and data integration using computations and tools which then provide high-quality data, reports as well as forecasting ability to the decision-makers.

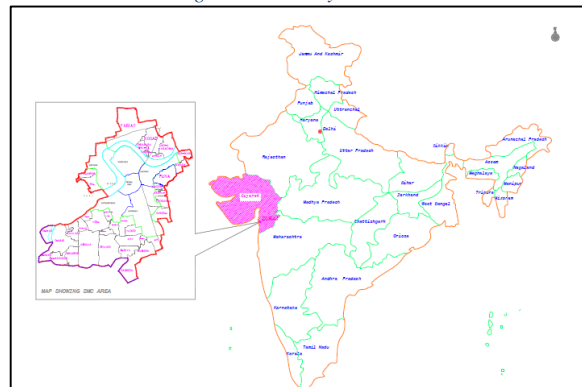
4. About Surat city

In the era of increasing urbanization, it is essential to plan and provide all basic amenities. Water is most important among these amenities and a necessity for living beings. Historically, almost all settlements have been framed in some form of the water body. If the quantity of water is abundant for the time being, the development pace is faster till the resource is shortened. Followed by resource, water supply infrastructure plays a crucial role.

The city of Surat is situated on the bank of river Tapi. The Arabian Sea is along the Tapi at the West adjoining the city administrative limits. The City received the status of Municipal Corporation (SMC) on 1-10-1966. The SMC is among the oldest municipalities establishes since 1852 AD. The city

area was 112.27 Sq. km. till 2005 and increased to 326.51 Sq. km. during 2006, whereby 27 villages and eight municipalities were added to the limits of Surat City. The estimated present population is about 44.66 lacs (Census of India, 2011) with a decadal growth rate of 55.29%. City has population density of 136.8 ppha. Administratively the city is divided into seven zones. Variation in population density in these zones vary from merely 31.05 ppha in the South-West Zone to 499.71 ppha in the Central Zone.

Figure 3 Surat city location



The climate of Surat city can be broadly divided into four seasons viz. Summer, Rainy, Autumn and Winter. The summers are quite hot with temperatures

ranging from 37.7° C to 44.4° C. The winters are not very cold but the temperatures in January range from 10° C to 15.5° C. The average annual rainfall of the city has been 1143 mm.

5. Present situation - Water supply operations

In the case of the Surat city, situated on a perennial river, Tapi has served as primary and almost abundant potable water source till now. The city authorities have constructed storage facilities in different locations and a supply system around them are in place.

All these systems are interconnected to ensure uninterrupted availability in all parts of city area. Remarkably, after major floods in 2006, water supply was actually restored well within 36 hours. It was just because of the grid pattern (having interconnectivity throughout) network.

The raw water collection system comprises of intake wells (potable water source - capacity 1463 MLD by 2014), jack wells, infiltration wells and a very few bore wells. Through secondary treatment plants (capacity of 1468 MLD) water is treated to potable quality as per the prevailing requirements of GPCB, Gujarat. The hydraulics department of SMC supplies water through an underground pipeline network (length 3350 km) with installed capacities of UG reservoirs of 713 ML. Pipelines are provided through a gravity system where ESR capacities are 112 ML. SMC has achieved 59% increase in water supply from 580 MLD in 2006 to 980 MLD in 2014 by fast-tracking in project implementation. It was due to financial assistance through JnNURM, and SJMMSVY funding support schemes of GOI and State Government respectively. Since 2009, Two treatment plants (Katargam and Sarthana – total treatment capacity 150 MLD) equipped with SCADA. In addition to that, SMC installed Kosad plant (90 MLD) with automatic system in 2013.

Presently, the augmentation works are going on with construction of two Intake wells (560 MLD), extension of three water treatment plants (200 MLD); eight UGSR (65.4 ML) and 21 ESR (40.8 ML). Also, expansion of pipeline network (287 km) is in progress. Due to progressive and improving scenario in water supply sector, Ministry of Urban Development (GOI) awarded SMC with 1st and 2nd National Urban Water Award in 2008 and 2009 consecutively. Efforts of SMC are directed towards ensuring and maintaining uniformity in supply of at least 150 lpcd in all areas of the city. Demands from citizen are always making a proposition increase amounts in different parts of the city. However, accurate information about the population thereto is not available till a decade. It may be a considerable reason due to which demand-supply gaps are not identified neither forecasts are matching.

Before 2011, it was anticipated that the population will reach a figure of 61.48 lacs by then however record was 44.66 lacs showing a lowering difference of 16.82 lacs. However, SMC initiated taking up projects and started developing capacities and today, still it is not assured whether the city has a

population of about 61 lacs or not though the ongoing works are carried out. It is bringing in somewhat absurdness in the entire system in terms of capacities, demands and supplies somewhere, however, identification of the same is still beyond data collection and technological interpretation practices of today. Water audit-related information is still not traceable to identify Non-Revenue Water (NRW) and other losses in the system with reasons because of that.

In the absence of data and its integration, planning becomes difficult where ongoing development activities at a pace in some areas of the city play a crucial role. It leads to drawing a statement that “SMC performance in O&M may be the best of a kind but data-driven and need-based planning with supply is absent that directly is related to expenditure of public money”. In other way, despite remarkable performance in the present, absence of data-driven approach, transparency and accountability of SMC may be questioned quoting incidents.

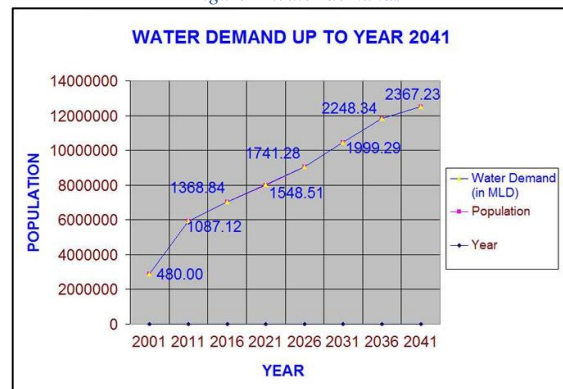
Below Table 1 shows the population projection differences in forecasts for Surat city. Till 2001, the population growth was faster and registered a growth rate of 85.1% in 1991-2001. With that, Surat emerged as the “fastest growing city in Asia” by then. In the following decade, the growth rate declined to 55.29% till 2011. It is natural with rise in absolute population against limitation in availing new development opportunities. However, the effect of this movement can well mislead the projections followed by project planning and implementation.

Table 1 Differences in population projection

Criteria	Projected Population (in lacs)		
	2021	2131	2041
Base year as 2001	81.46	107.56	121.42
Base year as 2011	61.25	72.30	81.20
Difference	20.21	35.26	40.22

Projections are keeping the base year as 2011 are a result of a detailed population projection carried out in 2014 (B. V. Bhatt et al.). Ratio-correlation method was applied for forecasting and each village/ward level considerations were adopted to have realistic projections to an extent.

Figure 4 Water demands



(Source: Water supply master plan, SMC, 2014)

At present, the water supply projects under implementation seem to be misled by population projections ambitiously taken up by SMC. The increasing capacities and underutilization depict for an exhaust by the time actual need will arise and in

the future, system crisis will demand larger and immediate investments to improve over future degrading service delivery scenario. Relief in the situation may be observed to some extent due to project proposal preparation and system design methods that involve ward level population projections. Demand estimation and supply strategies are becoming vague and dynamic to an extent that will keep the authorities on toes all the time for matching the ends.

6. Opportunities for Surat Water Supply

Available details till 2007 reveals that SMC area has total water connection of 3,27,000 out of which 3,19,669 (98%) connections are domestic, and water is supplied at a flat rate based on size of the connection. All nondomestic connections are metered. Tariffs are laid for all these connections by SMC. Service connections are of galvanized iron. An enormous level of efforts is anticipated to bring in all the connections in an IT network. If adopted, it will serve in identifying actual consumption of water (the Revenue Water) and help in optimizing the operations by reduction of possible wastes.

SMC among local authorities in India, rarely enjoys of having the privilege in acquiring ISO 9001:2008 certification for implementing QMS in all of its water works. The QMS is obtained for control on water quality, administration, operation & maintenance involving engineering, house-keeping and record maintenance, well-defined distribution and allocation of duties and responsibilities of all staff engaged. Common goals are set and achieved by meeting individual objectives of delivering safe, sufficient and regular supply of potable water well within the framework of standards for consistency.

GIS platform for Surat city is partially developed by SMC. At present, the database is being generated, and progressively information integration is shaping up the advancement of systems' approach to decision-making. The populous spatial spread of the city with diversity in activities slower down developing on the GIS platform. Technological advancement with available applications such as WaterGEMS integrated with GIS allow for efficient operations under water supply sector. If water distribution models are prepared then optimized designs and process scheduling, pipe assessment, loss estimation, SCADA integration and network simplification is possible.

As of current practices of operation, to control O&M expenses and introduce operational efficiencies, SMC has outsourced annual contracts on PPP basis for following services:

- O&M of WTP;
- O&M of Distribution Stations;
- Valve operations;
- Water supply period sample collection;
- Water Works & Distribution Stations housekeeping

On the experimental basis for outsourcing, SMC has recently allocated work under comprehensive O&M contract for areas of the new North (Amroli,

Kosad, Utran, Variav, Chhapra-bhatha and Mota Varachha). The agreement includes the works from the raw water up to consumer point including giving new water connection with the water meter, reading and billing.

If SMC implements, the smarter solutions using technological advances there shall be no need for such comprehensive O&M outsourcing contracts in the future. It will additionally save revenue money generated from citizens against services rendered.

7. Concluding remarks

Technological infusion in all the municipal operations is being conceptualized and taking shape. Surat is a potential city where sophistication in service delivery mechanism can be adopted. Primary reason is the active support from citizens as they enjoy the facilities provided by the authority. SMC has a comprehensive and computerized accounting systems; IT enabled along with web-based record management and undergone advancements. Under service delivery, individual operations are outsourced by SMC and such can entirely be waived off if smarter options are adopted. Although, SMC has initiated on smarter solutions by adopting SCADA in WTP. Instead of developing capacities for a misleading estimation on population and absence of standardized data, SMC must focus the investments in sophisticating entire water supply system and ultimately adopt all available smarter options.

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