MUNICIPAL WATER MANAGEMENT – A GLOBAL CHALLENGE

By Subhash Sethi

Water is essential for life. We need water for everything, from our personal use, to grow food, and to produce virtually everything required for our survival on the planet earth. Water is also equally important for the economic growth of the nation. Practically all of society's commercial activities, from agriculture, industrial and electricity generation to the production of consumer goods depend on the availability of water.

For years, we have taken the water supply for granted. Earlier the availability was much more than any demand and drinking water used to flows in abundance from the taps in our homes, schools, and workplaces. Many of us did not give a second's thought to the challenges that lie behind getting clean water to our taps or indeed how much of this finite resource we consume on a daily basis. But for most of the world, clean drinking water is now a precious commodity and the same is true for India. Although water covers more than 70 percent of the Earth's surface, but we have rely on annual rainfall for our actual water supply. About two–thirds of annual rainfall evaporates into the atmosphere, and another 20–25 percent flows into the oceans and is not fit for human use. This leaves only about 10 percent of all rainfall available for personal, agricultural and industrial use.

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India has about 4 percent of world's freshwater resources ranking it among the top ten water rich countries. The situation is changing very fast and as per international reports, India is designated to become a 'water stressed region' with current utilizable freshwater standing at 1122 cubic meter (cum) per capita per year compared to international standards of 1700 cum. The per capita water availability in the country is reducing due to increase in population and several other factors. The average annual per capita availability of water taking into consideration the population in various censuses has come down by 70 percent from 1951 to 2011, in a span of 60 years. The per capita availability of water as per 1951 census was 5177 cubic meters. In future, at the current rate it is expected that India with high demands will be termed a 'water scarce region' as utilizable freshwater level falls below the international standard of 1000 cum per capita. Water demand is on a high from industries along with the traditional demand for agriculture.

> More than 70 percent of the Earth's surface is covered with water, but for our actual water supply, we have very limited sources.

THE TOTAL VOLUME OF MUNICIPAL WASTEWATER PRODUCED PER DAY IN INDIA IS ESTIMATED TO BE ABOUT 62000 MILLION LITERS AND THE TOTAL CAPACITY OF SEWAGE TREATMENT PER DAY IS ONLY ABOUT 23000 MILLION LITERS.

19 MLD Water Treatment Plant, Gagreen, Rajasthan

The Challenges

Limited Supply

India with the current population of 1.36 billion people gets over 4000 cu km of freshwater in the form of rain and snowfall, of which 2047 cu km return to oceans or is precipitated. A small percentage is stored in inland water bodies and groundwater aquifers. Topographic constraints, distribution pattern, technical limitation, and poor management do not allow India to harness its water resources efficiently. Moreover, precipitation is not evenly distributed and millions of people are living in areas of water scarcity. Pollution has also made much of that water undrinkable and unsafe for use. Meeting India's increasing water needs has fast becoming one of the biggest challenges being faced by the water utilities. The available resource has reduced over the years but the demand escalated due to population growth, rapid urbanization, higher level of industrialization and it is projected to very soon overtake the availability of water. The per capita availability of water has significantly reduced and is likely to reduce further. As per the Ministry of Water Resources per capita water availability in 2025 and 2050 is estimated to come down by almost 36 percent and 60 percent respectively from the 2001 levels.

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Demand for Water

Demand of water in India is growing exponentially and projected to very soon overtake the availability. In some regions of the country, it has already happened. With fast paced urbanization and changes in economy, the water demand will continue to grow and by the year 2025, it is expected to increase by over 20 percent fueled by the industrial requirements which are projected to double from 23.2 trillion liters at present to 47 trillion liters. Domestic demand is expected to grow by around 40 percent from 41 to 55 trillion liters while irrigation will require 14 percent more to 592 trillion liters up from 517 trillion liters currently. The water ministry predicts that per capita water availability will reduce by 36 percent in 2025 and by about 60 percent by the year 2050 from the level of 2001. While agriculture will remain be the major water user in India, the challenges posed by growing urbanization on municipal water supply calls for a monumental change. But there is reason for optimism, in the past, shortage of vital resources has driven the need to innovate, discover new materials and generate new technologies. The water challenge is no exception, and countries across the globe are seeking to find solutions for water demand supply problem.

Population Growth

India's population is growing faster than many

3000 MM Dia MS Sauni Pipeline, Gujarat

countries and currently equivalent to 17.74 percent of the total world population, the second most populated country in the world. Kingslay Davis's report shows that India's population remained almost stationary since 1800 at around 125 million for about 50 years. The rate of population growth was moderate till 1921. The year of 1921 is known as the year of great divide. The rate of population growth fluctuated between 1.0 and 1.35 percent per annum during the 30 years period of 1921 to 1951. In 1951, total population was recorded to the extent of 361 million only. The year of 1951 is also termed as population explosion year. During the period of ten years, population increased by 7.81 million at the growth rate of 21.5 percent in the decade of 1951–61 compared to the previous ones. During the period of 30 years from 1961 to 1991, population has increased by 407 million at the rate of around 25 percent. This increase was 10 times more than the increase in the previous 30 years, from 1901 to 1931. The population of India reached 1.02 billion by the year 2001. The main factor responsible for this tremendous rise in population in the last 50 years was fall in death rate due to improvement in medical facilities whereas the birth rate continued on the same pattern. With annual increase of about 1.3 percent, India's current population has reached around 1.36 billion. The water sources remained unchanged and the pressure of population explosion is evident with the availability of water supply.

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Water Quality

One of the major concerns is the poor quality of water that is available in many states of India. Millions of people in India are still deprived of piped water supply and despite progress made in several fields, the level of water pollution is increasing considerably. Many residents of urban areas are not connected to a proper sewerage system and the wastewater from these households is released into the environment without any form of treatment, polluting groundwater and surface waters in the process. Solid waste is also frequently dumped into water sources. Industrial effluents are inadequately treated and being dumped into local rivers and water bodies further limiting the availability of clean water resources. It is estimated that almost 80 percent of generated wastewater in India is not being properly treated and untreated sewage is released to water bodies thus contaminating the already depleting groundwater sources. The range of potential pollutants is enormous, threatening the environment and human health, and their impacts are widespread. Excessive groundwater extraction increases soil salinity. Heavy metals and toxic compounds from industrial processes further contaminate drinking water.

Aging Infrastructure

As the economy of the country developed, people have steadily moved from rural to urban areas to improve their standard of living and quality of life. In 1901, only 11 percent of India's population was urban as compared to over 34 percent of people now living in urban areas which are expected to grow further to reach 60 percent by the year we reach 2050. A rapidly increasing urban population and the expanding middle class have driven up water demand. There are several challenges being faced by water utilities in India, but ageing infrastructure is at the root of them all. In particular, urbanization and population growth contribute to water scarcity and intensify the strain caused by ageing infrastructure. Water utilities in India are faced with the need to address all these challenges and revamping of infrastructure on priority for social, economic and environmental implications. Global non–revenue water estimates ranges from 30 to 40 percent of water produced, whereas it is as high as 50 to 60 percent in several cities in India and main reason behind it is the aging and debilitated water infrastructure. Water supply and sewer systems have a service life of roughly 60 to 80 years and in many cities of India, our water infrastructure have reached the end of their useful lives. In addition, the water mains are not being adequately maintained. Therefore, huge investments are needed in many areas to repair and upgrade the aging water infrastructure.

Among other key challenges is the problem

of water loss or non–revenue water. In India, it is considerable loss for the utilities that the amount of water put into distribution system and the actual water billed to consumers varied drastically. A phenomenon called as non–revenue water (NRW), a well–known issue that results in large volumes of water being lost through leaks in supply system. The classic example of NRW management in India is the Bangalore water loss management project which is being executed by SPML Infra in consortium with Suez. By using innovative technology of helium leak detection to accurately identify and locate hidden leaks in large and small pipes, the NRW reduced significantly from 61 percent at the beginning of the project to 27 percent currently thus saving 39.2 million liters drinking water per day. The water saved from the project will be used to provide drinking water facilities to 110 urban settlements. Same type of project needs to be initiated by all major cities in the country where NRW level is well above 40 percent to improve upon the services and reduce the financial loss of water utilities substantially.

500 MLD Water Pumping Station, Bangalore

The Solution

Consolidation and Privatization

The water industry in India is fragmented and over the last two decades has seen a number of consolidation and partial privatization under public private partnership mode which is expected to continue. Consolidation of the water industry opens up opportunities for private sector service providers. SPML Infra has executed such projects earlier. The management contract of water supply and distribution network is another mode of consolidation where the private companies are given charge of infrastructure development and rehabilitation along with operation and maintenance for a specified period. In recent years, the number of people whose drinking water and wastewater services are provided by private companies has increased. Globally, about 14 percent of the world's population is served by private operators that provide drinking water and wastewater treatment services, and this figure is expected to rise to 21 percent by 2025.

Water Tariffs

Water tariffs are essential to ensuring that utilities can cover the costs of providing services to the citizens as well as raising enough funds to expand and upgrade the existing water distribution infrastructure. It is also an important mechanism to encourage consumers to use water more carefully. Normally consumers tend to use too much water if the water prices are too low thus putting pressure on utilities to supply more water. In India, due to political and social considerations and due to poverty and affordability issues, water tariffs can take the form of a tiered pricing system. This enables water provision at very low prices to cover basic household needs, typically 30–50 liters per person per day, but acts as a deterrent to overuse. Tiered pricing schemes have been successfully implemented in Israel, Australia, Hong Kong, Japan, Korea, USA and several other countries. In India, it is also being followed by few utilities which need to be considered nationally.

Water Reuse

The total volume of municipal wastewater produced per day in India is estimated to be about 62000 million liters per day and the total capacity of sewage treatment per day is only about 23000 million liters. The operation and maintenance of existing plants and sewage pumping stations is not satisfactory and actual sewage being treated is much lower than the capacity. We need to develop not only the treatment plants, but also making reuse of treated water obligatory for select sectors and agriculture. The challenge lies not only in channeling used water back into the waterways once it has been treated, but also in processing it so that it can be reused for other applications. There has been a growing trend towards water reuse projects in Singapore, Australia, USA and Israel to deliver high–quality treated water that can be used to augment the potable water supply. India needs to follow the best practices from these countries to make water reuse a lucrative affair.

Desalination

Desalination is a viable solution to water scarcity, especially in dry, coastal regions like Mumbai, Chennai and other cities where no other options exist. Globally, coastal regions where water is scarce are increasingly trying to expand their freshwater supplies by installing desalination plants. It is estimated that over 150 countries are using desalination facilities to serve more than 300 million people. More than 90 million cubic meters water per day is being produced by desalination plants. In India, there are around 1,000 desalination plants having total capacity at about 0.3 million cubic meters per day.

Smart Water Technologies

Globally, utility companies could save an estimated USD 7–12 billion each year by using smart water solutions such as advanced leak

160 MLD Water Treatment Plant, Dhannaser, Rajasthan

detection and pressure management techniques to maintain and build water networks; information systems enabling the collection and interpretation of data, which can optimize capital expenditure management; and smarter water quality monitoring systems that include remote–controlled devices and sensors. SPML Infra has indigenously developed an Integrated Management Information System (IMIS) for smart management of water utilities. A powerful enterprise management system designed specifically as per Indian requirements and working conditions to meet day to day operations of water utilities to develop and manage smart water supply system. It provides technologically advance services which include GIS, Network Analysis, Hydraulic Modeling, Water Loss Reduction thru NRW & UFW Management, Demand Management, Customer Relationship, Financial Management, and complete Asset Management of the system.

Smart Metering

Smart water metering is crucial to limiting water losses in the distribution network and reducing non–revenue water. The faulty water meters contribute to water loss as it is not billed due to leakage, illegal use and inadequate measurement. In order to reduce NRW rates, water needs to be metered to identify and track water leakage rates. At the same time, consumers need to be billed based on their water use to encourage water conservation. Modern water meters now have components that automatically record and/or transmit electronic data on water use directly to the utilities. SPML Infra follows modern metering techniques with AMR meters using AMI technology to help water utilities in NRW management, accurate billing, online reading, data analytics, and optimized network management.

Way Forward

Water recycles and reuse, groundwater development (new resources and artificial recharge) and desalination are key supply options that should be pursued with dedicated planning and resources. There should be strong focus on protecting water quality, resolving regional disputes and contentious issues, application of new technology, reduction in water loss, smart metering solution, and enabling municipal water conservation and water demand management activities. The national water regulatory authority along with a strategy steering committee consisting of representatives from state government and other key stakeholders involved in water resources management must be setup to support the development of a robust municipal water supply system in the country.

About the Author

Subhash Sethi is Chairman of SPML Infra Limited. Over the last three decades, he worked relentlessly to grow the company with his mission to create value for the country. Under his able guidance and leadership, SPML Infra has become the leading infrastructure development company in India with a legacy of over 600 completed projects. Today, SPML Infra is providing drinking water facilities to over 40 million people and it is the first Indian company to be featured among World's Top 50 Private Water Companies according to research by Global Water Intelligence, London. With sheer commitment and ethical business practices, he continued walking the road of discovery and innovation.

SPML Infra Limited has integrated its strength in basic and in–depth engineering, process technology, project management, procurement, fabrication & erection, construction and commissioning to offer distinct responsibility under strict delivery agendas. Many of the engineering and construction projects executed by SPML have set new benchmarks in terms of scale, sophistication and speed. SPML has in–house engineering capabilities for both project design and construction. SPML design and engineering encompasses IT enabled facilities including modern CAD centre using various design and project management software.

To know more about the author and contributor, you can write to us. Your feedback is welcome and should be sent at: shefali@eawater.com.