Alternative Water Sources

Need to tap valuable wastewater to avert a crisis

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India, the second most populated country, is also the second largest water consumer in the world. With a population of 1,400 million and steady growth, the country needs around 740 billion cubic metres of water per year to serve its population. Irrigation is the largest user of fresh water, accounting for 88.1 per cent of the total water consumption, followed by domestic use at 7.7 per cent and industries at 4.2 per cent. According to government data, the average annual per capita water availability fell 15 per cent during 2001-11. It is predicted to fall another 13 per cent by 2025 and a further 15 per cent by 2050, which means that in less than 30 years, each Indian household will have about 1.1 million litres of water per year, down from 1.8 million litres in 2011.

The water stress level is constantly rising. A NITI Aayog report suggests that more than 50 per cent of the population today has no access to safe drinking water and about 200,000 people die every year due to lack of safe water. It also makes the water concerns clearer by stating that at least 40 per cent of the Indian population will have no access to drinking water by the year 2030. The report further claims that 21 major cities (including Delhi, Bengaluru, Chennai and Hyderabad) are expected to run out of groundwater, affecting at least another 100 million people.

Wastewater scenario

India is at the cusp of a momentous growth cycle, with an ambitious target of reaching a $5 trillion economy in the next three years. Water being a vital element of economic growth, the country cannot afford to ignore the impact of water scarcity and developing stress.

Water flows in nature to be used by different ecosystems, and then returns to nature in other forms and with different characteristics, to be treated and filtered before entering the cycle again. However, our water is becoming highly contaminated, as in India we are not performing this exercise properly. Of the water being supplied by municipalities, 80 per cent returns as used water, which needs proper treatment and filtration before being released into the ecosystem.

35 mld CETP at Bawana, Delhi

A report by the Central Pollution Control Board suggests that the existing sewage treatment plants (STPs) in India are able to treat about one-third of the total sewage generated per day. The country's urban centres are generating 72,368 million litres per day (mld), whereas the installed capacity of STPs stands at 31,841 mld. Of this installed capacity, developed and operationalised capacity is 26,869 mld, of which only 20,235 mld is the actual utilised capacity. Out of the total 72,368 mld sewage generated every day, only 20,235 mld is treated, which is just under 28 per cent of the total sewage being generated. India, with an increasing population and growing demand for water, is not utilising the valuable resource of wastewater to augment the water supply and cater to the needs of industries and irrigation.

Reuse of treated sewage

The world over, many countries are using treated sewage to satisfy their water needs. Singapore is a classic example. It has successfully adopted a smart wastewater management system to meet 40 per cent of its water demand, and plans to increase this to 50 per cent by 2030. "NEWater" is the brand name given to highly treated and reclaimed wastewater produced by Singapore's Public Utilities Board. The water is potable quality and can be added to drinking water supply reservoirs, from where it is withdrawn and treated again in conventional water treatment plants before being distributed to consumers. The Netherlands provides customised treated water for the specific requirements and preferences of each customer, with an overall emphasis on tailoring water to the needs of industries, thus reducing its dependence on surface water and groundwater sources.

The large-scale water stress and widely reported "day zero" event in Cape Town, South Africa, has expedited their action plan to reuse treated water. As per a Green Drop Report, South Africa has 824 wastewater treatment systems across 152 municipalities, which have a collective design capacity to receive about 6,500 mld of wastewater. With concentrated efforts, it is targeting the treatment of 50 per cent of the wastewater for reuse so that 3,250 million litres of water is made available to be returned for consumption.

In January 2021, Chinese authorities issued new guidelines for wastewater reuse, intensifying efforts to combat the impending water crisis. In 2019, China's urban wastewater discharge was 75,000 million cubic metres (million cum), whereas the water reclaimed from it was only 10,000 million cum, less than 15 per cent of the total generated wastewater. China has set forth an ambitious goal, with investments and implementation of advanced technology, to raise the level of reused treated sewage to 25 per cent or more by 2025, 5 per cent higher than its 2020 goals.

In India, water reuse is still at a nascent stage, with minimal reclaimed water. The reuse of treated sewage is an issue that hasn't assumed much importance in the policy planning of successive governments. In order to meet the growing water demand, wastewater recycling and reuse is the most sustainable option. Tremendous potential exists for wastewater recycling and reuse, mainly in non-potable applications.

The administrations of Indian cities must locally plan to implement pilot projects, to be scaled up for treated sewage reuse for horticulture, washing activities (roads, vehicles and trains), firefighting, industrial cooling, toilet flushing, gardening, and large-scale provision to farmers for agricultural purposes. The reuse of treated sewage can decrease the demand for water from surface sources such as rivers, ponds and lakes, as well as groundwater sources.

Market dynamics

As per the latest reports by Markets and Markets, the global wastewater treatment services market is projected to reach $71.6 billion by 2026 from the existing $53 billion, increasing at a compound annual growth rate (CAGR) of 6.2 per cent during the projected period. The global market for water recycling and reuse technologies was estimated to be $15.3 billion in 2020, and is projected to reach $27.1 billion by 2026, growing at a CAGR of 10 per cent over the analysis period.


42 mld STP at Kanpur

Another report pegged the value of the Indian water and wastewater treatment technology market in 2020 at $2.04 billion, with an estimated CAGR of 8.55 per cent during the forecast period of 2021-26. The rapidly declining freshwater sources and growing wastewater complexities will drive the demand for advanced water and wastewater treatment technologies in India. The factors supporting the demand for wastewater recycling and reuse are the growing economic activities and recovery in the manufacturing sector in India. The strict guidelines of the pollution control boards and municipal authorities, enforced through programmes such as zero liquid discharge in industries, are driving the penetration of advanced technologies in the country. The growth can also be attributed to the increased significance of water reuse in the backdrop of emerging water stress, and measures that are aimed at addressing the rising need for safe and clean water.

Barriers to water reuse

Wastewater is indeed a valuable resource that can be used to meet the increasing demands of water supply and provides both financial and ecological benefits. The technologies and treatment systems required to reliably treat water from domestic and industrial sources are well established and readily available. However, public perception and inhibition are impediments to adopting reclaimed water for potable purposes.

Another challenge in implementing water reuse is the capital investment required to effectively treat wastewater to meet drinking water standards. Depending upon the quality of wastewater, the treatment process would require several steps, including pretreatment, rapid sand filtration, membrane ultrafiltration, reverse osmosis and advanced oxidation. This multi-barrier treatment approach increases complexity and cost compared to traditional treatment processes. However, treatment costs are offset by the fact that the source water is essentially free, compared to the bulk water sourced from dams or groundwater. It also helps in reducing the environmental impact of wastewater.

India, facing a severe water stress while accumulating municipal and industrial wastewater, should start using reclaimed water for irrigation and industrial purposes. Irrigation being the largest user of fresh water in the country, if we are able to reuse at least 15 per cent of reclaimed water for agricultural and industrial purposes, we will be able to save billions of litres of fresh water, relieving the water stress while helping water utilities provide drinking water facilities to unserved areas.