# The Economy of Water



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**By Subhash Sethi**

Among all the natural resources necessary for propelling life on earth, water is the most important resource ensuring human and economic health and well-being. Historically, water has never been a subject of discussion until we started facing the complex challenges related to providing clean, safe drinking water. And these challenges are being faced at all stages from raw water intake to drinking water treatment, water distribution, wastewater collection and transportation and wastewater treatment. With trillions of gallons of water required every day to quench the thirst from each habitation in the world, we all understand that water is fundamental for sustainable development as it affects health, economy, livelihood and ecosystem protection.

The second most populated nation on the planet, India was fortunate to be a water rich nation not far ago. As it was freely available and plentiful, it was taken for granted. Currently, the home to 18 per cent of the world's population, the country has very limited global water resources. This inherent lack of sufficient water resources is constantly challenged by the rapidly growing demand which is projected to overtake the availability of water throughout the country. With increasing population, industrial growth and unprecedented pace of urbanization; the groundwater is extracted from lower and lower levels with much faster rate than rainfall can replenish.

Groundwater is an important source for irrigation as well as for domestic and industrial usage. It is also a major source of drinking water in urban and rural India. It is estimated that 45 per cent of total irrigation and 80 per cent of domestic water demands are met from ground water sources. India had abundant groundwater reserve that used to get replenished every year during the monsoon. However, over extraction of groundwater has led to water scarcity in some states including Delhi, Punjab, Haryana and Uttar Pradesh. The arid climate in states like Rajasthan and Gujarat leads to water stressed condition, while poor aquifer properties are responsible for water scarcity in Tamil Nadu, Karnataka and Andhra Pradesh.

## Water Demand

Fresh water is a renewable resource, yet the world's supply of fresh water is gradually decreasing. Water demand already exceeds its supply in many parts of the world and as the population continues to rise, so does the water demand. In India, faster economic growth, demographic change and industrial developments in the last three decades have seen an increased water demands in all sectors. With booming economies, people's expenditure patterns are changing and so do their life style. Rapid urbanization is also adding fuel to these changes.

According to the projections by National Commission on Integrated Water Resources Development (NCIWRD), the irrigation sector alone is going to need additional 71 billion cubic metres (BCM) by 2025 and 250 BCM of water by 2050 compared to the demands of 2010. Similarly, other sectors are also having increased water demands like drinking water requirement is expected to be at an additional 20 BCM by 2025 and 58 BCM by 2050 whereas, industrial water demand is expected to increase by 30 BCM and 44 BCM respectively. Similarly, water demand for power generation and other sectors will also increase in almost the same pattern. The following table indicates the estimated water demand in India for different sectors.

India's surface water resources get replenished every year during monsoon season from 4000 BCM of average annual precipitation.

| Projected Water Demand in India (by different sector) | | | | | | |
|---|---|---|---|---|---|---|
| Sector | Water Demand in BCM (Billion Cubic Meter) | | | | | |
| | 2010 | | 2025 | | 2050 | |
| | Low | High | Low | High | Low | High |
| Irrigation | 543 | 557 | 561 | 661 | 628 | 807 |
| Drinking Water | 42 | 43 | 55 | 62 | 90 | 111 |
| Industry | 37 | 37 | 67 | 67 | 81 | 81 |
| Energy | 18 | 19 | 31 | 33 | 63 | 70 |
| Others | 54 | 54 | 70 | 70 | 111 | 111 |
| **Total** | **694** | **710** | **784** | **843** | **973** | **1180** |

*Source: Basin Planning Directorate, CWC, XI Plan Document*

Because of concentration of rains in largely three monsoon months, the utilizable quantum of surface water is just about 690 BCM. However, conditions vary widely from region to region. Whereas, some regions are drought affected even during the monsoon, others are frequently flooded beyond the season. Due to rapid increase in the population, higher demand for irrigation, municipal and industrial consumption of water has increased considerably, thereby causing depletion of water resources.

While a considerable amount of water requirement is met by groundwater, a long term analysis of water recharge in both pre-monsoon and post- monsoon seasons shows lowering of water table due to excess abstraction and limited recharge. Since this trend is continuing, India is now facing huge water deficit in terms of scarcity for both drinking water and in the irrigation sector. While per capita available water is constantly decreasing, per capita water use is increasing faster than any estimates.

## Water Allocation

With increasing scarcity of water resources and multiplicity of demand from different sectors for a share of this scarce resource, the traditional approach has been found inadequate as an allocation mechanism. However, the challenge in identifying a mechanism for better water allocation is prioritising between widely divergent demands for water such as for basic human consumption, environmental services and the production processes that include water usage in agriculture, industry, power generation, transportation and others.

The irrigation infrastructure, both old and new, has more significance than merely providing water for crops, as it is the foundation of human activities in the adjacent settlements and the root of survival of the surrounding ecosystem. Large portion of population making an existence out of irrigation supported agriculture and the significance of the natural ecosystem in guaranteeing people's access to most water-related basic services make it important that economic, social, environmental and cultural values are recognized in an equitable manner in water resources planning, development and management.

## Economy of Water

Water as a resource is critical to sustainable development. Besides meeting basic human needs, it is a major source of energy generation in major countries in the world. Water is necessary for agriculture and for many industries that produce essential goods and commodities. In several countries, water makes up an integral part of the transport system. With improved scientific and technological innovations, the valuable services provided by water-related ecosystem, from flood control to storm protection and saline water purification to zero-liquid-discharge industrial production, there is an understanding that the economic value of water is immense in all segments of life. The value of a resource

*300 Million Litre Raw Water Reservoir at Pokhran, Rajasthan*

exists in its ability to provide services. Resources have value in services related to economic, environmental, social and other considerations. In this sense, water is a resource with value in all these considerations.

Market valuation of a good generally accepts the principle of costs and benefits as the basis of determining optimum value. On this basis of market allocations, welfare is maximized when water is priced at 'marginal cost' and it is used until the marginal cost equals the benefit. In India and almost all other countries, the social benefits of water supersede the cost involved in procurement, treatment, storage and distribution.

Water resource development is a must for economic prosperity. Access to safe water is as fundamental to the maintenance of life and ecological and environmental services as it has definite uses of a market good. The recognition of water as an economic good and water allocation with an increasingly market-based approach has been recognized to be most promising in formulating relevant policies and guidelines to address problems of water resources.

## Water Audit

Water auditing is aimed at quantifying water flows with a view to reducing water usage and conservation along with often saving money on unnecessary water use. Globally, there is an increasing awareness across political, social and industrial sections around the criticality of water to our lives and businesses. World over almost two billion people are suffering due to inadequate clean water supplies and most death under the age of five are happening owing to unclean drinking water. Water auditing is a mechanism for conserving water, which will grow in significance in the future for quantitative water conservation needs as demand for water increases from both domestic and industrial sectors.

Water audit is becoming an important tool for water utilities and industries to identify areas of higher water use, check on quality, quantify water losses, assess wastewater pollutant load and determine techniques for mitigation through reduce, recycle and reuse principle. It helps industrial units to decide on feasible options on reducing water usage, minimizing wastewater generation, reusing treated water and maximizing recovery. It also provides water efficiency solutions to comply with statutory obligations and cost savings for meeting internal policies, or signifying their commitment to environmental sustainability. The potential water savings through water audits by industrial units and water utilities results in saving of billions of litres of treated water, which in economic terms provides saving on financial resources and increased efficiency.

The classic example of water audit and subsequent remedial action taken by the Bangalore Water Supply and Sewerage Board for the city of Bengaluru to find out the losses in water transmission and distribution system. SPML Infra has been part of the project for reducing water loss in the city. This is a unique

example of reducing water losses in a metro city in India. The project executed by SPML Infra was initiated for 43 DMAs having the population of over 840,000 in the heart of the city. Project execution was extremely challenging due to very high volume of traffic, main business zones combined with maximum number of slums and narrow streets of thickly populated areas.

The team of experienced engineers & professionals worked mostly at late nights to execute the project and replaced 50-60 year old rusting pipes with new ones, leakages in bulk & distribution pipelines were detected by using innovative leak detection technology to accurately identify and locate hidden leaks & fixing them with sustainable methods. Electronic district meters with GSM/GPRS communication for measuring flow and pressure control were installed for continual monitoring of water supply.

The determined effort to improve the situation helped in significantly reducing water losses from as high as 72.56% in some area to reduce it to 10.24% with average of all DMAs reduction from 52.78% to 23.38% thus, saving more than 45 million litres of potable water every day. Saved water is being used to provide drinking water facilities to over 110 new human settlements in Bengaluru.

## Industrial Water Reuse

Industrial water demand is rapidly increasing in the country as we expect the higher industrial contribution along with industrial water demand to increase exponentially. The National Commission on Integrated Water Resources Development (NCIWRD) based on a small sample of industries and their water use, projected that industrial water demand would increase from 30 BCM in 2000, to about 101 and 151 BCM by 2025 and 2050 respectively, which is much higher than the XI Plan estimation. However, an analysis using the global trends show that with the present economic growth rates, the per capita industrial water demand could increase from 42 $m^3$/person in 2000 to about 66 and 102 $m^3$/person by 2025 and 2050 respectively or the total industrial water demand to increase to 92 and 161 BCM by 2025 and 2050, respectively.

Industries can recapture and purify wastewater and reuse it for a variety of applications that would otherwise be lost. With the advent of industrial water purification technology and high precision treatment facilities, even the problematic and elusive substances such as ammonia which can corrode and damage manufacturing facility equipment can be successfully removed

*The potential annual water savings from the water audits in large industrial units in India if undertaken can save billions of litres of water equivalent to supplying freshwater to entire population of India for weeks.*

from water. With modern equipment and technique, the toughest water treatment problems can be addressed and solved. Microfiltration techniques also substantially contribute to the recovery of water for industrial purposes.

That includes everything from purifying and recycling of typical grey water to recycling toughest industrial effluents with reverse osmosis and deionization filtration to reclaim up to 90 per cent or more of post-process water and use it again. Most of the industrial units are focusing on resource recovery of chemical or mineral contaminants from wastewater using high-tech membranes and other technologies which they can reuse while also ensuring that the discharged wastewater is cleaner and will have a less detrimental impact on the environment.

Industries around the world are seeking to integrate technology into their water management systems and apply contemporary treatment technique and advanced monitoring and analytics to continuously measure and improve their water performance. Applying the latest technologies, monitoring and evaluating plans with well-established parameters and standardised data collection are the essentials to sustainably developing water resources with reuse of generated wastewater. One of the most affordable first steps for industrial units seeking to reclaim wastewater is to conduct a water usage audit. Water experts can pinpoint exactly where the most money can be saved and can then recommend appropriate solutions tailored to a manufacturer's specific needs and reduce the consumption of clean water for other useful purposes.

## Last Word

Wastewater generation is expected to increase particularly in the industrial sector as the nation's economic progress is witnessing a faster growth. It is imperative that countries drastically increase their investment in water, sanitation, and other water-related infrastructure and services by convening all public, private, and innovative financing to achieve quality growth and the Sustainable Development Goals. At the same time, financing is needed to enable and sustain a virtuous system of good governance, which requires efficient water-related organizations with sufficient capacity and financial resources to enable them to provide coherent policies, monitor and evaluate progress and take action when needed in a transparent manner involving all stakeholders. Recognizing the importance of water security for the country's

*We take great pride in being the first company entered into the organised water infrastructure development in India more than forty years ago when nobody was talking about water.*

socio-economic development, the government of India along with state governments have embarked on several extensive investment programs in the water sector. In addition to several state government funded programs in the water sector, some of the prominent central government funded programs include the Swachh Bharat Mission, Jal Jeevan Mission for making provision of functional tap water connection to each and every household, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), Pradhan Mantri Krishi Sinchayee Yojana, Smart Cities, National Hydrology Project, Dam Rehabilitation and Improvement Project, National Mission for Clean Ganga (NMCG), National River Conservation Plan, Atal Bhujal Yojana, MNREGS etc.

While the progress of water sector is satisfactory, we need to integrate water supply and wastewater reuse by incorporating advanced treatment methods into our conventional processes to provide a higher level of water security that demonstrates good economics, corporate responsibility and environmental stewardship.


### About the Authors

Mr Subhash Sethi is Chairman of SPML Infra Limited. An ISO 9001:2015 Company nurtured by him has become the leading infrastructure development company in India with over 600 completed projects in a rich legacy of four decades. He has been bestowed with a number of awards for his significant contributions towards the development of water and power sector in India. He can be reached at corpcomm@spml.co.in.