

IN FOCUS



OPTIMISING INDUSTRIAL WATER SUPPLY MANAGEMENT



One of the most consumed resources on earth, water is fundamental to sustaining life and enabling countless human, industrial, and agricultural activities. It plays a critical role in maintaining ecosystems, driving economic growth, and ensuring public health. As the demand for water continues to rise due to population growth, urbanisation, and industrial expansion, the challenges of water scarcity, pollution, and climate change become increasingly persistent. Sustainable water management and innovative solutions at municipal, industrial and agriculture levels are essential to ensure its availability for the future, while addressing current demands responsibly.

Global industry – agriculture, petrochemicals, thermal power generation, mining, paper and pulp, food and beverage, automobile and pharmaceuticals – rely heavily on an abundant supply of fresh water for production and energy. In fact, the UN World Water Development Report 2023 data revealed that industry consumes approximately 19% of the world's accessible freshwater. This report highlights the significant impact of industrial activities on global freshwater resources.

Water leaders increasingly recognise accessible freshwater as a finite resource, viewing the global supply as largely non-renewable and non-replenishable. The growing scarcity of water across continents is now a significant source of economic insecurity and a driving force behind social and economic unrest in many nations. For industrial users, strategically managing water resources and employing them efficiently has become a critical business challenge.

The industrial sector remains water-intensive, with its demand steadily growing. Traditional industries such as textiles, chemicals, and food processing have long been significant water consumers. Now, emerging sectors like artificial intelligence data centres, semiconductors, and battery manufacturing have joined the ranks of water-intensive industries. These new-age businesses are consuming billions of litres of fresh water to power operations like cooling systems, chip manufacturing, and energy storage solutions,



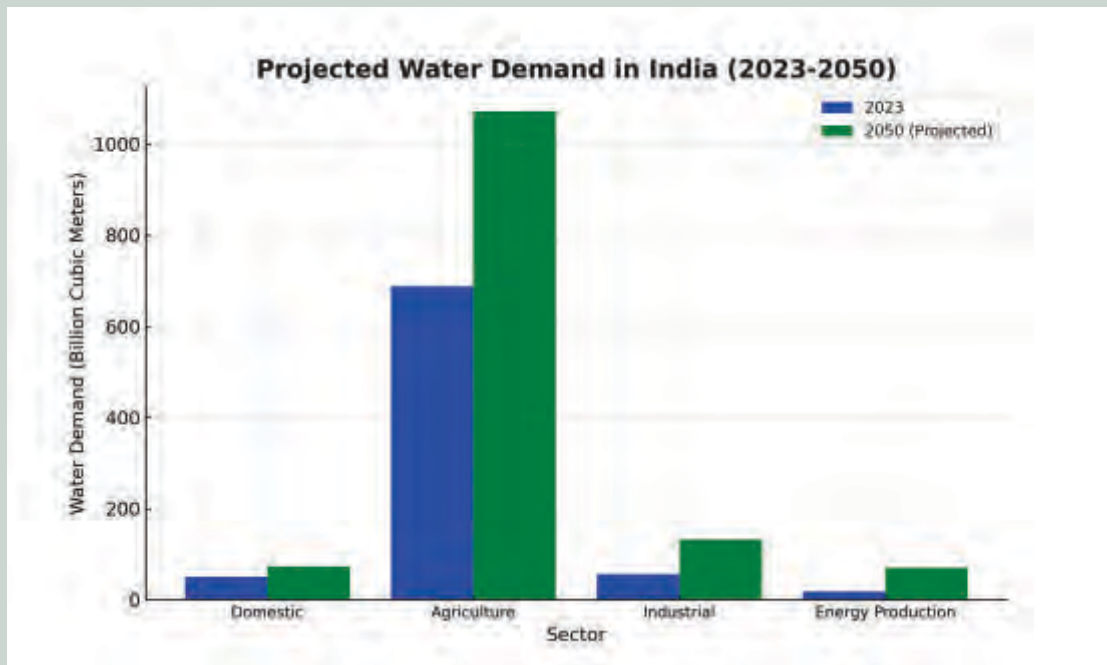
further straining limited supplies.

The challenge lies in balancing industrial growth with sustainable water management practices. Innovations such as water recycling, zero-liquid discharge systems and closed-loop processing are increasingly necessary to address this growing demand. By adopting advanced technologies and fostering collaboration across sectors, industries can mitigate their water footprint, ensuring long-term resource availability while supporting economic and social stability.

Industrial Water Usage: Current Trends and Projections

The Ministry of Jal Shakti reports that industrial water consumption currently accounts for approximately 8% of the total annual freshwater usage in India. This consumption is projected to rise to 13% by 2050, driven by rapid industrial expansion and urbanisation. Key sectors such as energy production and manufacturing are anticipated to experience a significant 15% increase in water demand over the next decade. These sectors are among the most water-intensive, highlighting the urgent need for strategic water management practices to ensure sustainability and mitigate resource scarcity.

The graphical representation overleaf illustrates sector-wise water demand, based on 2023 government data, emphasising the growing water needs of industries alongside agriculture, domestic use, and other applications.



Industrial Water Supply Chain

The industrial water supply chain is a complex network involving water sourcing, treatment, distribution, utilisation, recycling and discharge. Each stage presents unique challenges. Industries obtain water from various sources, including rivers, lakes, groundwater, and municipal supplies, depending upon factors like availability, quality, and cost. Most industries need ultra-pure water which requires extensive treatment to meet specific quality standards for industrial processes. This can involve multi-filtration, chemical treatment, and desalination. The treated water is distributed to different units of the industrial facility. Efficient distribution systems are crucial to minimise losses and ensure a steady supply.

Water is used in various industrial processes such as cooling, cleaning, manufacturing, chemical processing, and as a solvent. Different industries have varying water needs; the semiconductor industry uses large amounts of ultra-pure water for chip manufacturing, where it helps in shaping and treating metals during various stages of production. Water is essential as a solvent in drug formulation in pharmaceutical industry for producing medicines. Soft drink manufacturing also relies heavily on water.

The water supply chain remains incomplete until used and contaminated water is properly treated for reuse or safe discharge. With global water scarcity posing a threat to industrial production, many industries are turning to water recycling and reuse practices to minimise freshwater consumption and reduce environmental impact.

Challenges for Industries

Industries are grappling with significant challenges in securing a reliable supply of quality water for their production and processing operations. These could be defined as:

- **Scarcity, Quality & Accessibility:** Water scarcity and declining water quality have increasingly disrupted industrial operations leading to production delays, inefficiencies, and even closure of factories. Industries in water-scarce regions face significant challenges in securing adequate water supplies and often find themselves competing with domestic and agricultural sectors for access.
- **Regulatory Compliance:** Adhering to environmental regulations is a critical aspect of sustainable water management. Governments across the globe are

increasingly implementing stricter regulations on water usage, treatment, and discharge to address growing concerns about water scarcity, pollution, and climate change. Industries are mandated to follow advanced water management practices to ensure compliance with these evolving standards. This includes efficient water usage, zero liquid discharge, treating wastewater to meet discharge quality parameters to minimise environmental impact of their operations.

- Technological Advancements:** Innovations in water treatment and recycling technologies are transforming the way industries manage vital water resources. Advanced solutions such as membrane filtration, reverse osmosis, UV disinfection, and AI-driven monitoring systems enable industries to optimise water usage, reduce waste, and enhance operational efficiency. However, as technologies continuously evolve, traditional industries face significant challenges in adopting and investing in these solutions. High initial costs, the need for specialised expertise, and the rapid pace of technological advancements often create barriers for implementation.
- Infrastructure Limitations:** Aging infrastructure poses significant challenges to efficient water supply and distribution systems, leading to inefficiencies, leaks, and significant water losses. For industries, these limitations translate into unreliable water availability, higher operational costs, and disruptions in production processes. Retrofitting existing infrastructure to meet modern demands is a complex and capital-intensive task that requires careful

planning, advanced technologies, and significant financial investment.

Embracing Smart Water Solutions

To address the issues, industries are increasingly exploring innovative approaches such as smart water networks, automated leak detection systems, and energy-efficient pumping solutions. These technologies help optimise water usage, reduce losses, and enhance system reliability. Public-private collaborations and government support play a pivotal role in modernising water infrastructure and ensuring it is equipped to meet the growing demands of industries sustainably. Investment in resilient and adaptive infrastructure is critical not only for improving water efficiency but also for securing long-term industrial growth in the face of increasing water scarcity and climate change pressures.

As Industry 4.0 advances, smart water management becomes crucial to address the growing demand and environmental sustainability. By integrating of digital technologies optimising process and developing a water-smart strategy, industries will significantly enhance resilience and eco-friendly water management solutions.

Sahara Industry: Optimising the Water Supply Chain

Sahara Industry has been collaborating with diverse industries for over two decades, delivering efficient, cost-effective, and high-quality water treatment solutions. It is committed to addressing water quality challenges with a range of innovative solutions designed for sustainability and efficiency. The company focuses on eco-friendly; technology-driven approaches that ensure sustainable water management. From advanced treatment technologies to customised solutions, Sahara Industry is dedicated to meeting the evolving needs of industries while safeguarding the environment.

Cutting-edge desalination and purification technologies enable industries to utilise



unconventional water sources such as seawater and brackish groundwater. With modular systems, Sahara Industry ensures flexibility, scalability, and energy efficiency, making signature solutions adaptable to various needs. Smart water management systems leverage IoT and AI to provide real-time monitoring of water quality and usage, while predictive analytics help optimise consumption, reduce waste, and foresee potential shortages. This data-driven approach enhances operational efficiency and resource conservation.

In promoting a circular water economy, the company has developed wastewater treatment plants that can recover upto 95% of water for reuse, significantly reducing reliance on freshwater resources. By encouraging the use of closed-loop systems, it further enhances sustainability and operational resilience.

Real-World Impact

Among Sahara Industry's numerous industrial projects; a noteworthy project involved partnering with a major textile manufacturer in Hyderabad, grappling with significant water shortages. Installing a closed-loop water recycling system successfully reduced their freshwater dependency by upto 80%, saving millions of litres in fresh water consumption per annum. This solution not only bolstered their operational resilience but also highlighted the

company's steadfast commitment to sustainability and resource conservation.

In pursuit of addressing current and emerging water challenges, Sahara Industry continues to innovate and remains committed to delivering cutting-edge water treatment solutions that tackle the evolving issues of water scarcity and quality across various industries. The focus remains on developing sustainable, efficient, and eco-friendly systems that help industries reduce their environmental impact while ensuring reliable water access for the future.



About the Author

Mohammed Abdul Rahman is the CEO of Sahara Industry, a leading innovator in industrial water management solutions. With more than two decades of

experience, he is dedicated to creating sustainable and efficient water supply chains that address global water challenges. His leadership and vision drive Sahara Industry's commitment to advancing water treatment technologies and promoting resource conservation across industries.

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