

India's Water Magazine

June 2023 ₹ 300 | US \$ 15

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INSIDE

Water Sustainability in Urbanized Cities:
How Big is the Challenge and What
Could be the Pathways?

Water Resilience: Strategies
for a Sustainable Future

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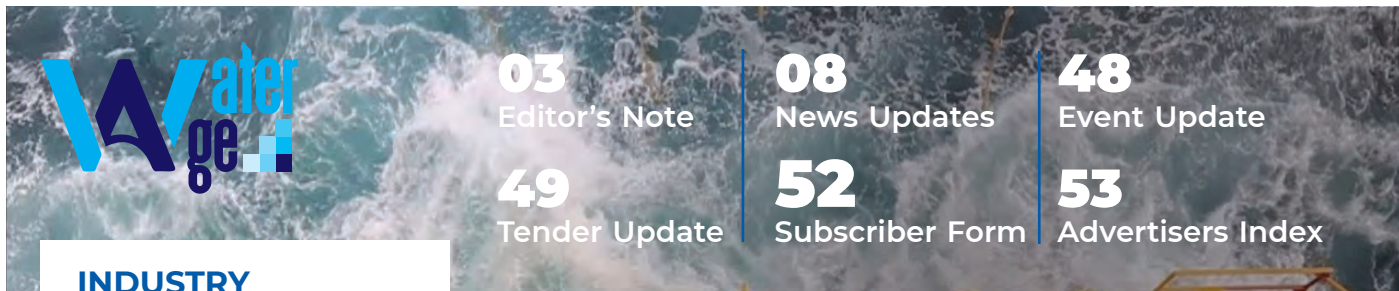
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The Green Revolution in the Water Treatment: LDI and the Path to Sustainability

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PRINTER

Fine Art: D-7 /3, Okhla Industrial Area, Phase 2, New Delhi 110 020

PRINTED AT

Fine Art: D-7 /3, Okhla Industrial Area, Phase 2, New Delhi 110 020

PUBLISHER

WaterAge
Initiative of SHUDH JAL FOUNDATION
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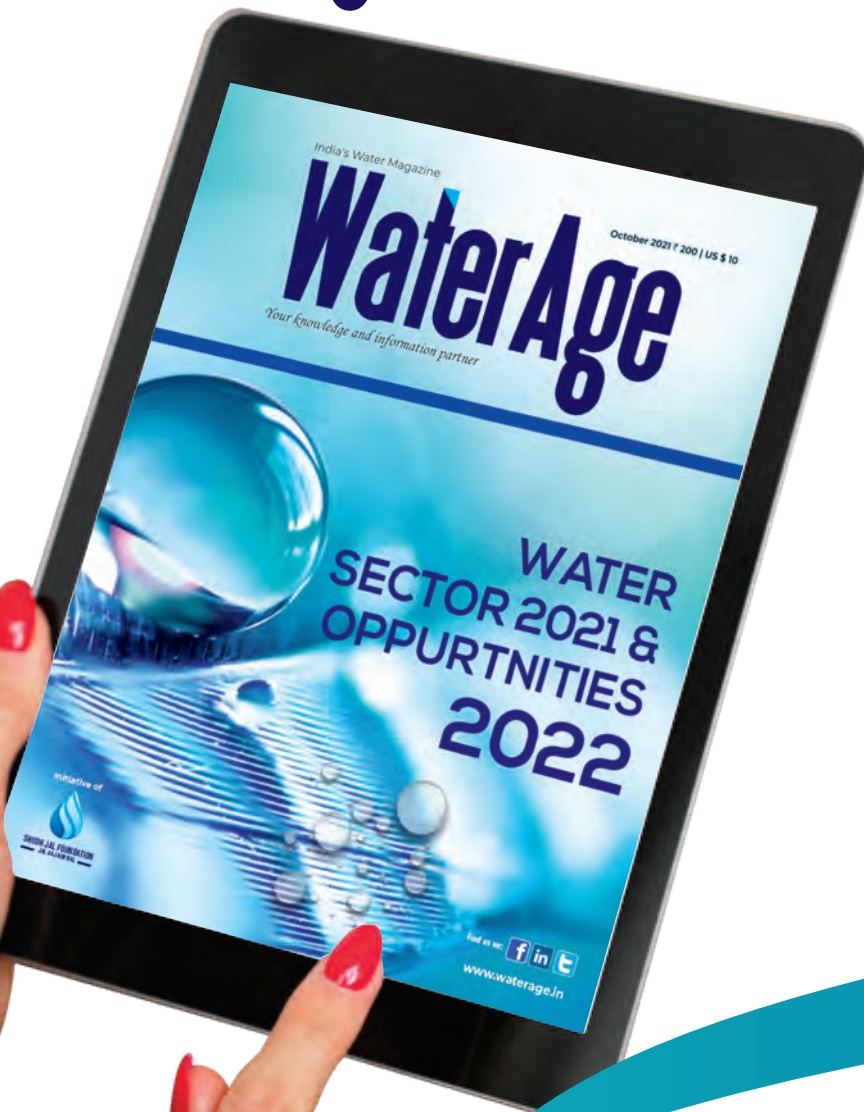
R E N U T O M A R
(Editor-in-Chief)

The rapid population expansion, coupled with rising levels of water consumption, rapid industrialization, urbanization and growing pollution levels has increased water insecurity in India. Also, these have been the major reasons for the nation to face a number of environmental problems, water pollution being the major one. The depleting water sources on one hand with high financial and technological costs to refine water and its transportation from far off sources on the other have been leaving limited possibilities for augmenting water supply in the near future. Additionally, climate change may further impact adversely the already available sources of fresh water supply. This has led to the deterioration of both quality and quantity of surface and groundwater, thereby affecting the net water availability for consumptive use. Even after numerous steps taken by the Indian government and local communities, the populace of the nation continues to be deprived of safe drinking water.

Today a large section of population in the urban India collects water from the public and private sources and their location is far away from their residence. Thus, leading to the massive direct or indirect opportunity cost. Therefore, this is the time for creating other avenues in filling the gaps of the existing structure of water sustainability for the survival of future generation on the planet. Bringing forth this special edition, we are aiming to throw light on the sustainable water management in urban cities, the challenges faced, pathways for water sustainable future, and much more. We hope that this edition educates everyone well about the imperative need of sustainable water management for a greener human existence on the planet earth.



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Paving the way for access to clean water and sanitation

By Hindustan Times – Mar 22, 2023 02:09 PM IST



The article has been authored by Biswanath Sinha, Director, Policy and Technical Support, WaterAid India.

The United Nations population projection report, published in 2022, states that India has surpassed China to become the world's most populous country, with over 140 crores of people. Furthermore, according to World Urbanisation Prospects (WUP) 2018, the urban population in India is estimated to reach a staggering 60 crores by 2030. In addition, climate change and water pollution are exacerbating the problem of water scarcity, which is causing global warming.

Erratic monsoons and decreasing groundwater resources will lead to an increase in the cost of water and inequitable access to it and the lack of water resources can hamper the amount of safe water needed by families for Water, Sanitation, and Hygiene (WASH).

Erratic monsoons and decreasing groundwater resources will lead to an increase in the cost of water and inequitable access to it and the lack of water resources can hamper the amount of safe water needed by families for Water, Sanitation, and Hygiene (WASH).

The pressure on water resources is expected to worsen as the frequency and intensity of floods and droughts in India increase. Erratic monsoons and decreasing groundwater resources will lead to an increase in the cost of water and inequitable access to it and the lack of water resources can hamper the amount of safe water needed by families for Water, Sanitation, and Hygiene (WASH).

Access to safe water ensures good health, dignity, and a quality life, and fosters happy communities. India urgently needs to ramp up its efforts to provide WASH services for its ever-burgeoning population as millions still lack access to clean water and toilets, which are basic human rights.

WASH is vital for the survival, growth, and development of individuals, particularly children. In India, 45% of children are stunted, or over 6 lakhs under-five die annually owing to poor water supply and sanitation,

according to a 2013 study by UNICEF and Food and Agriculture Organisation (FAO). To achieve Sustainable Development Goal (SDG) 6's goal of universal and equitable access to safe drinking water, sanitation, and hygiene for all by 2030, we need to take immediate and innovative measures to salvage the problem.

In recent years, there has been a growing emphasis on innovation in the WASH space, with new technologies and approaches emerging to address these critical challenges. With traditional approaches not being able to keep pace with the growing demand for clean water and sanitation services, there is a need for new technology-based, resource-efficient solutions.

While many regions in India face significant water scarcity issues, an assessment by the government's think tank NITI Aayog, done in 2018, states that nearly 70% of all of the country's fresh water — in the ground or on the surface — is contaminated. According to estimates, around 68 per cent of all households and 82% of rural households in India do not have access to treated water. In such a scenario, traditional approaches such as piped water systems and septic tanks are often inadequate or unsustainable. Innovation can help in overcoming these challenges by introducing new solutions that are more efficient, affordable, and long-lasting.

One example of innovation in the WASH space is the use of smart sensors to monitor water quality and usage in real-time. These sensors can detect changes in water quality, identify leaks and blockages in water systems, and provide data to help improve water management and conservation. Another instance could be the use of mobile technology to improve access to sanitation services in rural areas. Mobile apps can help to connect people with local sanitation providers and provide information on safe and sustainable sanitation practices.

Innovation in WASH encompasses not only the introduction of cutting-edge new technologies but also developing new approaches to deliver these services. The creation of social enterprises is one example of an innovative method to addressing the long-term water and sanitation infrastructure demands of water-deprived communities.

However, alongside innovation, it is essential to ensure that these new technologies and approaches are accessible and affordable for everyone, especially those who are most in need. Governments and other stakeholders need to come together to create an enabling environment for innovation in the WASH space by providing the necessary resources, policies, and regulations to support the development and implementation of new solutions.

Institutional innovation at the community level can also play a crucial role in addressing the complex challenges related to WASH. For example, the formation of an efficient village drinking water and sanitation committee (DWSC) can build transparency and sustainability and ensure that all members of a community have access to safe and reliable water,

sanitation, and hygiene services. Such community-led initiatives foster a sense of ownership for WASH facilities, leading to their long-term maintenance.

The Centre's flagship programmes such as Jal Jeevan Mission (JJM) and Swachh Bharat Mission (SBM) aim to provide safe and adequate drinking water to every household in India. Both, JJM and SBM, have provided a plethora of opportunities for both the start-up ecosystem and entrepreneurs to come up with innovative solutions to address the challenges in the WASH sector. For instance, JJM has created a market for products and services related to water supply, such as water quality testing kits, leak detection devices, and water treatment technologies. Similarly, SBM has led to the development of innovative solutions in the sanitation sector, such as low-cost toilets, wastewater and faecal sludge management solutions, and behaviour change communication campaigns.

Underserved communities are beginning to show signs of acceptance and support from sustainable solutions on offer by social enterprises. But to ensure that everyone has access to these new solutions and that they are affordable, governments and stakeholders must work towards creating an enabling environment for these innovations to thrive. Working together, we can improve both the health and well-being of individuals and at the same time promote sustainable development by ensuring that no one is left out.

The article has been authored by Biswanath Sinha, Director, Policy and Technical Support, WaterAid India.

‘Talent, Pure Water, Stable Power’: Minister On Why Micron Chose India

Centre rebuts Congress questions, says will tie up with 104 institutions and over 60,000 youth will be trained in semiconductor engineering.



India News Written by Vasudha Venugopal Updated: June 27, 2023 9:36 am IST

Ashwini Vaishnaw said the first made-in-India semiconductor chip will be produced in 18 months

New Delhi: Not just a few hundred jobs, but the start of an ecosystem to support manufacturing of semiconductor chips, and over 60,000 trained youth – this is how the setting up of a Micron Technology facility at Gujarat's Sanand will pave the way for India becoming a semiconductor

manufacturing hub, Union IT Minister Ashwini Vaishnaw said Monday.

The statement by Mr Vaishnaw, who also holds portfolios of Railways, Electronics and Telecom, came hours after Prime Minister Narendra Modi returned from his first State Visit to the US where the deal, apart from other collaborations on US-India tech transfer, was sealed.

Mr Vaishnaw said the first made-in-India semiconductor chip from the plant will be produced in 18 months, i.e., December 2024. He added that the upcoming Micron plant in Gujarat will be a state-of-the-art plant and contribute to the expansion of the semiconductor ecosystem in India. He said the US-headquartered Micron is the fifth largest company in the space of manufacturing semiconductors that are used in mobiles, laptops, servers, defence equipment, cameras, electric vehicles, trains, cars, and telecom equipment.

Micron Technology has announced that it would set up a semiconductor assembly and testing plant at Sanand. This will see an investment of \$2.75 billion. Out of this, Micron will invest \$825 million, and the rest will be a combination of incentives from the central and state governments. Sanand and India were chosen by Micron from among several options because of the availability of “talent, ultra-pure water and ultra-stable power”, the minister said.

The response came hours after the Congress questioned the need for the centre investing significantly on semiconductor chip manufacturing. The opposition party claimed that the investment was not worth the number of jobs it promised to create.

The Congress said that the “economics was not reasonable and that resources and taxpayers were being misutilised because it was merely assembling and not manufacturing”.

“Taxpayers will have to bear the burden of the remaining investment of about \$ 2 billion. We are investing \$ 2 billion to create 5,000 jobs. That is, the cost of one employment is 4 lakh dollars or 3.2 crore rupees. The economics doesn't make any sense,” Congress spokesperson Supriya Shrinete said.

Mr Vaishnaw said the Congress had attempted to bring the semiconductor industry to the country at least thrice in the past but had failed and was now speaking out of “frustration”.

He said the semiconductor plant was expected to create employment opportunities for thousands of youth and attract a large number of other associated industries, from logistics to storage. This will pave the way for the country emerging as a hub for semiconductor manufacturing in the future, he said.

Calling it the foundational industry of everything from smartphones to trains to TV sets, the minister said that many countries are vying to become the world's next semiconductor hub, but it is the Narendra Modi

government that had succeeded in attracting investments in emerging technology.

“Plasma has a fineness that is a lakh more times than laser... such equipment and components will also be designed in India. The machines ultimately will also be manufactured here, and with the tie-up with 104 institutions, over 60,000 youth will be trained in semiconductor engineering. This will be a force multiplier,” he said.

Calling the semiconductor industry highly complex, cyclical and capital intensive, Mr Vaishnav said the way the electronics industry has grown in India in the last nine years, “the world has confidence that we will be able to do it”.

The minister had earlier said that the government was in talks with nearly half a dozen more semiconductor fabrication, packaging and testing companies that are likely to plan significant investments in the country over a year.

“Good opportunity, But Challenges Ahead”

Experts that NDTV spoke with said it is important for India to take the plunge, as the semiconductor market is expected to double from \$600 billion to one to 1.3 trillion in the next 7 years, and India will also be the largest consumer of semiconductors. The Indian semiconductor market was valued at \$15 billion in 2020 and is expected to reach \$63 billion in the next three years.

An official in the government said the central initiative to push the building of semiconductors was domestically critical for the government’s aim to develop a domestic electronics supply chain so that it can also reduce its imports from foreign countries, specifically China with whom India has seen tensions rise in the last few years.

Last year, the US passed a long-awaited bill aimed at boosting US semiconductor production to increase American competitiveness. This was aimed at addressing a semiconductor chip shortage and making the US less reliant on other countries such as China for manufacturing. The lawmakers had then said that such a measure was also important for national security.

“It is also important for India to have a voice in the sphere of semiconductor geopolitics. A strong logistical network, a robust supply chain, design, technology and value-addition, apart from support to increase our exports to truly emerge as the hub, are as important as manufacturing. Policies too have to be long-term and constantly evolving, depending on feedback from stakeholders,” Arun Kumar, former professor of nano electronics at IIT-Delhi, said.

Groundwater Pumping Tilting Earth’s Spin, May Impact Climate, Says Study

The researchers noted that water’s ability to change the Earth’s rotation

was discovered in 2016, and until now, the specific contribution of groundwater to these rotational changes was unexplored.

SciencePress Trust of India Updated: June 16, 2023 1:08 pm IST



Water’s ability to change the Earth’s rotation was discovered in 2016.

New Delhi: Groundwater pumping has shifted such a large mass of water that the Earth tilted nearly 80 centimetres east between 1993 and 2010 alone, which could impact our planet’s climate, according to a study.

The research, published in the journal *Geophysical Research Letters*, found that during the study period, most water was redistributed in western North America and northwestern India. Scientists have previously estimated humans pumped 2,150 gigatons of groundwater, equivalent to more than 6 millimetres of sea level rise, from 1993 to 2010. However, validating that estimate is difficult.

“Earth’s rotational pole actually changes a lot,” said Ki-Weon Seo, a geophysicist at Seoul National University in South Korea, who led the study. “Our study shows that among climate-related causes, the redistribution of groundwater actually has the largest impact on the drift of the rotational pole,” Mr Seo said.

The researchers noted that water’s ability to change the Earth’s rotation was discovered in 2016, and until now, the specific contribution of groundwater to these rotational changes was unexplored.

The latest study modelled the observed changes in the drift of Earth’s rotational pole and the movement of water—first, with only ice sheets and glaciers considered, and then adding in different scenarios of groundwater redistribution.

The model only matched the observed polar drift once the researchers included 2150 gigatons of groundwater redistribution. Without it, the model was off by 78.5 centimetres or 4.3 centimetres of drift per year. The researchers said attempts by countries to slow groundwater depletion rates, especially in those sensitive regions, could theoretically alter the change in drift, but only if such conservation approaches are sustained for decades.

The rotational pole normally changes by several metres within about a year, so changes due to groundwater pumping do not run the risk of shifting seasons. However, on geologic time scales, polar drift can have an impact on climate, they said.

“This is a nice contribution and important documentation for sure,” said Surendra Adhikari, a research scientist at NASA’s Jet Propulsion Laboratory, US, who was not involved in this study.

Adhikari published the 2016 paper on water redistribution impacting rotational drift.

“They have quantified the role of groundwater pumping on polar motion, and it’s pretty significant,” Mr Adhikari said in a statement.

Adani Green Energy Gets Recognised For Water Conservation

Adani Green Energy Ltd (AGEL): DNV conducted qualitative and quantitative assessment of water balance index for AGEL’s operational sites having greater than 200 MW capacity in Tamil Nadu, Rajasthan, Karnataka, Gujarat and Andhra Pradesh.



Adani Green Energy is the renewable energy platform of Adani Portfolio. (Representational)

New Delhi: Adani Green Energy Ltd (AGEL) today said it has received a recognition for conserving water against consumption.

“AGEL has been certified Water Positive by DNV, an independent global assurance agency. The verification statement signifies that AGEL’s water conservation is greater than consumption,” a company statement said.

DNV conducted qualitative and quantitative assessment of water balance index for AGEL’s operational sites having greater than 200 MW capacity in Tamil Nadu, Rajasthan, Karnataka, Gujarat and Andhra Pradesh.

As per the assessment, the water balance index is 1.12 (positive), surpassing its target to become net water neutral by FY25, way ahead of time.

The verification process entailed sample-based checks and the methodology, measurement techniques, estimation methods, assumptions and uncertainties involved in the process of water accounting as adopted by AGEL.

AGEL has recorded a 99.5 per cent lower freshwater consumption per unit of generation as against 3.5 KL/MWh statutory limit for thermal power in FY23.

Adani Green Energy Limited (AGEL) is the renewable energy platform of Adani Portfolio.

(Except for the headline, this story has not been edited by NDTV staff and is published from a syndicated feed.)

(Disclaimer: New Delhi Television is a subsidiary of AMG Media Networks Limited, an Adani Group Company.)

Shortage In Delhi Water Supply Caused By Algae In Upper Ganga Canal

A DJB official said the production and pumping of clear water from the Sonia Vihar water treatment plant has been affected due to the persistent presence of algae and floating material in the canal’s water.

Delhi NewsPress Trust of India Updated: April 10, 2023 9:35 pm IST



Northeast and South Delhi are affected by the current water shortage. (Representational)

New Delhi: The presence of algae in raw water sourced from the Upper Ganga Canal has led to a disruption in the water supply to the national capital, the Delhi Jal Board (DJB) said on Monday.

A DJB official said the production and pumping of clear water from the Sonia Vihar water treatment plant has been affected due to the persistent presence of algae and floating material in the canal’s water.

The reduced flow of water from the plant is leading to supply shortages in parts of Northeast Delhi, South Delhi and the New Delhi Municipal Council

area, the water utility said in a statement.

The water supply situation is not expected to improve until water without algae is available from Muradnagar, it said.

(Except for the headline, this story has not been edited by NDTV staff and is published from a syndicated feed.)

Nearly 55% of farm land getting irrigation: NITI Aayog's Chand

Agriculture accounts for about 80% of India's available water use of 700 billion cubic metres annually.



New Delhi: More than half of India's cultivated land now has access to assured irrigation, led by an expansion in micro-projects that use water more efficiently. In 2022–23, of the 210 million hectares of gross sown area, about 115 million hectares, or nearly 55%, had irrigation access, up from 47.8% in 2013–14, according to state-run think-tank Niti Aayog member Ramesh Chand.

The monsoon rainfall in June–September, which waters the kharif or summer-sown crops, plays a crucial role in farm production (Mint)

The increase in irrigation cover has been attributed to a massive expansion of land under agriculture, especially in the dryland farm zones of Telangana, Gujarat, Madhya Pradesh and Karnataka and a moderate increase in Uttar Pradesh, Chand told Mint. This is expected to help curb the rising impact of dry summers and patchy monsoons, which are partly linked to the climate crisis.

Agriculture accounts for about 80% of India's available water use of 700 billion cubic metres annually. The monsoon rainfall in June–September, which waters the kharif or summer-sown crops, plays a crucial role in farm production. Agriculture accounts for about 18% of the national economy and is the largest employer.

Since the inception of the Pradhan Mantri Krishi Sinchayee Yojana (PMKSY) in July 2015, the cultivated area under irrigation has been increasing by 1% each year. States are making more investments than the Centre to make the scheme fruitful, Chand added.

With the aim of "Har Khet Ko Paani", PMKSY is being implemented to expand the cultivated area with assured irrigation, reduce wastage of

water and improve water use efficiency. PMKSY focuses not only on creating sources for assured irrigation, but also on creating protective irrigation by harnessing rainwater at micro level through "Jal Sanchay" and "Jal Sinchan". Micro irrigation is also incentivized through subsidy to ensure "Per drop–More crop".

In 2018–19 financial year, a 500 billion worth micro-irrigation fund (MIF) was created with the National Bank for Agriculture and Rural Development (NABARD) to help states mobilise resources. Under the fund, central assistance worth 127 billion has been released to states, out of which 118 billion was utilised in the financial year ended March.

The increase in irrigated area has been driven by five programmes and projects other than PMKSY. These are the Accelerated Irrigation Benefit Programme (AIBP), Har Khet Ko Paani–Surface Minor Irrigation, PMKSY–groundwater projects, special package for Maharashtra, Rajasthan and Srijind feeder and Shahpur–Kandi project.

In Madhya Pradesh, under PMKSY–AIBP, 21 prioritized irrigation projects have been identified; out of which 17 projects have been completed, raising the state's irrigation area by 16%.

Of the total irrigation–infrastructure expansion, micro irrigation facilities through sprinklers and drip systems were installed in 8 million hectares. Out of the total irrigated area in the country, 40% is currently watered through canal networks, and 60% through groundwater, which in several states has shrunk to severely depleted levels, NITI Aayog data show.

India can create irrigation potential in about 60% of its arable land and 40% of the cultivable area will remain dependent on rainfall because it is not possible to create irrigation networks in certain regions because of hydrological and geographical reasons, as per a document of the ministry of Jal Shakti.

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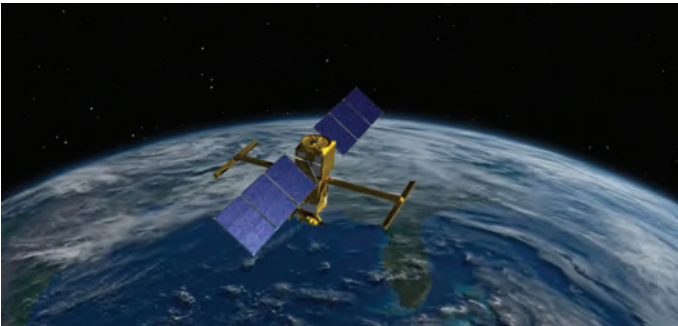
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SWOT Mission: Why This Satellite Is Mapping The World's Water



The first global study of Earth's bodies of water is underway. Learn why it's important and about the satellite making it possible.

From wildfires to record-setting unseasonable temperatures – extreme weather events are becoming more severe and frequent.

Globally, the intensity of extreme droughts and rainfall increased “sharply” over the past 20 years, according to a study published in *Nature Water* journal in March using data from GRACE and GRACE-FO satellites.

In the western US, warmer and drier conditions, a byproduct of climate change, have led to longer-lasting fire seasons – causing fires to burn over larger areas in recent decades, according to the National Oceanic and Atmospheric Administration. The 2021 winter storm in Texas that, at its height, left nearly 10 million people without power; the 2022 summer heatwaves in Europe, leading to more than 20,000 heat-related deaths; and the recent Canadian wildfires are just a few of many examples of the increasing intensity of extreme weather events.

Getting a deeper look into Earth's oceanography – the study of the oceans and their properties – can help scientists, researchers and policymakers better understand climate change and the water cycle and better predict and respond to natural disasters such as floods and droughts.

That's why the Surface Water Ocean Topography (SWOT) mission is underway. A joint mission developed by NASA and the French Space Agency, with contributions from the Canadian Space Agency and the United Kingdom Space Agency, SWOT launched into space in 2022 and is orbiting Earth. Over the next few years, the satellite will obtain the most comprehensive view of the world's surface water.

SWOT mission fast facts

What: The SWOT mission is providing the first global, complete look at the Earth's oceans, the land and freshwater resources, and the water supply-demand chain. It will survey at least 90% of the world's surface water and take measurements 10 times more accurately than any previous Earth-observation satellite.

When: The SWOT satellite was launched in December 2022. The satellite will orbit the Earth for at least three years to get all of its measurements. NASA shared its first findings publicly in March.

The impact: The findings from SWOT will benefit any decision-making that involves water management, according to NASA's Jet Propulsion Laboratory – from wildlife area monitoring and coastal protection to hydropower. The mission will help improve our ability to predict and respond to natural disasters such as floods and droughts, as well as reveal previously unseen details about Earth's water due to the high-definition quality of the SWOT satellite images.

The 'heart' of the satellite

One of the features of SWOT that sets it apart from other satellites is one of its instruments: the Ka-band Radar Interferometer (KaRIn).

KaRIn is designed to measure detailed changes in water surface height from space. It does this by transmitting radar pulses (similar to how your phone uses radar to get WiFi) and receiving signals with its two antennas – measuring the phase and time of those returned signals.

Part of the KaRIn instrument is a technology known as the Ka-Band Radio-Frequency Duplexer, which was built by Honeywell engineers for NASA. The Duplexer built by Honeywell teams is part of the radio frequency subsystem produced by Thales Alenia Space.

The KaRIn instrument shows a resolution that's 10 times higher – in other words, significantly more detailed – than instruments on seven other satellites, according to NASA. The NASA Jet Propulsion Laboratory, which is leading the SWOT mission, calls the instrument the “scientific heart” of the satellite.

SWOT's findings so far

NASA released some of the first findings from the SWOT satellite in March, revealing views of the Gulf Stream – the current that brings warm water into the Atlantic Ocean from the Gulf of Mexico – in previously unseen detail. It also revealed a map of Long Island, New York, showing clearer-than-ever water elevation features of the area.

Curious about space exploration and satellites? Learn more about how innovations from Honeywell engineers have powered space projects since the 1950s.

Image credit: NASA/JPL-Caltech

Frontline health facilities faltering without water, sanitation, hygiene and electricity – WHO, UNICEF new report

13 June 2023 Departmental news Reading time: 3 min (900 words)

Worldwide, millions of lives could be saved and billions in economic losses prevented through one simple, affordable intervention: water, sanitation, and hygiene (WASH) services in health care facilities.



Safe WASH services enable life-saving infection prevention and control practices, curb the spread of antimicrobial resistance, and help in delivering quality primary health care services to all. Yet, actions taken in countries are insufficient, according to a new report by the World Health Organization (WHO) and UNICEF (United Nations Children's Fund) released today.

Water, Sanitation, Hygiene, Waste and Electricity Services in Health Care Facilities: 2023 Global Progress Report highlights that an estimated 8 million people die annually in 137 low- and middle-income countries from poor-quality health care, resulting in US\$6 trillion in economic losses from poor health and premature mortality.

WASH, waste and electricity services are major contributors to high quality health care. Interventions such as improving availability of hand hygiene and drinking water stations, regular cleaning, functioning toilets and regular on-site water supply can greatly help in improving health services, staff performance and in respecting the dignity of health care facility users.

"We are often given the excuse that public health problems are too costly to fix, but we now understand that providing basic WASH and energy to health care facilities is both non-negotiable and affordable," said Dr Maria Neira, WHO Director for Environment, Climate Change and Health. "We have no excuses and time is running out. Basic infrastructure is a prerequisite to quality of care and is essential for life-saving practices." On average, basic WASH services cost only 60 US dollar cents per person each year in the least developed countries, or just 6% of current annual least developed government health spending. As the risk of future pandemics, climate change, and geopolitical insecurity and conflict increases, investment is more critical than ever. Yet, currently, just 12% of all countries have more than 75% of funds needed to reach targets for WASH in health care facilities.

WASH, waste and electricity services more generally have critical impacts on the health of mothers and babies during childbirth. Lack of services increases the risk of infection, particularly sepsis, which can be deadly for children and mothers. More than 1 million women and girls indicated that WASH services are their second most important demand for quality reproductive and maternal health, after dignified and respectful care.

"Latest data reveals that 5 million children lost their lives before their fifth birthday from preventable causes, half of which were newborns," said Cecilia Scharp, UNICEF Director of Water, Sanitation, and Hygiene and Climate, Energy, Environment and DRR. "Many of these deaths are preventable by a solution as simple as safe water and soap. Safely

managed water and sanitation services where babies are born will help to save the lives of millions of children and mothers each year."

Approximately 43% of the newborn deaths occurred in sub-Saharan Africa, where only half of health care facilities have a water source on site. In addition, global progress in reducing maternal mortality stalled between 2016 and 2020. If the world continues on this trend, it will miss the Sustainable Development Goal target to reduce preventable maternal mortality, costing more than 1 million lives by 2030.

An online tracking mechanism is providing valuable insights on where country progress is greatest, with over 70% of 73 reporting countries having established baseline data, updating and implementing health care waste and WASH standards, including with a climate resilience focus. However, less than 1 in 5 countries have undertaken national infrastructure improvements or are tracking and using WASH data within health management information systems.

WHO and UNICEF call on countries and partners to implement the following recommendations in order to rapidly improve WASH, waste, and electricity services in health care facilities:

Addressing financial obstacles;

Integrating WASH, waste and electricity services into health planning; Developing and empowering the health workforce to deliver and maintain WASH, waste and electricity services, and practising good hygiene; and Strengthening accountability by regularly monitoring and reviewing progress.

WHO and UNICEF are co-hosting a Global Summit on Water, Sanitation, and Hygiene (WASH), waste and electricity services in health care facilities in Amman, Jordan, today. The event is attended by representatives from over 30 countries, providing a vital platform to discuss the report's findings with the aim to consolidate country insights and to create an opportunity for health leaders to strategize on implementing key recommendations and scaling up solutions.

About WHO

Dedicated to the well-being of all people and guided by science, the World Health Organization leads and champions global efforts to give everyone, everywhere an equal chance at a safe and healthy life. We are the UN agency for health that connects nations, partners and people on the front lines in 150+ locations – leading the world's response to health emergencies, preventing disease, addressing the root causes of health issues and expanding access to medicines and health care. Our mission is to promote health, keep the world safe and serve the vulnerable.

About UNICEF

UNICEF works in some of the world's toughest places, to reach the world's most disadvantaged children. Across more than 190 countries and territories, we work for every child, everywhere, to build a better world for everyone.



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Incinerators



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Water Sustainability in Urbanized Cities: How Big is the Challenge and What Could be the Pathways?

Introduction

Urbanization and industrialization are the primary aspect of development, that comes up with several challenges. Urbanization occur with the migration of population and industrialization with the growth prospects sometimes allows the unplanned proliferation of human settlement. These changes have significant impact upon the hydrological, environmental, water demand and quality and energy consumption (Paul et al., 2018). The significant growth of population especially in urban centre forcing the modifications in land use land change (LULC) categorization. The built-up area of Capital of India (Delhi) has changed from 769.26 sq.km. in 1990 to 1212.73 sq.km. in 2015 (Naikoo et al., 2020) and expected to increase rapidly with the increase in population (Sharma and Joshi, 2013).

The tremendous extraction of freshwater, discharge of domestic and industrial untreated wastewater into rivers, dumping of solid waste on nonengineered landfill sites, percolation of leachate to groundwater, conversion of forest land is the common after impacts of uncontrolled urbanization, intensive agricultural activities, industrial access. Urban expansion has deteriorated the quality of groundwater as a result of the infiltration form sewer and storm, industrial activities, waste disposal and use of fertilizers (Hua et al., 2020).

Delhi is one of the biggest cities of India, attract several people from other parts of country

and experiencing exponential increase in population, energy demand and overstressed basic amenities. The large part of Delhi's population is still not connected with the sewerage system. More than 73% population of Northeast district of Delhi are relying on the septic tanks, 40% of population living in South district of Delhi are not connected with adequate sewerage system (Aijaz, 2020).

and activities of water consumption is shown in Figure 1. The annual groundwater extraction is 0.39 billion cubic meters (BCM) whereas the net annual recharge is 0.29 BMC as reported by Central Ground Water Board (CGWB, 2014). As per Delhi Jal Board (DJB), Delhi's water requirement is 172 lpcd to meet the domestic demand, whereas another 102 lpcd is required to meet the commercial, industrial and fire

The sewerage connections are extended up to all the planned areas, 557 unauthorised but regularised colonies, 384 unauthorised colonies, 130 urban villages, 54 rural villages, and 44 resettlement colonies.

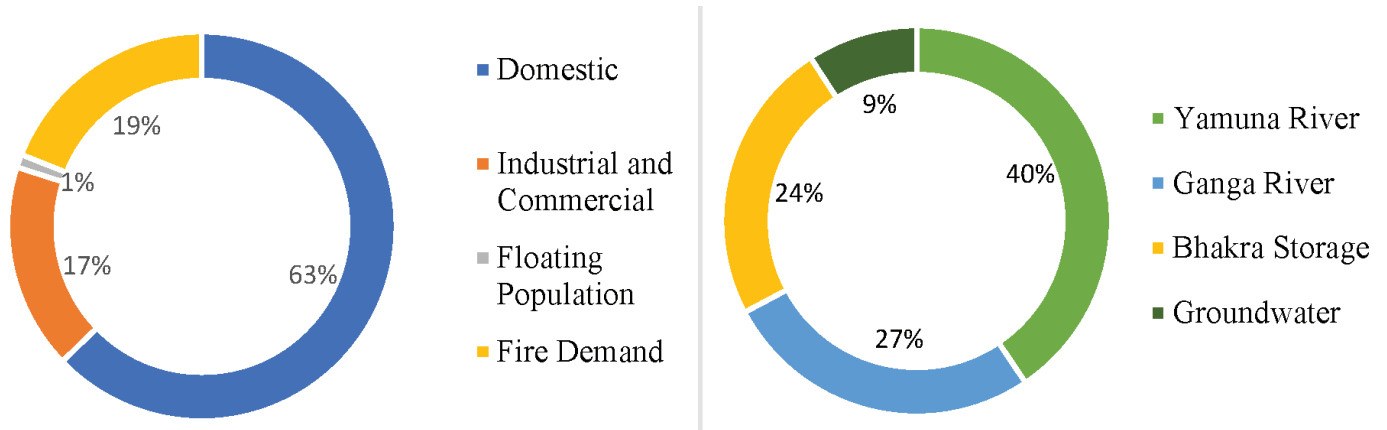


Figure 1: Water consumption and sources in Delhi

Slums and communities in the outskirts of Delhi are dumping their wastewater directly into nearby drains, which further contaminate the surface and groundwater resources.

Water Supply and Treatment

The main surface sources of water supply for Delhi are the rivers Yamuna and Ganga. Apart from these sources there are three additional canals; Agra, Hindon and Western Yamuna that are fed by the reservoir of the Bhakra–Nangal Dam (Ghosh et al., 2019). Delhi receives a per day supply of 1.49 million cubic meters (MCM) from river Yamuna, 0.94 MCM per day from river Ganga and nearly 1 MCM per day from the reservoir of the Bhakra–Nangal Dam. The water in river Yamuna is highly polluted and in order to meet the water requirements, groundwater resource is utilised. The sources

demand of the city. The cumulative load of water supply considering the guidelines specified in manual of water supply and treatment is 274 lpcd (CPHEEO, 1999). Therefore, total water required to feed the population of Delhi is 5617 MLD, whereas total water received by Delhi Jal Board (DJB) from various sources is 4260 MLD, which is only 75.8% of the total demand.

In the last one decade (2009 – 2019), the water treatment capacity has increased only 12%, whereas the supply from groundwater sources (Ranney wells and Tube wells) has reduced by 15%, which is further expected to reduce due to decline in groundwater table in Delhi. Surface water sources which account for the 91% of total supply are also under significant pressure due to impairing water quality of rivers. The cumulative supply from

The reduction in the disposal of wastewater into drains and river, would also improve the water quality of river in the downstream area.

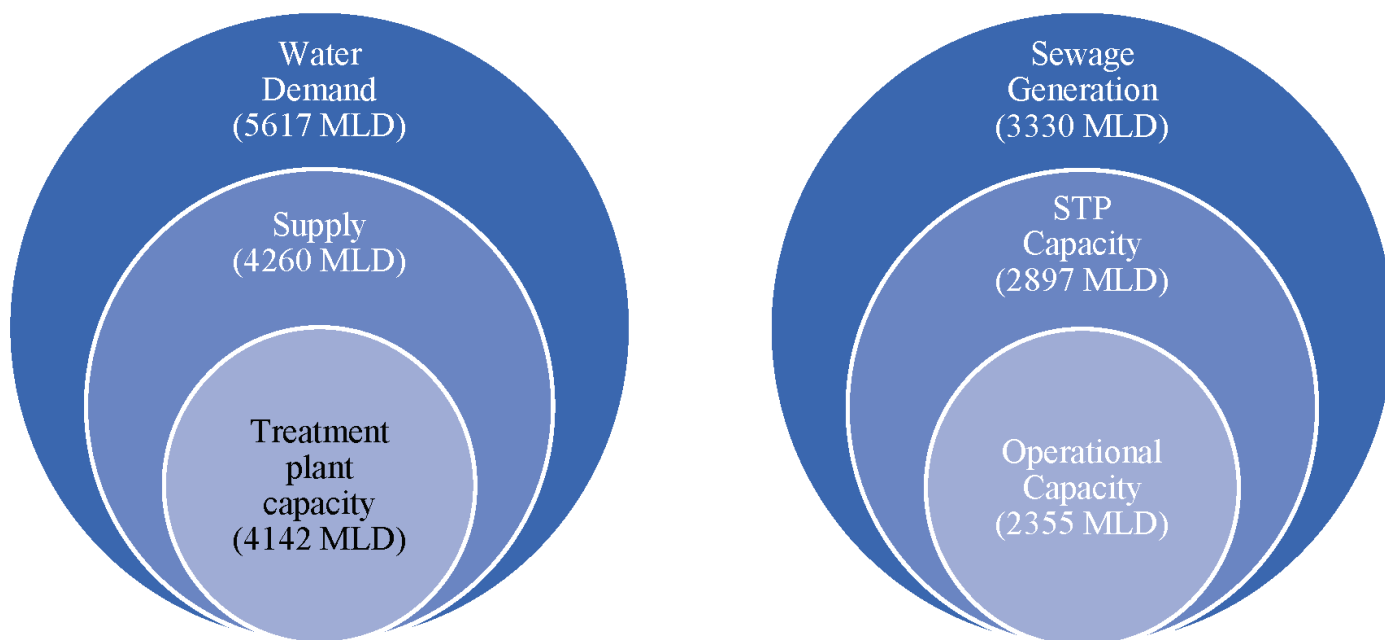


Figure 2: Gap in water and wastewater demand and supply

different sources only makes 75.84% of total demand of fresh water and 97.2% of which is being treated through various water treatment plants, as shown in Figure 4. Total gap of 26.26% is the primary reason for intermittent supply, low water pressure in areas away from treatment plant, and water theft.

Wastewater treatment and disposal

The scenario of wastewater treatment is more dreadful as till the large part of population is not connected with the sewerage system. The large number of colonies established in Delhi are not planned adequately, unauthorised, unauthorised but regularised. The sewerage connections are extended up to all the planned areas, 557 unauthorised but regularised colonies, 384 unauthorised colonies, 130 urban villages, 54 rural villages, and 44 resettlement colonies. The total length of sewerage network of pipe is more than 8400 km long, however, only covers the 78% population of the city. The wastewater generated from the rest of the authorised colonies (1797 unauthorised colonies) directly discharged into wastewater drains and ultimately joins the river and degrades the water quality. The operation of sewage treatment plant (STP) was analysed to identify the primary cause of water pollution.

Most of the operational STPs in Delhi are not working to full capacity due to either low inflow diversion through pumping station or less available inflow through sewerage system. Adequate maintenance, timely cleaning and replacement of defunct parts are the prime requirements to maximize the performance of STPs. The maximum reduction in treatment capacity were observed in STPs older than three decades. The status of all the STPs commissioned in Delhi are shown

in Table 1. The age of the STP is the prime cause of lower operational capacity. The performance of treatment plant also reduces with the time if not maintained properly and affects the output characteristics of wastewater. The low flow in trunk and peripheral sewers and STPs is major reason for the low operational capacity of newly built STPs. Most of the STPs are based on activated sludge process (ASP) followed by extended aeration (EA). The sequential batch reactor (SBR) is being adopted for some new plants. The STPs working on SBR are expected to produce excellent effluent characteristics compared to other treatment techniques. The performance of the STPs is analysed by collecting the daily data of various STPs for one year (2020–2021), as shown in Table 2. Most of the STPs found working effectively and discharging the effluent within the standard discharge limits. Coronation Pillar Phase I and II, Coronation Pillar Phase III, Pappankalan Phase I and Rithala Phase I were found discharging high BOD, however COD was within the limits. Kesopur Phase II and Kesopur Phase III were found discharging high BOD and COD. Even TSS was found high in effluent compared to disposal standards. The low maintenance and replacement of defunct parts (electro–mechanical equipment) are the prime reason for the deprived performance of STP. The treated wastewater from STP discharged in to drains, where it gets mixed with the untreated wastewater from unauthorised colonies, non–point sources and industrial areas and deteriorate the water quality substantially. The degraded wastewater from multiple drains enters Yamuna River and diminishes the dissolved oxygen of river to zero at the downstream of Wazirabad barrage, where river have minimum flow. The joining of subsequent drains further retards the water quality and characteristics of Yamuna River become equivalent to drain characteristics.

Table 1: Status of sewage treatment plants installed in Delhi

S.No	Location of STP	Date of Commissioning	Status	Capacity (MLD)	Operational Capacity (MLD)	Percentage Reduction	Technology
1	Mehrauli	2003	Operational	22.73	18.91	16.81	EA
2	Okhla Phase II	1983	Operational	54.55	27.24	50.06	ASP
3	Okhla Phase III	1993	Operational	168.2	145.8	13.32	ASP
4	Okhla Phase IV	1993	Operational	204.57	176.6	13.67	ASP
5	Okhla Phase IV	2001	Operational	72.74	63.5	12.70	ASP
6	Okhla Phase VI	2012	Operational	136.38	120.5	11.64	ASP
7	Molarband	2003	Operational	3	2.3	23.33	FAB
8	Sen Nursing Home	1998	Operational	10	10	0.00	ASP
9	Vasant Kunj Phase I	1998	Operational	10	7.7	23.00	EA
10	Vasant Kunj Phase II	1998	Operational	13.64	7.3	46.48	EA
11	Ghitorni	2016	Operational	22.73	2.5	89.00	ASP
12	Delhi Gate old	1998	Operational	10	10	0.00	ASP
13	Delhi Gate new	2016	Operational	68.19	68.19	0.00	ASP
14	Kondli Phase II	1999	Operational	113.65	113.5	0.13	ASP
15	Kondali Phase IV	2013	Operational	204.57	204.57	0.00	ASP
16	Chilla	2014	Operational	40.91	40.91	0.00	ASP
17	Yamuna Vihar Phase I	1998	Operational	45.46	45.46	0.00	ASP
18	Yamuna Vihar Phase II	2002	Operational	45.46	45.46	0.00	ASP
19	Yamuna Vihar Phase III	2015	Operational	113.65	113.65	0.00	ASP
20	Akshardham	2010	Operational	4.55	0.5	89.01	MBR
21	Coronation Pillar Phase I and II	2000	Operational	90.92	90.92	0.00	ASP
22	Coronation Pillar Phase III	2001	Operational	45.46	38.59	15.11	ASP
23	Narela	2000	Operational	45.46	18.16	60.05	ASP
24	Rithala Phase I	1991	Operational	90.92	90.92	0.00	ASP
25	Rithala Phase II	2001	Operational	181.84	181.84	0.00	ASP
26	Rohini	2002	Operational	68.19	22.7	66.71	ASP
27	Kesopur Phase I	1957	Operational	54.55	54.55	0.00	ASP
28	Kesopur Phase II	1975	Operational	90.92	90.92	0.00	ASP
29	Kesopur Phase III	1990	Operational	181.84	181.84	0.00	ASP
30	Nilothi Phase I	2002	Operational	181.84	68.1	62.55	ASP
31	Nilothi Phase II	2015	Operational	90.92	90.92	0.00	SBR
32	Najafgarh	2002	Operational	22.73	11.35	50.07	EA
33	Kapaspha	2014	Operational	22.73	8.17	64.06	SBR
34	Kondli Phase I	1987	Under rehabilitation	45.46	0	100.00	ASP
35	Kondli Phase III	2001	Under rehabilitation	45.46	0	100.00	ASP
36	Coronation Phillar Old	1957	Under rehabilitation	90.92	0	100.00	ASP
37	Pappankalan Phase I	2002	Operational	90.92	90.92	0.00	ASP
38	Pappankalan Phase II	2015	Operational	90.92	90.92	0.00	SBR

Table 2: Annual average of wastewater characteristics at the outlet of STPs

S.No	Location of STP	pH	TSS	BOD	COD
1	Mehrauli	7.6	23	14	50
2	Okhla Phase II	7.2	32	15	60
3	Okhla Phase III	7.7	33	16	60
4	Okhla Phase IV	7.7	45	21	80
5	Okhla Phase IV	7.7	30	16	60
6	Okhla Phase VI	7.7	6	5	20
7	Molarband	7.6	13	13	30
8	Sen Nursing Home	7.7	7	5	20
9	Vasant Kunj Phase I	7.7	19	12	40
10	Vasant Kunj Phase II	7.8	13	8	20
11	Ghitorni	7.7	37	19	70
12	Delhi Gate old	7.7	8	6	20
13	Delhi Gate new	7.8	6	5	20
14	Yamuna Vihar Phase I	7.4	34	24	132
15	Yamuna Vihar Phase II	7.4	26	17	144
16	Yamuna Vihar Phase III	7.5	41	29	149
17	Coronation Pillar Phase I and II	7.2	52	55	156
18	Coronation Pillar Phase III	7.6	68	66	224
19	Narela	7.4	32	22	124
20	Rithala Phase I	7.2	105	80	170
21	Rithala Phase II	7.3	12	10	30
22	Rohini	7.6	24	14	90
23	Kesopur Phase I	7.7	17	12	34
24	Kesopur Phase II	7.6	84	104	290
25	Kesopur Phase III	7.5	142	113	453
26	Nilothi Phase I	7.4	78	55	236
27	Nilothi Phase II	7.4	12	7	28
28	Najafgarh	7.8	24	18	76
29	Kapasphera	7.6	8	5	20
30	Pappankalan Phase I	7.7	108	54	170
31	Pappankalan Phase II	7.5	6	5	28

The large number of small and medium scale industries operate in Delhi and induce significant pressure on the wastewater drains by discharging untreated or partially treated industrial discharge. It is mandatory for all the water polluting industries to treat the industrial effluent in effluent treatment plant (ETP) before discharging it in common effluent treatment plant. Discharge of industrial effluent without any treatment to open drains and bypassing the common effluent treatment plant (CETPs) are the primary reason for the degradation of water quality of river, as the drains ultimately joins Yamuna River. The large number of industries are operating in Delhi from 24 industrial areas having specific type of industries dominantly in each cluster. To treat the effluent from those industries, 13 CETPs are installed in industrial areas. However, none of the CETP is receiving effluents from industries up to their designed capacity of treatment. The low flow in CETPs also hampers the operational characteristics and reduces the efficiency of the plant. Out of the 13 CETPs, only 3 CETP operating at Bawana, Narela and Mangolpuri receiving more than 50% of the flow compared to design capacity. Minimum flow was observed at Okhla and Wazirpur, receiving less than 10% of flow against the designed capacity. Unavailability of sufficient flow is the primary reason for low efficiency of treatment plants. The untreated wastewater from industrial area which could be several times severe than the domestic wastewater and mixing of such untreated wastewater with drain or river, deteriorate the water quality tremendously.

Table 3: Status of common effluent treatment plant (CETP) installed in Delhi

S.No	Location of CETP	Status	Capacity (MLD)	Annual average flow received (MLD)	Percentage Gap
1	Wazirpur	Operational	24	1.705	92.90
2	SMA	Operational	12	1.704	85.80
3	Okhla	Operational	24	1.548	93.55
4	Naraina	Operational	21.6	4.379	79.73
5	Lawrence Road	Operational	12	1.295	89.21
6	Bawana	Operational	35	19.120	45.37
7	Badli	Operational	12	1.424	88.14
8	GTK	Operational	6	1.208	79.86
9	Mayapuri	Operational	12	2.252	81.23
10	Narela	Operational	22.5	11.515	48.82
11	Nangloi	Operational	12	2.651	77.91
12	Mangolpuri	Operational	2.4	1.563	34.89
13	Jhilmil	Operational	16.8	3.403	79.75



Conclusion

Reduction of freshwater requirement and minimum withdrawal of fresh water are the primary objective of water sustainability in Delhi considering the low flow in Yamuna River and increasing water demand of city. The utilization of effluents after treatment for irrigation of crops (except vegetables) may reduce the load on groundwater.

The reuse of effluents would minimize the burden on freshwater resources, reduce the organic and nutrient load from rivers and maintain the nutrient concentration in agricultural fields. The reduction in the disposal of wastewater into drains and river, would also improve the water quality of river in the downstream area.

The provision of sewerage network and planned habitation could also improve the water quality significantly. The wastewater from

the unauthorized colonies can be tapped easily with the installation and commissioning of sewerage system. All the open drains heading towards river would carry the treated water would also reduce the soil contamination due to the percolation of impurities.

The performance of pumping stations should be monitored precisely to transfer all the sewage to STPs, and characteristics of influents should be monitored on daily basis to identify the adequate doses of chemical and aeration time of plant. Monitoring of influents characteristics and changes in treatment process concerning the variation of characteristics would push the STP to comply with the stream disposal norms. STPs should be equipped with the tertiary treatment techniques to minimize the pathogens concentrations from wastewater and comply with the norms of recycled water. The tertiary treatment would also support the reuse of effluent for irrigation.



Anil Sethi

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About the author: Anil Sethi, the Founder Chairman of Pump Academy Private Limited, brings extensive expertise in the water sector. He established the company with the vision of offering innovative solutions to water utilities, aiming to transform pumping stations into technologically advanced, automated, and responsive entities with robust processes. His remarkable contributions to nation building initiatives have earned him widespread recognition, with numerous awards honouring his achievements in the industry.

Maximizing Efficiency: Effective Use of Pumping Stations

Water is indeed a precious resource, essential for human survival and plays a crucial role in various industrial processes thus also vital for business and economy. With unsustainable practices and mismanagement of water resources, the human survival is at stake while businesses and economies face significant risks. However, the challenges associated with managing water resources have intensified due to several factors, including population growth, urbanization, and changing climate patterns.

Pumping stations play a crucial role in water management systems, ensuring the efficient transfer of water from one location to another. Whether it is for urban water supply, irrigation, or wastewater management, the effective use of pumping station is essential for maintaining a reliable and sustainable water infrastructure. It has a critical role in both municipal water supply systems and various industries, serving as a vital means of efficiently transporting water and other liquids to ensure human consumption and support production processes.

In the context of a changing water scenario, it is crucial to focus on key aspects of effectively utilizing pumping stations to maximize their efficiency and optimize their performance to adapt to evolving water conditions.

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Efficient operation of pumping stations requires careful consideration of several key factors:

Understanding Pumping Stations

Pumping stations are series of pumps and associated equipment designed to move water against gravity over long distances. Choosing the appropriate pump type and size for the specific application is crucial. Factors such as flow rate, head requirements, and

the characteristics of the fluid being pumped should be the criteria for the selection. Pumps also facilitate controlling friction losses in pipelines and maintain proper water levels in reservoirs.

Selection of Design and Size

One of the most important factors in optimizing pumping station performance is the selection and size of pumps. The consideration of correct

With a commitment to driving innovation in the pumping industry, Pump Academy has unveiled iPUMPNET as a pioneering solution for efficient pumping station management.



Industrial Liquid Supply Pumping System



The deployment of iPUMPNET across all water pumping stations in India is expected to yield a significant reduction of approximately 3.06 million tonnes in carbon emissions. This achievement would make a substantial contribution towards realizing the visionary goal of achieving Net-Zero Emissions in India by 2070, as envisioned by the Hon'ble Prime Minister.

size is important for ideal flow rates, head requirements, and system pressure to determine the appropriate pump capacity and configuration. Proper pump selection ensures that the station operates at its peak efficiency, minimizing energy consumption and reducing operational costs. By conducting thorough hydraulic analyses and accurately assessing system demands, designers can ensure that pumping stations are adequately sized for optimal performance. It is essential to consult with experts and engineers to determine the most suitable pump type and size for a specific application.

Pumps Monitoring and Control

Implementing a comprehensive monitoring and control system is essential for optimizing the performance of pumping stations. Real-time data on variables like flow rate, pressure, and power consumption allow operators to identify potential issues and make informed decisions for system optimization. Routine inspections of pumps, motors, valves, and associated equipment help identify and address any potential issues before they escalate, minimizing downtime and maximizing the station's operational lifespan.

With technology revolutionizing the way pumping stations are managed, automated controls, remote monitoring, and alarm systems enable timely responses to abnormal conditions, receive real-time

alerts, and remotely adjust settings as needed to minimize downtime and preventing costly failures. This allows for proactive response to changing conditions, timely maintenance interventions, and efficient troubleshooting, ultimately enhancing operational effectiveness.

Energy Efficiency and Control Systems

With increasing concerns about energy conservation, implementing energy management strategies can contribute to efficient pumping station operation. This includes energy audits, energy-efficient motor systems, and the use of renewable energy sources. Given the escalating energy costs and increasing concerns about global warming and reducing carbon emissions, prioritizing the implementation of energy-efficient practices in pumping stations has become imperative.

Utilizing variable frequency drives (VFDs) can help control pump speed and optimize energy consumption based on demand. Moreover, integrating advanced control systems that utilize real-time data and predictive analytics can further enhance operational efficiency, allowing for proactive maintenance and better decision-making.

Preventive Maintenance

Regular maintenance of pumping station is essential for ensuring their optimal performance and longevity. Establishing a preventive maintenance schedule that includes pump inspections, lubrication, testing and calibration, seal and gasket replacements, electrical system inspection and motor servicing is essential. Proper maintenance reduces the risk of unexpected breakdowns, ensures efficient operation, helps extend lifespan of equipment, reduces energy consumption, and contributes to overall cost savings.

Redundancy and Reliability

Pumping stations are critical components of water supply systems, and downtime can have significant consequences. Incorporating redundancy measures, such as backup pumps and power supply, helps ensure uninterrupted operation in the event of equipment failure or power outages. A robust and reliable pumping station design includes redundancy as a fundamental element to minimize disruptions and improves overall system reliability.

A reliable pumping station ensures a consistent water supply or uninterrupted industrial processes, avoiding disruptions that can impact human consumption, production, or critical operations resulting in end users' satisfaction.

Pump Academy Endeavour

With a wealth of experience in installing over 400 pumping stations of varying capacities across India, coupled with extensive research into their functioning, operation, and maintenance, we embarked on a mission to transform the landscape of pumping systems. This endeavour led to the establishment of Pump Academy Private Limited (PAPL), a pioneering company dedicated to promoting innovation and harnessing digital technologies to enhance the efficiency of pump operation and maintenance.

With deep understanding of the challenges faced by pumping systems, Pump Academy recognized the need for a paradigm shift in the way these systems are managed. Traditional approaches often resulted in inefficiencies, high maintenance costs, and limited control over pump performance. Determined to change this scenario, we set out to revolutionize the industry.

Pump Academy, a trailblazer in pumps optimization in India, has introduced a groundbreaking solution called iPUMPNET, a patented IoT-enabled system designed to optimize the management of pumping stations. Harnessing the power of digital technologies, iPUMPNET enables intelligent pump monitoring, remote control, and real-time data analysis. The advanced system offers invaluable insights into pump performance, facilitating proactive maintenance, energy optimization, and minimizing downtime.

Recognizing the alarming fact that pumping systems consume a significant proportion, ranging from 25% to 50%, of the total electrical energy usage, we set out on a mission to address this concern. Our goal is to enhance energy efficiency and make existing pumping systems smarter by implementing iPUMPNET solutions, which not only aimed at reducing energy consumption and optimizing pump performance, but significantly reducing carbon emission of pumping systems. Based on conservative estimates, the deployment of iPUMPNET across all water pumping stations in India is anticipated to lead to energy savings of approximately 5 GW. This substantial reduction in energy consumption showcases the significant impact that iPUMPNET solution can have in enhancing energy efficiency within the pumping infrastructure.

Conclusion

In India, water pumping stations face various challenges, including aging infrastructure, energy consumption, water losses, water quality, and disaster preparedness. Addressing these challenges requires a proactive approach, regular maintenance, and the adoption of innovative technologies. By investing in upgrades, implementing efficient practices, and focusing on resilience, water pumping stations can overcome these challenges and continue to provide clean and reliable water to the people and industries.

By focusing on proper design and sizing, regular maintenance, energy efficiency measures, remote monitoring, and system reliability, water utilities and industries can maximize the performance and lifespan of these crucial infrastructure facilities. Embracing advancements in technology and sustainable practices will pave the way for more efficient and environmental friendly pumping station operations in the future.

With the introduction of iPUMPNET, Pump Academy has revolutionized pump station management in India. By leveraging technological innovation, it has managed to change the existing scenario offering the best possible solutions to make these systems intelligent and smart. iPUMPNET represents a significant leap forward in pump system management, improving operational efficiency, and setting new industry standards.



Clean Water Sources

Water Resilience: Strategies for a Sustainable Future

Water! Not just a buzzword; it serves as an urgent wake-up call, demanding immediate action for the sake of our own survival.

Globally, 2.2 billion people lack access to safely managed drinking water, and more than 4.2 billion people lack safely managed sanitation. The importance of water resilience and responsible water use has become increasingly crucial. Climate change is further aggravating the situation, with increasing droughts in some regions where other places getting inundated by heavy flooding creating natural disasters. Alarmingly, 80 per cent of wastewater in the world flows back into water bodies without being treated or reused, and 70 per cent of the world's natural wetland has been lost. Water pollution is another critical issue. Municipal and industrial waste, agricultural runoff, and inadequate disposal of chemicals and other harmful waste products are contaminating water sources, making them unsafe for human consumption and harming ecosystems. Water pollution poses greater risk to human health when contaminated water is consumed or used for daily activities, leading to 1.4 million premature deaths in a year.

Water Scarcity

Water scarcity is a significant concern in many parts of the world. Some regions experience chronic water shortages due to factors such as population growth, climate change, and inefficient water



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About the author:

With a distinguished background in media, he has dedicated a significant portion of his career to the water sector. As the Chief Strategist at TS Advisory Services, he has played a pivotal role in developing, evaluating, and defining marketing and communication strategies across various industries. His extensive knowledge and strategic acumen have proven instrumental in driving growth and success in the ever-evolving landscape of the water sector.

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management practices. Lack of access to clean drinking water and sanitation facilities can have severe health and social consequences.

According to a report by the World Wide Fund for Nature (WWF), around a hundred cities worldwide, including 30 in India, are at risk of experiencing “severe water scarcity” by the year 2050. The report states that these cities would face a significant water risk due to urbanization trends and substantial population growth. Among the cities facing this challenge are prominent global hubs such as Beijing,

affected especially during the summer months.

Water & Climate Change

In the face of climate change, water emerges as the key conduit through which its impacts will be deeply felt. As climate change and rising sea levels persist, the frequency and intensity of natural disasters are projected to escalate in the coming decades which will have unprecedented consequences on nations’ economies, environment and ecological systems and people’s livelihoods. With this dire scenario aggravating year after year,

Water resilience is not just the ability to bounce back from any disaster but also the ability to weather and recover from shocks and adapt to deal with future stress.



Jakarta, Johannesburg, Istanbul, Hong Kong, Mecca, and Rio de Janeiro.

India’s NITI Aayog stated that the states of Maharashtra, Gujarat, Karnataka, Jharkhand, Andhra Pradesh, Rajasthan, Uttar Pradesh, Punjab, and Delhi have been facing serious water scarcity since 2018. More than 330 million people in urban India are affected due extreme scarcity of fresh water and majority of them living in large and metropolitan cities like Bengaluru, Chennai, Delhi, and Hyderabad. They are already facing the ‘Day Zero’ scenario wherein most of their water supplies are

prioritizing resilient water management has become an exceptionally urgent and pivotal aspect of climate adaptation.

Asia and the Pacific is the most disaster-prone region in the world embracing nearly 45 per cent of the world’s natural disasters and more than 75 per cent of those affected by natural disasters globally live in the region, according to United Nations Population Fund. Estimated 1.4 billion people were affected by disasters in the region, while 500,000 people lost their lives nearly 60 per cent of total global disaster deaths.

30 Indian cities are at the risk of experiencing “severe water scarcity” by 2050.

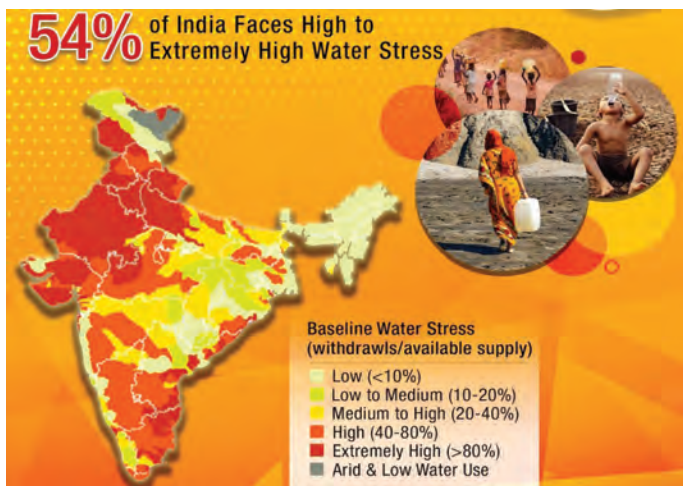


Extreme weather events such as hurricanes, cyclones, and heavy rainfall are also intensified in many regions due to climate change. The frequency of such events have increased causing irreparable destructions like flooding, damaging infrastructure, contaminating water sources, and posing risks to human lives. Melting glaciers and ice caps contribute to rising sea-level threatening coastal areas and increasing the risk of saltwater intrusion into freshwater sources. This pose challenges for communities dependent on coastal ecosystems and small island nations vulnerable to the impacts of increasing sea levels.

Mitigation efforts to reduce greenhouse gas emissions are also essential to curb the impacts of climate change on water resources. This involves transitioning to clean and renewable energy sources, reducing carbon emissions, and promoting sustainable practices in industrial and other business sectors.

Water Resilience

Adaptation of resilience measures is crucial to address the water-related challenges. It refers to the ability of water systems, communities, and ecosystems to withstand and recover from challenges, shocks, and stresses related to water availability, quality, and management. It



involves implementing strategies to ensure sustainable water supplies, adapt to changing conditions, and safeguard against water-related risks, such as droughts, floods, pollution, and climate change impacts.

Water resilience not only ensures water security for human needs but also supports the health of ecosystems, biodiversity, and the overall sustainability of the environment. Making regions water resilient is a multi-stakeholder initiative that include improving local resilience, reducing disaster and climate risks through resilient practices, robust infrastructure, technology intervention, sharing knowledge and experiences, establishing mutually strengthening learning networks, adding technical expertise, connecting government and other stakeholders, and building partnerships.

Some of the key elements that help in the water resilience include:

Physical Resilience

Physical resilience is the ability of water supply and distribution infrastructure to withstand and recover from various physical stresses, such as natural disasters, extreme weather events, aging machineries, and human-made disruptions. It is a critical aspect of water management, especially in the face of increasing climate variability and challenges posed by urbanization.

Developing diverse and decentralized water sources, climate and disaster prone infrastructure including rainwater harvesting system, groundwater recharge, and reclaimed water for reuse, and integrated and comprehensive planning to reduce dependence on a single water supply system and enhance reliability that helps maintain service continuity during disruptions.

Financial Resilience

Financial resilience of water supply system is crucial for maintaining reliable water services, safeguarding public health, supporting economic growth, and protecting ecosystems. By strengthening the financial resilience, we can ensure sustainable delivery of essential water services, invest in technology and infrastructure improvements, and adapt to emerging challenges. Ensuring sufficient funding for water infrastructure development, maintenance, and operation is essential. This may involve a combination of public funding, user fees, tariffs, grants, loans, and public-private partnerships to secure the necessary financial resources. It also involves financial governance frameworks, including financial reporting, auditing, promotes accountability, builds trust, and ensures effective and efficient use of financial resources to create water resiliency.

Social and Institutional Resilience

Social and institutional resilience of water system is the capacity of communities, institutions, and government structures to adapt, respond, and recover from water-related challenges while ensuring equitable access and sustainable management of water resources.

Developing and implementing comprehensive disaster preparedness and



Melting Glaciers are Alarming

response plans specific to water-related risks helps communities and institutions respond swiftly and effectively in the face of emergencies. Ensuring equitable access to water for all, particularly the marginalized and vulnerable people is essential for social resilience.

Real time monitoring and evaluation system enables the effectiveness of resilience-building measures, identifies gaps, and implement adaptive management strategies. Regular monitoring helps track progress, improve decision-making, and enhance the resilience of water systems.

Environmental Resilience

Environmental resilience of water systems is the capacity of ecosystems, habitats, and natural processes to withstand and recover from disturbances, ensuring the sustainability and health of water resources



Water Pollution

and the surrounding environment. By promoting conservation and sustainable management practices, we can enhance the ability of water systems to adapt and thrive in the face of environmental challenges.

Preserving the health and integrity of aquatic ecosystems, such as rivers, lakes, wetlands, and coastal areas is essential for maintaining the resilience of water systems. Adopting integrated watershed management approaches helps protect upstream areas, reduce soil erosion, and manage land use, thereby contributing to improved water quality downstream.

Environmental resilience also involves controlling pollution from the sources like municipal and industrial discharge, agricultural runoff and other disposals to safeguard water quality and the health of water ecosystems. Regular monitoring of pollution parameters provides valuable information for timely responses and adaptive management to maintain environmental resilience.

Way Forward

Building water resilience requires proactive planning, risk assessment, and preparedness to address potential water-related challenges. Investments in research, monitoring, and technology adoption are critical for understanding water systems, identifying vulnerabilities, and making informed decisions for enhancing water resilience.

Active participation and engagement of communities, local government and all other stakeholders are essential for increasing water resilience. Local knowledge, practices, and involvement in decision-making processes help in developing context-specific and sustainable water management approaches. By prioritizing water resilience, communities, municipalities and government can better navigate water challenges, adapt to changing conditions, and ensure a sustainable and secure water future for present and future generations.

RIVER OVER BRIDGE: ENGINEERING, CHALLENGES AND SCOPE OF IMPROVEMENT



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Since May 2019, **Dr Harinarayan Tiwari** is the Managing Director of Floodkon Consultants LLP. Backed by a research and consulting experience of 12+ years across the Water Resources Development and Management. He is a well-known expert in River engineering, Sediment Transport, Urban Flood, Modeling, Project Planning, Strategic Implementation and Climate Change.

River Over Bridge structure and functionality deeply rely on its hydraulic design. It entails the analysis and design of the hydraulic systems and structures connected to bridges in order to provide an efficient and safe flow of water and avoid damage to the bridge and its surroundings. Among the most important factors in hydraulic bridge engineering design are the following:

- **Waterway Analysis:** The design process begins with a comprehensive analysis of the waterway, including the study of flow rates, water levels, and flood patterns. This information helps determine the bridge's hydraulic requirements and assess potential risks. Waterway analysis of River Over Bridge is relying on the several existing IRC standards, which was formulated using basic equation suggested by Lacey in way back in 1930 with some limited canal data. In spite of developing more than 100 of large River overbridges in India, we have not reformulated the same for large alluvial river system. Instrumentation can play significant role to do the same via data collection & data analytics.
- **Scour Analysis:** Scour refers to the erosion of sediment around bridge foundations caused by flowing water. Hydraulic engineers analyze the scour potential to determine the bridge's foundation design and protect it from excessive erosion. Factors such as flow velocity, sediment characteristics, and channel stability are considered. Detection of actual scour at their worst time of flow hydrograph is still challenge for the hydraulic engineer. Secondary instrumentation data can be analyzed to find practical solution for the same.
- **Bridge Opening Design:** The design of the bridge opening, such as piers and abutments, needs to accommodate the expected water flow. The shape and size of openings are designed to minimize flow restriction and potential turbulence, ensuring efficient water passage and reducing the risk of bridge damage. Mathematical Modeling can be one of the potential solutions before fixing the structural components.
- **Floodplain Analysis:** Bridges must be designed to withstand and accommodate flood events. Hydraulic engineers analyze floodplain characteristics, including flood levels, frequencies, and duration, to determine the bridge's elevation, length, and hydraulic capacity. This analysis helps prevent the bridge from being overtopped or damaged during floods.
- **Scour Countermeasures:** To protect bridge foundations from excessive scour, various countermeasures can be employed, such as riprap, erosion-resistant materials, or scour monitoring systems. These measures aim to stabilize the channel bed and protect the bridge from erosion caused by high-velocity flows.
- **Hydraulic Modeling:** Hydraulic engineers use computer-based hydraulic modeling software to simulate and analyze flow patterns, water levels, and potential impacts on bridges. This allows them to optimize the design and assess the hydraulic performance of the bridge under various flow scenarios.

Designing bridges for future conditions requires making assumptions and projections, which may introduce uncertainties and increase the risk of inadequate design.

■ **Environmental Considerations:** Hydraulic design also takes into account environmental factors, such as fish passage requirements, water quality considerations, and habitat preservation. These aspects are essential to ensure that the bridge design aligns with ecological and environmental regulations.

While bridge hydraulic design is an essential aspect of constructing river over bridges, it is not without its limitations and potential shortcomings. Here are some common shortcomings or challenges associated with bridge hydraulic design:

■ **Uncertain Future Conditions:** Predicting future hydraulic conditions, such as flood



Figure 1 River Over Bridge (Ghazipur, UP © Floodkon Consultants LLP)



levels and flow rates, can be challenging due to the inherent uncertainties associated with climate change, changing land use patterns, and limited historical data. Designing bridges for future conditions requires making assumptions and projections, which may introduce uncertainties and increase the risk of inadequate design.

- **Limited Data Availability:** Accurate hydraulic design requires reliable and comprehensive data, including flow data, sediment characteristics, and topographic information. However, data limitations, such as insufficient monitoring networks or outdated information, can hinder the accuracy of hydraulic analysis and design.
- **Modeling Assumptions:** Hydraulic modeling is often used to simulate and analyze flow patterns, water levels, and scour potential. However, these models rely on simplifying assumptions and parameters, which may not fully capture the complexity of real-world hydraulic behavior. Unthoughtful models can lead to inaccuracies and deviations from nearby hydraulic conditions.
- **Inadequate Scour Prediction:** Predicting scour depth and extent around bridge foundations is a critical aspect of hydraulic design. However, scour prediction models are based on empirical relationships and simplifications, making them prone to inaccuracies and uncertainties. As a result, there is a risk of underestimating scour potential, which can lead to bridge instability and structural damage.

Fiber optic sensors enable distributed sensing over long distances, making them suitable for large-scale bridge monitoring.

- **Environmental Impact:** Bridge hydraulic design should consider the potential environmental impacts, such as alterations to natural water flow patterns, disruption of aquatic habitats, and impacts on water quality. Despite efforts to minimize environmental impacts, the construction and operation of bridges can still have adverse effects on ecosystems and aquatic life.
- **Maintenance Challenges:** Once a bridge is constructed, ongoing maintenance is required to ensure its hydraulic functionality. However, access limitations, sediment accumulation, and changing hydraulic conditions can make maintenance challenging. Failure to adequately maintain bridges can lead to increased flood risks, reduced hydraulic efficiency, and potential damage to the structure.
- **Cost Constraints:** Bridge hydraulic design must balance engineering requirements with financial constraints. Achieving optimal hydraulic design, such as incorporating sophisticated flood mitigation measures or high-capacity waterway openings, can significantly increase construction costs. Budget limitations may restrict the implementation of advanced hydraulic features, potentially compromising the bridge's hydraulic performance.

Recent unfortunate events in the river overbridge industry also put the alarm for we engineer to think more than what we are thinking right now. Engineers strive to address these limitations through improved modeling techniques, enhanced data collection networks, and better understanding of hydraulic processes, ultimately aiming to create safer and more resilient river over bridge structures. The Lacey equation, also known as the Lacey's regime theory, is an empirical equation used for estimating the stable channel width in alluvial rivers. While the Lacey equation has been widely used in the past for bridge hydraulic design and channel stability analysis, it has several drawbacks:

- **Basic Assumptions:** The Lacey equation is based on simplified assumptions and idealized conditions. It assumes uniform flow, steady state conditions, and equilibrium between sediment transport and channel morphology. In reality, natural channels can exhibit complex and dynamic behaviors, including sediment transport variations, non-uniform flow, and evolving channel morphology. The simplifications in the Lacey equation can lead to inaccuracies in estimating the stable channel width.
- **Limited Applicability:** The Lacey equation is primarily applicable to alluvial rivers with moderate slopes and uniform sediment characteristics. It may not be suitable for channels with non-uniform sediment, steep slopes, or complex geometries. In such cases, the Lacey equation may provide unreliable estimates of the stable channel width and may not adequately address the hydraulic requirements for bridge design.
- **Lack of Consideration for Environmental Factors:** The Lacey equation focuses solely on hydraulic aspects and stable channel width, neglecting important environmental considerations. It does not account for ecological requirements, water quality considerations, or the impact of channel modifications on the surrounding ecosystem. As a result, relying solely on the Lacey equation may lead to designs that do not fully address the

environmental impacts of bridge construction and operation.

- **Limited Predictive Accuracy:** The Lacey equation is based on empirical relationships derived from limited field data. Its accuracy depends on the range of conditions used to develop the equation and its applicability to similar river systems. It was developed with limited canal data. In cases where the site-specific conditions differ significantly from those used to develop the equation, the Lacey equation may not accurately predict the stable channel width, potentially leading to inadequate bridge design.
- **Lack of Consideration for Climate Change:** The Lacey equation was developed based on historical data and assumptions of relatively stable channel conditions. However, with climate change and associated variations in precipitation patterns and sediment transport, the equation's applicability to changing conditions may be limited. It may not adequately account for future changes in flow regimes, sediment dynamics, and channel stability, potentially leading to suboptimal bridge designs.

However, it is often supplemented with additional data, field observations, and advanced hydraulic modeling techniques to enhance the accuracy of bridge hydraulic design.

At last, coming to room of improvement in the river over bridge engineering which can also expand our design capability and lead to minimum failures in the future. Advancements in instrumentation technology have greatly improved the ability to monitor and evaluate the condition of river over bridges as well as improve the design criteria for the same in future. Here are some key advancements in bridge health assessment using instrumentation:

- **Structural Health Monitoring (SHM) Systems:** SHM systems involve the deployment of sensors and data acquisition systems to continuously monitor the behavior and response of bridges. These systems can include various types of sensors such as strain gauges, accelerometers, displacement sensors, scouring measurement arrangements and corrosion sensors. SHM systems provide real-time data on structural performance of river over bridge, allowing for early detection of damage, monitoring of load effects, and assessment of overall bridge health.
- **Fiber Optic Sensors:** Fiber optic sensors have emerged as a powerful tool for bridge health assessment. These sensors use optical fibers to measure strain, temperature, and vibration. They offer several advantages, including high accuracy, durability, immunity to electromagnetic interference, and the ability to multiplex multiple sensors along a single fiber. Fiber optic sensors enable distributed sensing over long distances, making them suitable for large-scale bridge monitoring.
- **Wireless Sensor Networks:** Wireless sensor networks (WSNs) have revolutionized bridge health monitoring by eliminating the need for physical wired connections between sensors and data acquisition systems. WSNs consist of wireless sensors deployed throughout the bridge structure, communicating wirelessly to a central data acquisition and processing unit. WSNs provide flexibility in sensor



placement, ease of installation, and scalability for monitoring multiple bridges or bridge components simultaneously.

- **Remote Sensing Technologies:** Remote sensing technologies, such as LiDAR (Light Detection and Ranging) and aerial imaging, have become valuable tools for bridge health assessment. These techniques allow for rapid and non-contact data collection, enabling the creation of high-resolution 3D models of bridge structures. Remote sensing technologies provide valuable information for assessing bridge geometry, identifying deformations, and detecting structural damage.
- **Non-Destructive Testing (NDT) Techniques:** NDT techniques involve the use of various instruments and technologies to assess the condition of bridge elements without causing damage. These techniques include ground-penetrating radar (GPR), ultrasonic testing (UT), magnetic flux leakage (MFL), and acoustic emission (AE) testing. NDT techniques can provide valuable insights into the integrity of bridge components, such as concrete deterioration, corrosion in steel elements, and internal defects.
- **Data Integration and Analysis:** Advancements in data integration and analysis techniques have enhanced the effectiveness of bridge health assessment. Integration of data from multiple sensors, including strain, vibration, temperature, and environmental conditions, allows for a comprehensive understanding of bridge behavior. Advanced data analytics, including machine learning and artificial intelligence algorithms, enable the interpretation and identification of patterns in large datasets, facilitating condition assessment and predictive maintenance strategies.

These advancements in bridge health assessment instrumentation have significantly improved the ability to monitor, evaluate, and manage the condition of bridges. By providing real-time data, early warning capabilities, and more accurate assessment of structural integrity, these technologies contribute to safer and more efficient river bridge operations, maintenance, and rehabilitation.

HOW AYODHYA IS STRENGTHENING ITS RELATIONSHIP WITH THE SARYU RIVER?

Ayodhya is a city that needs no introduction. With strong connotations to our traditional belief, the city is fast becoming a hub for tourists from across the country. That the area under Ayodhya Development Authority is set to grow from 133 to 873 square kilometers speaks volumes of the extent of expansion that has been envisaged. While there is going to a spurt of development going forward, it is crucial to ensure that this development does not come at the cost of the environment. One of these vital environmental features in the city is the Saryu River, which so far has been bereft from pollution concerns. However, the burgeoning development that is planned in the future can tilt this delicate balance. To ensure a symbiotic relationship in the river, going forward, in 2022, the city embarked on the preparation of the river management plan for the Saryu River.

Incidentally, Ayodhya is a member of India's River Cities Alliance that

was established by the National Institute of Urban Affairs (NIUA) and the National Mission for Clean Ganga (NMCG) in 2021. The objective of the River Cities Alliance is to create a platform for river cities across India to ideate and discuss solutions for managing different aspects of urban rivers. NIUA and NMCG provide handholding support to any member city that is interested in enhancing its relationship with their rivers. Ayodhya decided to leverage this and requested support from NIUA for the preparation of the river management plan for the city. At the onset, NIUA introduced the city officials to the national framework that they had developed in 2020 for managing urban rivers. The framework which is called Urban River Management Plan (URMP) framework requires cities to take actions against ten agenda items, covering environmental, social, and economic aspects. This framework is markedly different from the conventional approach to manage rivers in India that has solely focused on pollution control. Because the URMP framework considers

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several aspects beyond mitigation of pollution, it is more holistic and if implemented correctly, creates a premise for sustainable management of rivers.

Among the first activities that the city did was to form a Working Group for the preparation of the URMP for Ayodhya. The Working Group was chaired by the Municipal Commissioner and featured representation

vis-à-vis different parameters. Ayodhya also followed the same procedure and developed several spatial maps and databases to inform decisions making. One such map, for example, marked the location and areas of all water bodies (lakes and ponds) in the city. Another marked the areas within the city that are not serviced by the existing sewer network. These baseline maps provided valuable and tangible

However, these are only point locations with no other information available besides their coordinates.

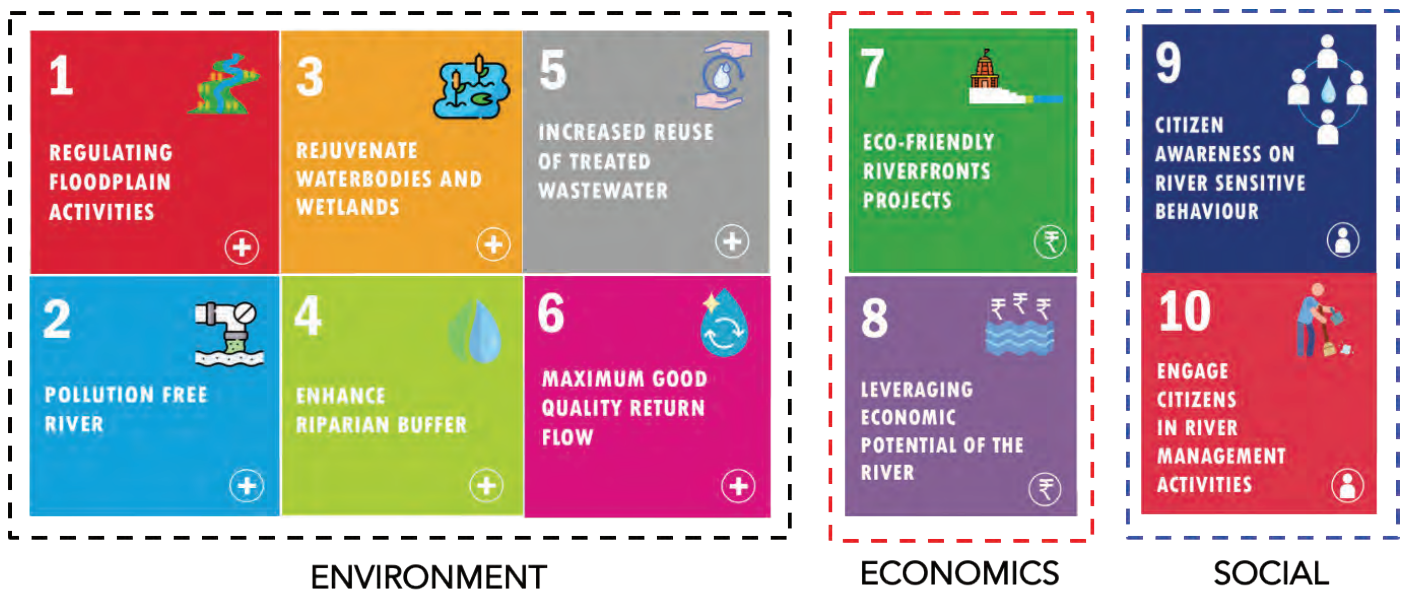


Figure 1: The ten-point agenda of the Urban River Management Plan framework

from diverse government agencies such as the Ayodhya Municipal Corporation, Ayodhya Development Authority, Forest Department, Tourism Department, Irrigation and Flood Control Department, Jal Nigam, NGOs, and local universities. The purpose of the Working Group was to drive the preparation of the Plan as well as to facilitate inter-departmental coordination and cooperation, which is so vital for interdisciplinary plans of this nature.

A fundamental step for any Plan is developing a robust baseline to understand the ‘status quo’ of the existing conditions on the ground

insights to the Working Group to identify and propose actions (or interventions) that need to be taken up on a priority basis against the ten-point agenda of the URMP framework. Over a period of four months, the Working Group decided upon nineteen interventions for Ayodhya’s URMP that would be implemented over the next five years. The following sections highlight some of these interventions.

A core intervention of Ayodhya’s URMP is to strengthen the ‘river consideration’ in its Master Plan. The purpose of doing so is to create a long-term strategy for protecting

The Plan also proposes celebrating an annual ‘Sarayu Nadi Utsav’ where activities like cleanliness drives, yoga sessions, and cultural programs will be organized.



Figure 2: Glimpse of the Saryu-based tourism activities in Ayodhya

the river and its floodplain through sound regulatory provisions. For example, one such provision proposed in Ayodhya's URMP is for the Master Plan to demarcate dedicated use zones for the river, floodplains, water bodies, and buffer areas. This zoning approach will ensure the proper regulation of activities and that only eco-friendly activities are permitted in these sensitive areas. Because agriculture is widely prevalent in the floodplain, the URMP advocates the regulating of type of crops grown in the floodplain, encouraging native species cultivation, and reducing chemical usage in agriculture. Similarly, the URMP calls for a mandatory buffer zones of certain width around lakes and ponds to aid their protection. The next Master Plan for Ayodhya is currently under preparation. Because the URMP Working Group also had representation from the Ayodhya Development Authority, these recommendations are being taken up in the Master Plan.

One of the issues that emerged strongly from the baseline analysis was the lack of a robust database of water bodies in the city. Some of the water bodies have been geotagged marked on GIS layers. However, these are only point locations with no other information available besides their coordinates. To plug this gap, one of the interventions under Ayodhya's URMP is for the city to prepare a comprehensive repository of the water bodies in the city on a GIS-based portal. At a minimum, this database will have information about the physical, chemical, and ecological parameters for each water body. City officials will use the 'Urban Water Body Diagnostic Tool' for this purpose which has been developed by NIUA and UNESCO. Such an inventory will provide valuable insights into the status and condition of each waterbody, allowing for targeted interventions.

While one bank of the Saryu River in Ayodhya is inhabited, the opposite edge of the river is pristine and untouched by human activities. The

URMP recognizes that unless regulatory measures are put into place today, there is a high possibility that the pristine area may succumb to development pressures. To prevent this from happening, the URMP has earmarked a buffer width (also called riparian buffer) of 30 meters from the edge of the river throughout its length in the city. This buffer will feature a combination of green-grey bioengineering solutions for urban flood control, integrating ecological benefits without compromising on the rights of locals and tourists visiting Sarayu.

The URMP for Ayodhya also emphasizes strongly on the reuse of treated wastewater. Currently, there is hardly any reuse. However, the city acknowledge the importance of reuse to reduce the demand for freshwater from the Saryu and in the process helping it sustain its natural functions. To begin with the city will ensure that only treated wastewater is used for fulfilling the water requirement of parks and gardens within three kilometers of all sewage treatment plants.

In due course, the treated wastewater will be used for other purposes such as washing buses, cleaning roads, and developing artificial water bodies for groundwater recharge.

Ayodhya's URMP also features several eco-friendly practices for tourism and enhancing river-related livelihoods. For example, the city will replace traditional diesel-powered boats with solar-powered e-boats for boating activities at Guptar Ghat and Ram ki Paidi. This shift will reduce pollution and contribute to a more environmentally friendly tourism experience. Another initiative involves promoting community-based organic farming through agritourism. River islands and floodplains in Ayodhya offer fertile soil and water availability, making them suitable for agriculture. Native crops such as Indian mustard, millets, and oilseed cultivation, have been strongly promoted in the Plan.



Figure 3: Agriculture practiced along the Sarayu in Ayodhya

Through another novel initiative, the URMP for Ayodhya has proposed the setting up of a river sanctuary. The purpose of this sanctuary is to protect the rich biodiversity of the Sarayu River— Gharials, Gangetic dolphins, Freshwater turtles, and the rare Gangetic Shark. The Ayodhya Development Authority along with the State Forest Department, Irrigation and Water Resources Department, and Tourism Department, would coordinate efforts to establish and manage the sanctuary, ensuring controlled and regulated activities that prioritize wildlife conservation over tourism.

A central tenet of Ayodhya's URMP is to strengthen the citizen–river connect, bringing more people to the river, thereby creating a social value for the river. Therefore, the Plan proposes a dedicated river–based sensitization program to involve schools, colleges, and youth

organizations in river conservation and rejuvenation activities. Under the program, dedicated spaces along the river stretch have been earmarked for schools and colleges to organize classes, allowing youth to learn more about the Sarayu River and develop sensitivity towards it. The Plan also proposes celebrating an annual 'Sarayu Nadi Utsav' where activities like cleanliness drives, yoga sessions, and cultural programs will be organized.

A river, in so many ways, is a city's greatest environmental asset. How a city manages this asset will go a long way in determining its sustainable development trajectory. Ayodhya has taken steps in the right direction by developing a dedicated plan for the River Sarayu. As the city starts implementing the interventions proposed in the Plan, it takes a step further towards the grand ambition of making Ayodhya a world class city.



Figure 4: Sarayu Aarti performed on the banks of the river

**SUSTAINABLE ENVIRONMENT:
EMBRACING TECHNOLOGY FOR**

A BETTER FUTURE



Anil Sethi, Chairman, Pump Academy Private Limited



exceeds 400 million tonnes, with half of it intended for single-use purposes. Shockingly, less than 10% of this plastic is recycled, resulting in an estimated 19-23 million tonnes polluting lakes, rivers, and oceans every year while approximately 85 per cent ends up in landfills or as unregulated waste. The pervasive issue of microplastics, which are tiny particles measuring up to 5mm in diameter, further compounds the problem as they contaminate food, water, and even the air we breathe. It is estimated that each individual consumes over 50,000

plastic particles annually, and this number significantly increases when considering inhalation as well.

The immense ecological challenge we face serves as a resounding wake-up call, demanding our immediate attention and determined efforts to address increasing pollution, combat climate change, and reduce carbon emissions. Fresh water, being a vital environmental resource, plays a crucial role in sustaining life and supporting various ecosystems.

World Environment Day 2023 Sustainable environment is intrinsic to all forms of life. On World Environment Day today, we are reminded of the crucial importance of caring for the environment and preserving ecological balance. This year's theme "beat plastic pollution" is a pressing and existential concern. It also underscores the vital role of plastic and microplastics has on our lives and need to reduce it for maintaining the environmental equilibrium that supports life on Earth.

As per the information provided on the UN observances page, the annual production of plastic



Water infrastructure, including pumping stations, necessitates a strong commitment to environmental consciousness. Creating a sustainable environment apart from other measures also requires optimizing water treatment plants, pump systems, and supply networks to maximize energy efficiency, minimize waste, and reduce environmental impact by lowering carbon emissions.

According to estimates, pump systems contribute to approximately 20% of the global demand for electrical energy, and in certain applications, they account for 25% to 50% of electrical energy usage. Pumps are the largest consumers of electricity within

various industrial sectors.

At Pump Academy Private Limited, we are dedicated to implementing sustainable practices in the field of pumping technology. With the assistance of iPUMPNET, an IoT-enabled system that revolutionizes the management of pumping stations. It provides a range of advanced technological solutions designed to enhance operational efficiency, reduce energy costs, extend the lifespan of pumps, minimize overall lifecycle expenses, and virtually eliminate breakdowns and frequent maintenance requirements through powerful analytics. Through comprehensive implementation, knowledge sharing, and cutting-edge technology, we aim to create a

greener and more sustainable future for the pumping industry.

Environmental sustainability is not a luxury; it is a necessity for the survival and well-being of all living beings. By embracing smarter and greener technology and encouraging others to do the same, we can create a brighter and healthier future.

On World Environment Day, let us reaffirm our commitment to the environment and take action to safeguard our planet. Together, we can build a world where nature thrives, where ecosystems are protected, and where future generations can enjoy the beauty and abundance of our planet.



PLANET EARTH: RETHINK. REVIVE. RESTORE.



Tariq Siddiqui, Chief Strategist, TS Advisory Services



the importance of sustainable practices and conservation efforts. The theme for World Environment Day 2023 is “Beat Plastic Pollution” which emphasizes the issue of plastic waste growing beyond human control. Urgent action is needed to contain and replace them with environment-friendly materials. The vast accumulation of plastic waste in our oceans, lakes, rivers, and land is not just visually displeasing but also poses a severe threat to humans, plants, wildlife, and ecosystems. The issue of plastic pollution is undeniably real, and the impact of single-use plastics is

alarming significant.

To grasp the severity and consequences of plastic pollution, ponder over these facts. Let them inspire you to take decisive actions in reducing single-use plastic consumption at all levels:

- Around 400 million metric tonnes of plastic are being produced yearly. The amount of plastic produced in a year is roughly the same as the entire weight of humanity.
- Humans use about 1.2 million plastic bottles per

World Environment Day 2023 World Environment Day serves as a powerful reminder for us to reflect on our actions and their impact on the environment. It is a global awareness initiative held annually since 5th June 1973, led by the United Nations Environment Programme (UNEP). It aims to raise awareness and mobilize individuals, communities, businesses and governments to take responsibility, take action and work towards a more sustainable and resilient future for all. It serves as a reminder of the urgent need to address the environmental challenges we face and emphasizes



minute and approximately 91% of plastic is not recycled.

- Roughly half of our global annual plastic production is destined for a single-use product. ■ Virtually every piece of plastic that was ever made still exists in some shape or form (with the exception of the small amount that has been incinerated).
- Five trillion plastic bags are produced worldwide annually. It can take up to 1,000 years for a bag to disintegrate completely.
- The world uses 500 billion plastic cups every year.
- Around 19-23 million tonnes of plastic end up in our lakes, rivers and oceans every year.
- Plastics that end up in landfills are not harmless. They break down into tiny toxic particles that contaminate the soil and waterways and enter the food chain.
- The estimated annual loss of

plastic packaging waste during sorting and processing alone is US\$ 80-120 billion.

- The global production of primary plastic is forecasted to reach 1,100 million tonnes by 2050.
- Plastic waste, whether in a river, the ocean, or on land can persist in the environment for centuries.

Many countries lack the infrastructure to prevent plastic pollution such as: sanitary landfills; incineration facilities; recycling capacity and circular economy infrastructure; proper management and disposal of waste systems. This ultimately have adverse health effects on humans, animals and ecology.

It is essential that we pause and contemplate the consequences of our actions, while actively seeking positive change. Each and every one of us possesses the power to make a

difference, be it through our everyday choices or large scale endeavors. Together, we can minimize our carbon footprint, conserve valuable resources, foster biodiversity, and protect the intricate equilibrium of nature.

When you embark on your next shopping trip, take a moment to contemplate the choices you make. Make a conscious decision to select food items that are free from plastic packaging. Equip yourself with a reusable bag, prioritize local products, and opt for refilling containers instead of buying new ones. These small actions have the power to significantly reduce plastic waste and its detrimental impact on the environment.

By embracing these practices, we actively contribute to building a more sustainable future and generate a collective impact that extends far beyond our immediate surroundings. Let us unite for the love of our Earth and ensure a sustainable future for all.



World Environment Day 2023

SUSTAINABLE ENVIRONMENT TO PROTECT OUR PLANET

Naser Azeez Mohammed, MD, Aquality Water Solutions Pvt. Ltd.



Environment Day encourages us to take a collective stand and prioritize the preservation of nature. It calls for a shift in our behaviours, policies, and practices towards more sustainable and environment friendly alternatives. By recognizing the value of nature and understanding the consequences of our actions, we can make a positive impact on the planet.

The well-thought theme for the year “beat plastic pollution” highlights the critical need to

address the immense damage caused by the plastics, a significant threat to our environment, particularly our water resources and the species that depends on them. The staggering amount of 19-23 million tonnes of plastic waste being disposed of in lakes, rivers, and seas each year is alarming. Plastic pollution not only degrades the aesthetic beauty of our water bodies but also harms marine life through ingestion and entanglement. It disrupts the delicate balance of aquatic

Every year, on the 5th of June, World Environment Day is celebrated. This significant day serves as a platform to increase awareness about environmental issues and inspire people, organization and government to take action in addressing them. It reminds us of the collective responsibility we have in safeguarding our planet and encourages us to explore ways to mitigate environmental challenges.

With pollution, climate change, drought and natural disasters and ecological imbalance posing significant threats to our planet and our future generations. World



ecosystems and poses risks to human health.

To combat plastic pollution, it is crucial to adopt a multi-faceted approach. This includes reducing the production and consumption of single-use plastics, promoting recycling and waste management practices, and raising awareness about the environmental impact of plastic pollution. Additionally, innovation and research into sustainable alternatives to plastic can play a significant role in mitigating the problem.

With the increasing prevalence of plastic and microplastics pollution in our water sources, it has become crucial to address this pressing environmental issue. Recognizing the importance of water treatment and management, Aquality Water Solutions Pvt. Ltd. has developed innovative solutions to address water pollution and ensure

sustainable water management to people and industries. The company offers the cutting-edge technologies and systems including solar powered water treatment system that aim to safeguard both the environment and human health.

Through the advanced water treatment processes, AQUALITY strive to remove contaminants and pollutants from various water sources, including industrial wastewater, municipal water, and polluted water from ground sources or rivers and lakes. We employ state-of-the-art filtration, disinfection, and purification techniques to ensure that water meets stringent quality standards before it is used for various purposes.

AQUALITY not only focuses on water treatment but also recognizes the significance of

efficient water management. We collaborate closely with individuals and industries to promote sustainable water usage practices. Our aim is to optimize water resources and minimize wastage, ensuring the long-term availability of clean and safe water for everyone. By implementing these measures, we contribute to a more sustainable future, where water is conserved and accessible to all.

Let us unite in our efforts to safeguard and rejuvenate our planet's ecosystems by minimizing plastic usage in our daily activities. Together, we can raise awareness, take decisive action, and create a positive impact on environmental protection. By prioritizing ecological restoration and embracing sustainable practices, we actively contribute to preserving our precious natural heritage for the well-being of future generations.



RESPONSIBLE RESOURCE MANAGEMENT FOR A CLEANER FUTURE



Abdul Rahman Mohammed, CEO, Sahara Industry



On this World Environment Day, let us all think deeply and acknowledge the significance of our planet and the urgent need to protect and restore its precious ecosystems. The planet Earth is a remarkable habitat for millions of diverse species playing a unique role in the intricate web of life. However, unsustainable activities are causing unprecedented damage to our ecosystems and threatening the very existence of human life.

This year, the focus is on plastic pollution, with the campaign #BeatPlasticPollution. Led by the United Nations Environment

Programme (UNEP), the day highlights critical environmental issues and mobilises individuals, governments, and businesses worldwide to take action oriented steps to reduce plastic waste.

According to estimates from the United Nations, approximately 400 million metric tons of plastic are produced annually. Since the introduction of plastic in the 1950s, a staggering 8.3 billion metric tons of plastic has so far been produced. If historic growth trends continue,

global production of primary plastic is forecasted to reach 1,100 million tonnes per annum by 2050. Approximately 36% of all plastics produced are used in packaging, including single-use plastic products for food and beverage containers, approximately 85% of which ends up in landfills or as unregulated waste.

Estimated 98% of single-use plastic products are produced from fossil fuel, or 'virgin' feedstock. The level of greenhouse gas emissions associated with the production, use



and disposal of conventional fossil fuel-based plastics is forecast to grow to 19% of the global carbon budget by 2040. Annual production of fossil fuel-based plastics is set to top 1.2 billion tonnes by 2060 and waste to exceed 1 billion tonnes, according to a report by the Organisation for Economic Co-operation and Development (OECD).

At Sahara Industry, our unwavering commitment lies in reducing the consumption of single-use plastic products and minimizing our environmental impact. We achieve this by offering long-lasting products with well-defined life cycles, consciously designed to reduce the use of plastic

components. Our water treatment systems are meticulously designed to effectively reduce the presence of microplastics in raw water, ensuring that the treated water is of the highest quality for both consumption and industrial production purposes. We continually innovate and implement sustainable practices in our manufacturing and operations to minimize our environmental footprint. With a focus on sustainability and responsible resource management, Sahara Industry is dedicated to making a positive impact on the planet and fostering a greener future.

The battle against plastic pollution requires a comprehensive

approach involving individuals, governments, and businesses alike. Let us reflect upon the impact of our actions and strive for positive change. Each one of us has the power to make a difference, whether through small daily choices or larger initiatives. Together, we can reduce our carbon footprint, conserve resources, promote biodiversity, and preserve the delicate balance of nature.

We all have the responsibility of being custodians of our planet, entrusted with the task of protecting it. I wish you a happy World Environment Day 2023 as we celebrate our collective commitment to the well-being of our planet.



The Green Revolution in Water Treatment: LDI and the Path to Sustainability

LDI (Liqui-Deionization) technology in water treatment can play a significant role in promoting sustainability by addressing various environmental and resource management challenges. Here are several ways in which LDI technology contributes to sustainability:

- 1. Reduced chemical usage:** LDI systems do not rely on chemicals for water purification, eliminating the need for chemical regenerants used in traditional water softeners and ion exchange systems. By avoiding the use of chemicals, LDI helps reduce the discharge of harmful substances into the environment, minimizing environmental pollution.
- 2. Lower energy consumption:** LDI technology generally requires less energy compared to other water treatment methods, such as reverse osmosis. The reduced energy demand results in lower greenhouse gas emissions and a smaller carbon footprint, supporting efforts to mitigate climate change and reduce energy consumption.
- 3. Water conservation:** LDI can efficiently remove ions and contaminants from water, helping to reduce water wastage and improve overall water usage efficiency. By conserving water resources, LDI contributes to sustainable water management practices, especially in regions facing water scarcity or stress.
- 4. Reuse of treated water:** LDI technology can produce high-quality purified water, making it suitable for various applications, including non-potable uses like irrigation, flushing, and industrial processes. The ability to reuse treated water helps in reducing the demand for freshwater resources and conserving water for essential purposes.
- 5. Potential for renewable energy integration:** LDI systems can potentially be powered by renewable energy sources, such as solar or wind power. Integrating LDI technology with renewable energy helps in creating sustainable water treatment solutions that operate on clean and renewable energy, reducing the environmental impact further.
- 6. Low maintenance and longer lifespan:** LDI systems are known for their low maintenance requirements, and the absence of moving parts contributes to their longevity. This leads to a reduction in waste generation and the need for frequent replacements, promoting sustainable practices.
- 7. Water quality improvements:** LDI technology removes a wide range of contaminants, including heavy metals, dissolved salts, and other harmful substances. By enhancing water quality, LDI helps protect ecosystems, aquatic life, and human health, promoting sustainable water ecosystems.
- 8. Versatility and adaptability:** LDI technology can be used to treat various water sources, ranging from tap water to brackish or seawater. Its adaptability makes it suitable for different regions and water treatment applications, contributing to sustainable water management in diverse contexts.
- 9. Compliance with environmental regulations:** By efficiently removing contaminants and maintaining high water quality, LDI systems can help commercial and industrial facilities comply with environmental regulations and standards, ensuring sustainable water use and discharge practices.

In conclusion, LDI technology offers numerous sustainability benefits, including reduced chemical usage, energy efficiency, water conservation, and the potential for renewable energy integration. By adopting LDI systems for water treatment, communities and industries can promote sustainable water management practices, reduce environmental impacts, and ensure the availability of clean and safe water for current and future generations.



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Delhi Water Expo

13 – 15 July, 2023 Delhi, India
<https://www.waterex.biz/>

Water & Waste Expo 2023

3 – 5 August 2023
 Venue: Gate 9, India Trade Promotion Organisation, Pragati Bhawan, Pragati Maidan New Delhi

World Water Summit

25 – 26 August 2023
 Venue: Dr Ambedkar International Centre, 15, Janpath Rd, Windsor Place New Delhi, Delhi
<http://worldwatersummit.in/>

EverythingAboutWater Expo 2023

3 – 5 August 2023
 Venue: Hall No. 11, Pragati Maidan, N. Delhi

World Water Summit 2023

24 – 25 August 2023
 Venue: NDMC Convention Centre, 15, Sansad Marg, Hanuman Road Area, Connaught Place, New Delhi
<http://worldwatersummit.in/>

Desalination & Industrial Water Management

12 – 13 September 2023
 Venue: Le Meridien New Delhi, Le Meridien, Windsor PI, Connaught Place New Delhi

Water Expo – Hyderabad 2023

21 – 23 September 2023
 Venue: HITEX Exhibition Center, at Khanammet, Hyderabad, Telangana

Renewable Energy India Expo

4 – 6 October, 2023
 Venue: Greater Noida, India
<https://renewableenergyindiaexpo.com/>

IFAT India

17 – 19 October 2023
 Venue: BEC Mumbai, Bombay Exhibition Centre, NESCO, Goregaon, Mumbai, Maharashtra
<https://www.ifat-India.com/>

India Water Week

10 – 14 October 2023
 Venue: Vigyan Bhavan, Maulana Azad Rd, Rajpath Area, Central Secretariat, New Delhi



Ref No.: 61974327**Tender Bid Closing Date:** 01-08-2023**Tender bid Opening Date:** 12-07-2023**Tender Value:** 2289.74 Cr**Company Name:** karaj green space and landscape org**Tender Brief:** Construction Tank 500 M3 And Engine Room Require For Project Parkorod(with Material)**Address:** Azimieh, Esteqlal Square, Karaj City.**Tender Notice No:** 1402-23**Tender Location:** Iran**Ref No.: 62259898****Tender Bid Closing Date:** 18-08-2023**Tender bid Opening Date:** 20-07-2023**Tender Value:** 62013731**Company Name:** public procurement service incheon regional public procurement service
Tender Brief: Seoksu Sewage Treatment Plant Odor Improvement Project (civil Engineering, Construction, Machinery Field)**Address:** Sanghoon Kim.**Tender Notice No:** 20230724072-00**Tender Location:** Korea**Ref No.: 62013731****Tender Bid Closing Date:** 21-08-2023**Tender bid Opening Date:** 14-07-2023**Tender Value:** 387.78 Cr**Company Name:** surat urban development authority**Tender Brief:** Design, Build, Trial Run Contract for Construction of Two Numbers of Intake Wells (North & South), 66 MLD (South) and 50 MLD (North) WTPs with Clear Water Reservoirs at MHWs, RCC U/G Sumps, Pump Houses & Providing, Supplying, Lowering, Laying & Jointing Trunk Raw Water, Clear Water Rising Main Pipeline, Transmission Rising Main & Distribution Network Pipeline & Supply, Installation, Testing & Commissioning of Pumping Machineries With Associated Mechanical and Electrical Equipment's, Instruments & Accessories with Operation & Maintenance of All type Civil & Mechanical Structures, Machineries & Pipeline Network for 5 Yrs. for Water Supply Scheme of Surat Urban Development Authority (SUDA) Kamrej North, South & SUDA South Cluster-1 Project.**Address:** Chief Executive Authority, Surat Urban Development Authority, Suda Bhavan,

Vesu Abhava Road, Vesu, Surat, Gujarat, India-395007

Tender Notice No: 603346**Tender Location:** kamrej – gujarat – India**Ref No.: 61006296****Tender Bid Closing Date:** 02-08-2023**Tender bid Opening Date:** 13-07-2023**Tender Value:** 189.78 Cr**Company Name:** public health engineering department**Tender Brief:** Augmentation of Surface Water Based Piped Water Supply Scheme for Arsenic affected Pandua Block in Hooghly District with three months trial run subsequent O M for one year.**Address:** Phellcentral Circle (PHE) Surface Pandua Block Under Hooghly District.
pincode 713103**Tender Notice No:** 2023_phed_542236_2**Tender Location:** hooghly – west bengal – India**Ref No.: 62326754****Tender Bid Closing Date:** 21-08-2023**Tender bid Opening Date:** 22-07-2023**Tender Value:** 126.71 Cr**Company Name:** gujarat water supply and sewerage board**Tender Brief:** Carrying out Level Survey, Soil Investigation, Detailed Survey Work, Designing Etc for Providing, Supplying, Lowering, Laying and Jointing DI/MS/ PVC Rising/gravity Pipeline, Designing and Constructing of RCC UG Sump at Different Hw/shw & Village Level, Constructing of Pump House, Installation, Testing & Commissioning of Pumping.**Address:** Mangle Murti Complex, Opp. Jain Temple, Dahod-godhra Road, godhra
 Gujarat
 India**Tender Notice No:** 603450**Tender Location:** halol – gujarat – India**Ref No.: 62374145****Tender Bid Closing Date:** 21-08-2023**Tender bid Opening Date:** 22-07-2023**Tender Value:** 103.74 Cr**Company Name:** jharkhand urban infrastructure development corporation limited**Tender Brief:** Rehla & Bishrampur Urban Water Supply Scheme With 5 Years Of

Operation And Maintenance.

Tender Notice No: juidco/nit/ rehla bishrampur /uwss/23/554**Tender Location:** ranchi – jharkhand – India**Ref No.: 62375835****Tender Bid Closing Date:** 01-08-2023**Tender bid Opening Date:** 22-07-2023**Tender Value:** 92.39 Cr**Company Name:** municipal corporation of chandigarh**Tender Brief:** Strengthening Tertiary Treated Water Supply System and laying of T.T. water lines in left out areas to Supply Tertiary Treated Water in Chandigarh (Ch to :AMRUT-2.0).**Tender Location:** chandigarh, punjab, India**Ref No.: 61792594****Tender Bid Closing Date:** 01-08-2023**Tender bid Opening Date:** 08-07-2023**Tender Value:** 80.26 Cr**Company Name:** seoul transportation corporation**Tender Brief:** Purchase Of 135 Types Of Brake System Screw Blocks For Trains (appropriation + Debt)**Address:** Hyein Kwon.**Tender Notice No:** 20230707162-00**Tender Location:** not classified – not classified – korea**Ref No.: 62299720****Tender Bid Closing Date:** 18-08-2023**Tender bid Opening Date:** 21-07-2023**Tender Value:** 75.59 Cr**Company Name:** uttar pradesh jal nigam**Tender Brief:** Water Supply Scheme in Saharanpur Nagar Nigam Zone-21 22 Sub Zone-1 22 (Sub Zone-2 25 26 29 31 32 33 #*. Over Head Tank Rising main Pump House Tubewell Distribution System Boundary Wall Power Connection**Address:** UP Jal Nigam (Hq), Lucknow\\chief Engineer (Ghaziabad)\\lgm, Cc, Saharanpur\\lpm, Construction Unit, Saharanpur
saharanpur**Tender Notice No:** 2023_upjnm_822348_1**Tender Location:** saharanpur – uttar pradesh – India**Ref No.: 62355027****Tender Bid Closing Date:** 19-08-2023

Tender bid Opening Date: 22-07-2023

Tender Value: 60.56 Cr

Company Name: gujarat water supply and sewerage board

Tender Brief: Design, Construction and O&M of Providing, Supplying, L., L. and J. various DI/PVC Rising Main and Gravity Main Pipelines, RCC ESR, RCC Sump, Pump House, Staff Quarter, RCC Road, Compound Wall, Supplying and erecting Pumping Machinery at Various HWs & SHWs to Villages with 10 Years of O&M under Augmentation of Sonariya RWSS with including existing & new structures with trial run of three months for supplying to all benificer villages & Town. Taluka:Veraval, Sutrapada, Talala.

Address: Ishwar Complex, 2nd Floor, Nr. Saibaba Temple, Patel Timbers Street, junagadh Highway Road, Veraval

Tender Notice No: 604940

Tender Location: somnath – gujarat – India

Ref No.: 61686208

Tender Bid Closing Date: 01-08-2023

Tender bid Opening Date: 09-07-2023

Tender Value: 40.00 Cr

Company Name: bhabha atomic research centre

Tender Brief: Setting-up of Acrylic Fiber Production Plant, Associated Tank Farm and Solvent Recovery System at BARC, SMF, Challakere through Engineering, Procurement and Construction (EPC) mode.

Address: Bhabha Atomic Research Centre||bhabha Atomic Research Centre Rmp Mysurullbarc Mysore –project – Mysore Division
barc Chitradurga

Tender Notice No: 2023_bar_760087_1

Tender Location: chitradurga – karnataka – India

Ref No.: 62273934

Tender Bid Closing Date: 18-08-2023

Tender bid Opening Date: 20-07-2023

Tender Value: 40.00 Cr

Company Name: rajasthan urban drinking water sewerage and infrastructure corporation limited

Tender Brief: Providing, laying, jointing, testing and commissioning of Sewerage System and all ancillary works along with Design, construction, supply, installation, testing and commissioning (Civil, Mechanical,

electrical, instrumentation & other necessary works) of Sewerage Treatment Plant with provision for treated waste water reuse including 1 year defect liability with 05 years O&M for towns under packagea) NAGAR: Sewer System with 8 RUIDP Technology WWTPs

Address: Rajasthan Urban Drinking Water Sewerage And Infrastructure Corp. Ltd. (Rudsico)||ceo/Md||e.D.(Rudsico)||p.D. (Urban Infra)
nagar

Tender Notice No: 2023_rudsi_351502_1

Tender Location: jaipur – rajasthan – India

Ref No.: 62374237

Tender Bid Closing Date: 21-08-2023

Tender bid Opening Date: 23-07-2023

Tender Value: 38.20 Cr

Company Name: jharkhand urban infrastructure development corporation limited

Tender Brief: Barki Saraiya Urban Water Supply Scheme With 5 Years Of Operation And Maintenance.

Tender Notice No: juidco/nit/barki saraiya/uwss/23/555

Tender Location: ranchi – jharkhand – India

Ref No.: 62320442

Tender Bid Closing Date: 18-08-2023

Tender bid Opening Date: 22-07-2023

Tender Value: 36.22 Cr

Company Name: public health engineering department

Tender Brief: Augmentation of source cum creation of spring water storage of 80 ML water by improvement of and upgradation of Open Ground Reservoir Lake at 3.2 Km from Algarah and other allied works to cover the uncovered areas

Address: Phellnorth Bengal Circle – Illneorkhola W/S Mtc. Div.
kalimpong
pincode 734301

Tender Notice No: 2023_phed_548704_1

Tender Location: kalimpong – west bengal – India

Ref No.: 62233773

Tender Bid Closing Date: 17-08-2023

Tender bid Opening Date: 19-07-2023

Tender Value: 26.94 Cr

Company Name: korea rural community corporation safety diagnosis headquarters

Tender Brief: Precise Safety Diagnosis And Precise Safety Inspection Service For 5 Places Including Gara Reservoir

Address: Joonhyung Park.

Tender Notice No: 20230722452-00

Tender Location: not classified – not classified – korea

Ref No.: 62328788

Tender Bid Closing Date: 21-08-2023

Tender bid Opening Date: 22-07-2023

Tender Value: 26.05 Cr

Company Name: public health engineering department

Tender Brief: Construction of Ground Water Reservoir having capacity of 20 ML at Durpin Lake to accommodate 5 Mouzas in Kurseong Block within Darjeeling District under Kurseong Division, P.H.E.D- GTA.

Address: PHE G.T.A. Circle, darjeeling, Pincode 734101

Tender Notice No: 2023_phed_549113_1

Tender Location: darjelling – west bengal – India

Ref No.: 62300810

Tender Bid Closing Date: 02-08-2023

Tender bid Opening Date: 22-07-2023

Tender Value: 25.87 Cr

Company Name: kerala water authority

Tender Brief: Jal Jeevan Mission (JJM)-WSS to Vettathur Grama Panchayath, Melattur Grama Panchayath and Keezhattur Grama Panchayath-Supply and Laying 600mm DI RWPM from Well site to WTP-Pipeline Work

Address: Kerala Water Authority||chief Engineer Northern Region (Kozhikkode)||superintending Engineer (Ph Circle Malappuram)
keezhattur

Tender Notice No: 2023_kwa_588541_1

Tender Location: kozhikode – kerala – India

Ref No.: 62013088

Tender Bid Closing Date: 01-08-2023

Tender bid Opening Date: 14-07-2023

Tender Value: 25.77 Cr

Company Name: public health engineering department

Tender Brief: Retrofitting of Composite Water Supply Scheme for Iron and Arsenic Mitigation under Golaghat Central development Block under Golaghat (PHE) Division under the programme of Jal Jeevan Mission Assam.

Address: Public Health Engineering Department\l\chief Engineer PHE(P), Assam, PHED, Lower Assam Zone, Guwahati, PHED, Guwahati Circle, Guwahati, PHED Golaghat
Tender Notice No: 2023_phed_31607_1
Tender Location: golaghat – assam – India

Ref No.: 61789237

Tender Bid Closing Date: 01–08–2023
Tender bid Opening Date: 08–07–2023
Tender Value: 25.00 Cr
Company Name: directorate for construction land and construction of belgrade jp belgrade (VRACAR)
Tender Brief: Provision For Technical Control Of The Technical Documentation For The Makiš–mladenovac Regional Water Supply System – Mladenovac Reservoir
Address: RS11, Belgrade region, BELGRADE.
Tender Notice No: 2023/? ?02–0026744
Tender Location: Serbia

Ref No.: 60569194

Tender Bid Closing Date: 02–08–2023
Tender bid Opening Date: 21–07–2023
Tender Value: 22.01 Cr
Company Name: kerala water authority
Tender Brief: JJM WSS To Chakkupallam Vandanmedu Karunapuram and Vandiperiyar Panchayats in District Supply laying of CWPMS CWGMs construction of steel tanks and sump cum pumphouses in Vandiperiyar Panchayat Package 4

Address: Kerala Water Authority\l\chief Engineer Central Region (Kochi), Superintending Engineer PH Circle Muvattupuzha, Vandiperiyar
Tender Notice No: 2023_kwa_579414_1
Tender Location: muvattupuzha – kerala – India

Ref No.: 62311113

Tender Bid Closing Date: 18–08–2023
Tender bid Opening Date: 21–07–2023
Tender Value: 20.43 Cr
Company Name: department of urban local bodies
Tender Brief: Operation and maintenance of all structures/components, pump chambers, distribution system, tubewells, pumping machinery etc of water supply scheme of MC Panipat for the period of 18 months.(recall).

Address: Haryana Government\l\urban Local Bodies, MC Panipat, Panipat
Tender Notice No: 2023_hry_298547_1
Tender Location: panipat – haryana – India

Ref No.: 62300809

Tender Bid Closing Date: 18–08–2023
Tender bid Opening Date: 21–07–2023
Tender Value: 18.11 Cr
Company Name: kerala water authority
Tender Brief: AMRUT 2.0 – Augmentation of WSS to Kollam Corporation–Extension of distribution system for a total of 50 Kms in various zones using PVC pipes, including road restoration charges Phase I
Address: Kerala Water Authority, Chief Engineer Southern Region (Trivandrum) Superintending Engineer (Ph Circle Kollam), Kollam Corporation
Tender Notice No: 2023_kwa_588507_1
Tender Location: trivandrum – kerala – india

Ref No.: 62234720

Tender Bid Closing Date: 18–08–2023
Tender bid Opening Date: 20–07–2023
Tender Value: 15.41 Cr
Company Name: Public Health Engineering Department
Tender Brief: Water Supply Scheme for Pussingbong Piped Water Supply Scheme in Jorebunglow Sukiapokhri Block Under Darjeeling District.
Address: PHE, G.T.A. Circle, Darjeeling – 734101
Tender Notice No: 2023_phed_548069_1
Tender Location: Darjelling, West Bengal, India

Ref No.: 62237258

Tender Bid Closing Date: 18–08–2023
Tender bid Opening Date: 20–07–2023
Tender Value: 14.20 Cr
Company Name: public health engineering department
Tender Brief: Contract for Water Supply Scheme for Lizzipur Tea Garden Pwss in Kurseong Block Under Darjeeling District
Address: PHE, G.T.A. Circle, Darjeeling – 734101
Tender Notice No: 2023_phed_548019_1
Tender Location: darjelling – west bengal – india

Ref No.: 62285889

Tender Bid Closing Date: 02–08–2023
Tender bid Opening Date: 21–07–2023
Tender Value: 13.87 Cr
Company Name: kerala water authority
Tender Brief: CWSS to Idukki Kanjikuzhi Vazhathope Mariyapuram Kamakshi Vathikudy and Vannapuram Part Panchayaths in Idukki District supply and laying CWPMS and storage reservoir cum pump house in Kamakshi Panchayath General CIV

Address: Kerala Water Authority, Chief Engineer Central Region (Kochi), Superintending Engineer PH Circle Muvattupuzha, Kamakshi Panchayath
Tender Notice No: 2023_kwa_588530_1
Tender Location: cochin (kochi), Kerala, India

Ref No.: 62144235

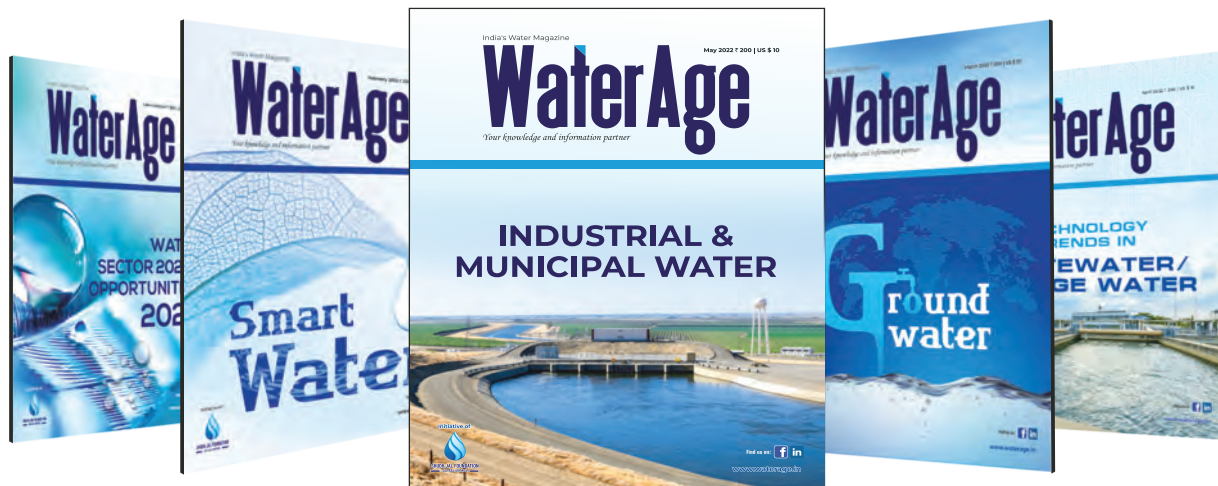
Tender Bid Closing Date: 21–08–2023
Tender bid Opening Date: 18–07–2023
Tender Value: 13.08 Cr
Company Name: Urban administration and development
Tender Brief: Survey, Soil Investigation, Design and Execution of Various Works for Augmentation of Water Supply System Including Construction of An Intake Well, Raw Water Pump House, Installation of Raw, Clear Water Pumps, More Details Given in Nit

Address: Directorate Urban Administration and Development\l\join Director–Indore Division – Uad\ldhar –Nagar Parishad Kukshi – UAD, Kukshi
Tender Notice No: 2023_uad_291475_1
Tender Location: Indore, Madhya Pradesh, India

Ref No.: 61721400

Tender Bid Closing Date: 01–08–2023
Tender bid Opening Date: 06–07–2023
Tender Value: 12.78 Cr
Company Name: Ahmedabad Municipal Corporation
Tender Brief: Construction of under ground sump with pump house with 15 lakh liter capacity over head tank at vejalpur Gamtal Water tank in Vejalpur ward of south west zone.
Tender Location: Ahmedabad, Gujarat, India

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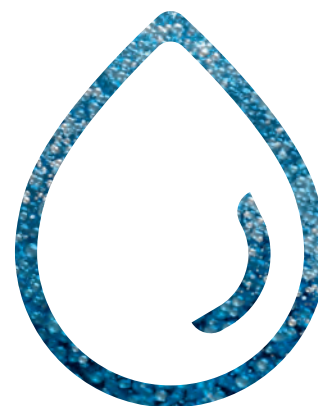
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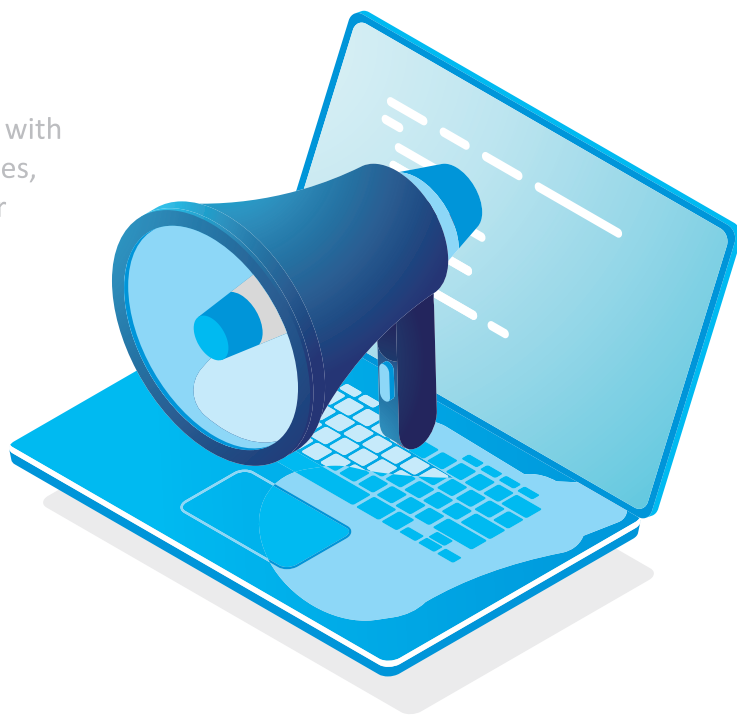
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- ▶ Type of treatment of sewage.
- ▶ Specification of mechanical and electrical equipment of sewage network STP & ETP.
- ▶ Preparation of drawing.
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