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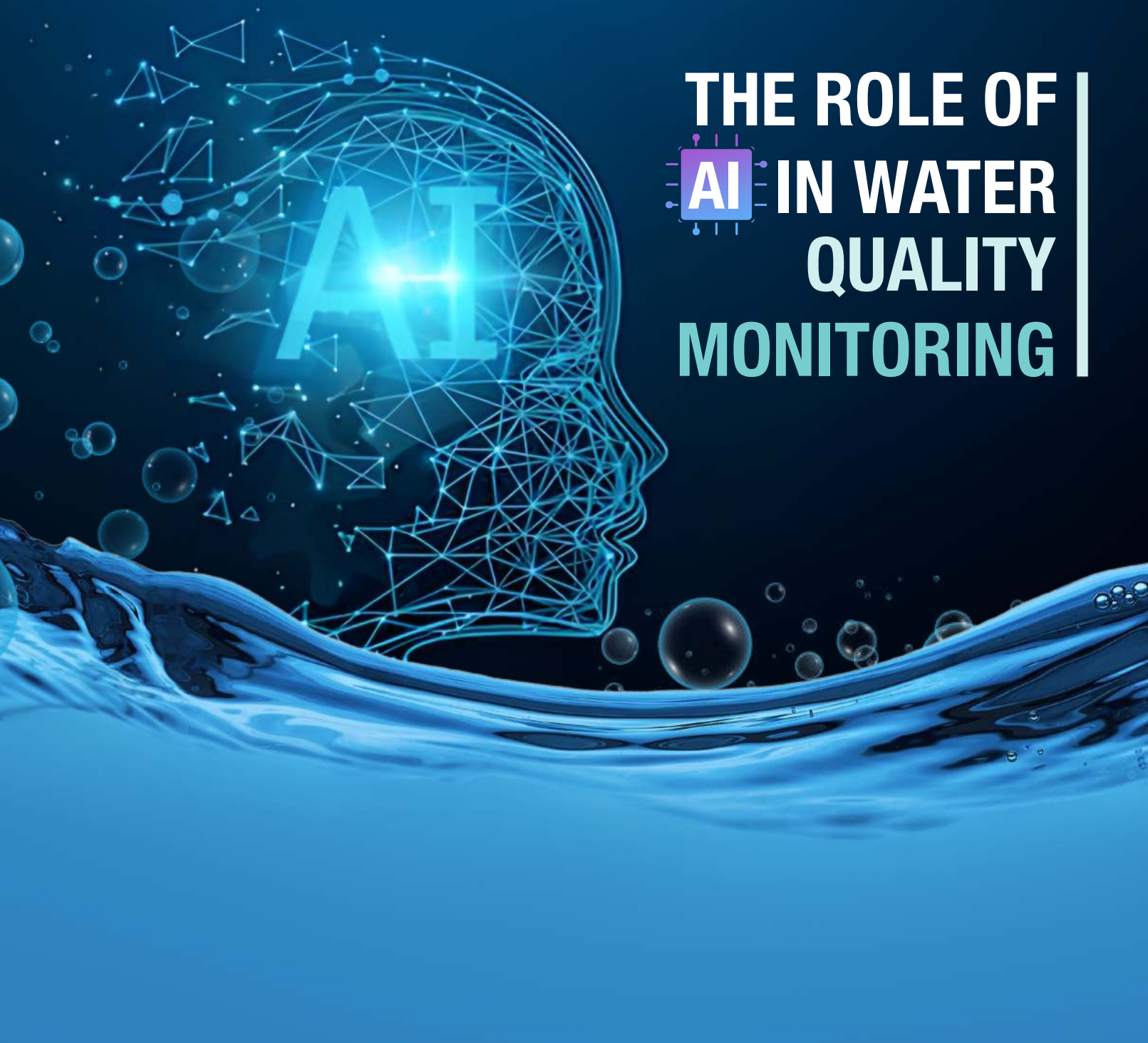


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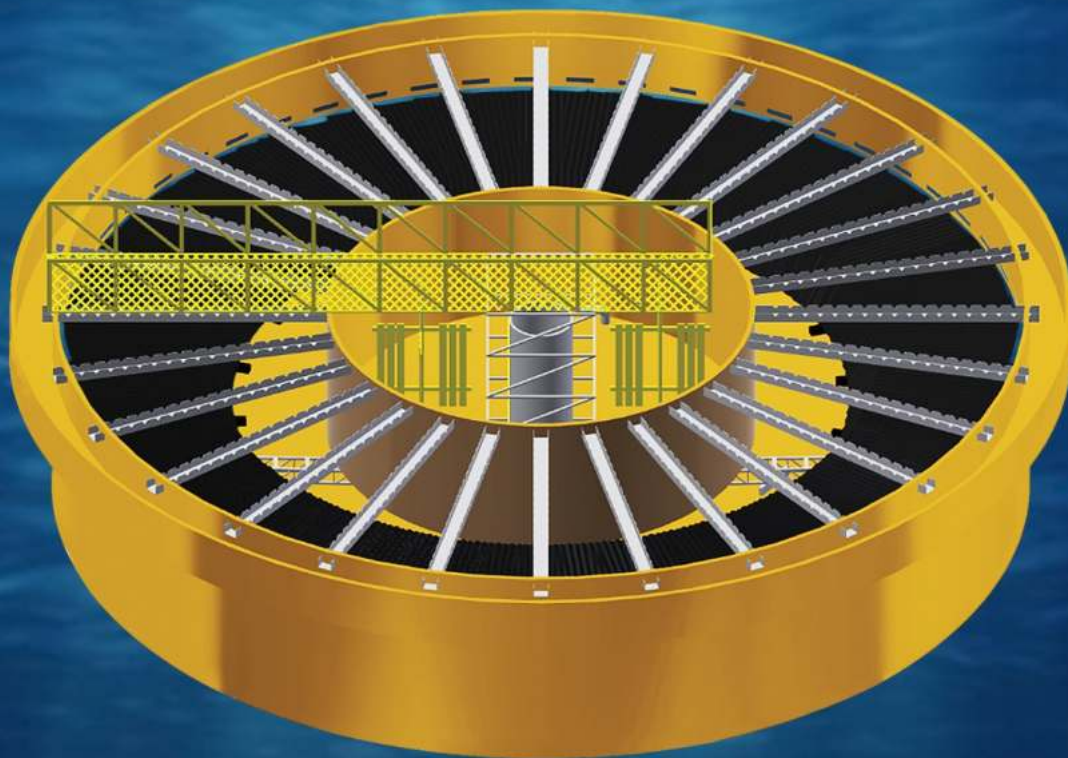




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All the images and news articles have been taken from leading online sources through secondary research.

ADVANCING WATER QUALITY MONITORING: HARNESSING THE POWER OF ARTIFICIAL INTELLIGENCE

Dear Readers,

Welcome to the March edition of EverythingAboutWater Magazine, where we embark on an enlightening journey into the pivotal role of Artificial Intelligence (AI) in revolutionizing water quality monitoring. As the world grapples with escalating environmental challenges, the need for innovative solutions to safeguard our water resources has never been more urgent.

Within these pages, we illuminate the transformative potential of AI in enhancing the efficiency, accuracy, and sustainability of water quality monitoring systems. From leveraging AI algorithms for real-time data analysis to deploying sensor networks for proactive detection of contaminants, we delve into groundbreaking technologies that promise to redefine the landscape of water management.

This issue serves as a beacon of knowledge, offering invaluable insights to scientists, engineers, policymakers, and environmentalists alike. As you immerse yourself in the compelling articles, envision a future where AI-driven monitoring systems empower communities to make informed decisions, ensuring the availability of clean and safe water for generations to come.

In summary, I extend my heartfelt appreciation for embarking on this exploration into "Advancing Water Quality Monitoring through Artificial Intelligence." May the wisdom shared in these pages inspire collaborative efforts towards building resilient and sustainable water ecosystems.

Thank you for your unwavering commitment to the preservation of our most precious resource.

Thanks & Regards,

Simran Arora

Associate Editor

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NATIONAL W

DROPLETS

NX Filtration becomes B Corp certified

NX Filtration N.V. (Euronext Amsterdam: NXFIL), the global provider of breakthrough direct hollow fiber nanofiltration technology for pure and affordable water with strong sustainability benefits, today announces that it has officially become B Corp certified. NX Filtration N.V. joins a global movement of over 8,400 B Corps that pursue a sustainable purpose alongside profit.

At NX Filtration, we believe we have a responsibility to contribute positively to society and the environment. A B Corp must meet high, verified standards in terms of social and environmental impact, accountability and transparency and the certification is granted by B Lab. B Lab is the nonprofit network transforming the global economy to benefit all people, communities, and the planet. The B Corp certification addresses the entirety of a business' operations and covers five key impact areas of Governance, Workers, Community, Environment and Customers. Every three years, B Corps must recertify to uphold certification.

Becoming a B Corp marks another significant milestone in advancing our ESG agenda and demonstrates our commitment to a sustainable and socially responsible organization. Together with the global B Corp community we take collective action to address society's most critical challenges. NX Filtration remains fully committed to making an impact based on our mission 'clean and affordable water for all', whilst offering strong sustainability benefits to our customers and providing an inspiring working environment for our employees.

Jeroen Pynenburg, CEO of NX Filtration, states:

"We are truly honored to join the global B Corp community alongside other companies aiming to transform business into a force for good. NX Filtration has a clear sustainability proposition with its strong drive to make an impact on the water transition. Our B Corp Certification is another step in our journey and the B Corp movement gives us a great framework to measure our progress."

AVer Launches The FONE700 Speakerphone System, Featuring Cutting-Edge 3D Audio Tracking

AVer Information Inc., an award-winning provider of video conferencing solutions, is pleased to announce the launch of our latest ceiling speakerphone system, the FONE700. Suitable for rooms of any size, the FONE700's cutting-edge technology allows for seamless integration of our suite of audio-visual products. The state-of-the-art 3D Audio Tracking system allows for pinpoint audio-visual accuracy, ensuring optimal performance to meet your conferencing needs.

The FONE700 offers unique 3D Audio Tracking technology, which pinpoints and tracks the exact location of each speaker and adjusts the camera for optimal view through the CAM550 Conference Camera. Setup takes only four easy steps, and once complete, no further input is required.

The FONE700 System includes a full duplex acoustic apparatus for the optimal meeting experience. A single daisy chain can connect up to four speakerphones for flexible installation and versatile connectivity. With no need to worry about sockets, users can enjoy a truly clutter-free configuration.

The FONE700 ceiling speakerphone boasts advanced features including Noise Suppression, Double-Talk Detection, and De-Reverberation, ensuring crystal-clear audio in any environment. With its state-of-the-art technology, it minimizes background noise, detects simultaneous speech, and reduces echo, providing unparalleled audio clarity. The FONE700 connectivity hub enables seamless integration of our full suite of audio-visual products, including external speakers and cameras, as well as external devices such as monitors and Bluetooth equipment. The system can be adjusted via your preferred web browser and with the PTZApp 2, AVer's innovative value-added free software for meeting collaboration.

Solidaridad's Pathways to Prosperity Programme Spearheads Equality Efforts in Malawi's Agricultural Sector



Vande Jalam Campaign Launched in Indore to Combat Water Crisis

Water resources minister Tulsiram Silawat here on Tuesday stated that Indore's prosperity hinges on effective water management. "This city needs to conserve every single drop of the water for a rainy day," he said, underscoring the critical role of public participation, drawing parallels to the success of the city's cleanliness drive, at the launch of 'Vande Jalam' campaign at Ravindra Natya Grah on Tuesday.

In an initiative to tackle the looming water crisis in the city, the campaign was officially launched by organisations Sanghamitra and Vishwam. The event witnessed the presence of key figures including Silawat, mayor Pushyamitra Bhargav, river conservator of Bangalore Prasanna Prabhu, and saints and activists. Highlighting Indore's ranking among cities facing underground water depletion, Bhargav emphasised the need for proactive measures to avert a crisis akin to Bangalore. He proposed widespread adoption of water storage facilities such as pits to maximise groundwater recharge. Echoing this sentiment, Niharika Shivhare, a water conservation expert, stressed the significance of individual actions in water conservation, advocating for simple yet effective measures such as limiting water usage and adopting traditional practices like Indian-style toilets.

Sandeep Narulkar, an advocate for integrated water management, highlighted the pressing need to conserve natural water bodies and recharge groundwater sources amidst urban expansion. He underscored the importance of community-driven initiatives to revive neglected water resources and promote sustainable practices. Similarly, Sagar Choukse emphasised the role of behavioural change in water conservation, calling for a collective effort to instil values of water conservation in future generations. Citizens shared innovative approaches to water conservation, including utilising vacant industrial spaces for rainwater collection and implementing decentralised purification systems. Dutta of Shalimar Palms showcased the success of community-led initiatives such as terrace gardening and indigenous plantations in replenishing groundwater levels and mitigating water scarcity.

ATER NEWS

Pramod Dafriya highlighted the corporation's past efforts in water conservation and reiterated the need for sustained action to combat rising salinity levels in industrial areas. As Indore embarks on this ambitious journey towards water sustainability, the 'Vande Jalam' campaign stands as a beacon of hope, uniting citizens, policymakers, and environmentalists in a collective endeavour to secure the city's water future. "With determination and concerted effort, Indore aims to emerge as a model for water conservation and resilience, setting a precedent for cities nationwide to follow suit in safeguarding this precious resource for generations to come," the mayor said.

105 villages in Mysuru district likely to face water scarcity in next two months

The Mysuru Zilla Panchayat took stock of possible water scarcity in the district due to depleting water levels in reservoirs and plummeting groundwater table coupled with heat wave conditions. A review meeting was convened on April 3 where Mysuru ZP CEO K.M. Gayatri said that 105 villages in the district have been flagged as likely to face drinking water scarcity over the next two months.

Authorities have tied up with owners of borewells in the private domain to fulfil drinking water requirements in seven villages. Officials and PDOs were instructed to ensure that they tap all possible sources, and ensure that there is no hardship due to water scarcity in any village. While thrust is on ensuring drinking water, officials were also instructed to monitor the water quality to ensure that they meet the prescribed standards. Regular and random tests were prescribed to ascertain presence of arsenic, fluoride, nitrate content in water. Borewells testing positive for high arsenic, fluoride and nitrate content should be sealed and closed. A survey of borewells has been ordered to identify those whose water yield had depleted so that alternative arrangements could be made. Apart from ensuring drinking water to tide over the summer, the ZP CEO instructed officials to rope in NGOs to create public awareness on judicious use and conservation of water. Authorities have shared a circular of Dos and Don'ts, and precautions that need to be taken in view of the rise in temperature and heat wave conditions. The Indian Meteorological Department has said that the maximum temperature could rise by 2-3 degree Celsius in Mysuru, Mandya, Hassan districts during the next four days.



DROPLETS

[Lilongwe, Malawi | 6 April 2024] – In Malawi, like many countries in Africa, inequality persists as a significant challenge, particularly in the agricultural sector. Despite being largely agrarian economies, smallholder farmers in Malawi face immense disparities in access to inputs and other farming services, market opportunities, and socio-economic benefits. According to the World Bank, around 80% of Malawi's population relies on agriculture for their livelihoods, yet smallholders often lack access to modern farming inputs, financial services, and extension support, leading to lower productivity and income levels compared to larger commercial farms. It is against this backdrop that Solidaridad's Pathways to Prosperity Programme strives to tackle such deep-rooted inequalities through a transformative system change. "As Solidaridad, we strive for an economy that works for all. We dare to push for farmers and workers in Southern Africa to earn a living income in spite of the inequalities which are further exacerbated by gender disparities, with women farmers facing additional barriers to land ownership, credit access, and decision-making power within households. Solidaridad's Pathways to Prosperity Programme exemplifies the type of transformative change needed, aiming to ensure equal and rewarded participation of producers in global value chains while addressing the underlying inequalities that persist in agricultural systems across Africa," says Shungu Kanyemba, Managing Director for Solidaridad Southern Africa. According to Kanyemba, to address these deep-rooted inequalities and foster sustainable development in Malawi's agricultural sector, there is an urgent need for transformative system change. Such change should prioritize the creation of inclusive policies and programs that provide smallholder farmers, particularly women, with equal access to resources, markets, and decision-making processes. By investing in innovative solutions such as digital technologies for farm management, climate-smart agriculture practices, and inclusive financial services, Malawi can empower smallholders to improve their livelihoods, enhance food security, and contribute to overall economic growth.

[Media] field trip bridges digital and physical divides.

"As the name suggests, Pathways to Prosperity embodies Afrocentric-cultural worldviews that uphold collective community growth and values. This programme is implemented in partnership with the local cotton and tea industry major players including the Cotton Council of Malawi, Cotton Farmers Association and the Tea Association of Malawi with Kuno playing an important role in connecting the industry digitally. In the spirit of transparency and maintaining open doors, Solidaridad's Pathways to Prosperity Programme Management Team will be visiting Malawi from 7-13 April 2024 – and will be taking several Malawian journalists with to the fields – to come face-to-face with the farmers, beneficiaries, stakeholders, partners and donors who make all the difference. Media is a vital stakeholder in raising awareness to our efforts to make sustainability the norm in Malawi and the rest of Southern Africa," says Humphrey Nxumalo, Head of Programmes at Solidaridad. According to Nxumalo, the annual field trip aims to track project progress, connect with local teams, learn and share with each other, enhance understanding of the programme's implementation modalities, and identify opportunities for synergy and partnership development. Highlights of the field trips include visiting Nsalu Kuno Hub and Lisaka Cooperative farmers, attending Salima Cotton Seed Multiplication Field Day, going to the Tea Association of Malawi and more.

Breaking silos to elevate silent voices

"We need to break silos if we are to have a shot at combating food insecurity and elevating the voices of voiceless farmers. Kuno supports interventions that bridge digital and service gaps and enhance last-mile services in local economies. We are all about using digital tools and technology to empower smallholder farmers for wealth creation through farming and offer holistic solutions that are co-created with communities, experts and farmers. From having partnered with Solidaridad on this program, it gives us great pleasure to walk the mile on the ground with our farmers as we navigate this transformational journey together," says Lydia Banda, Regional Operations Lead at Kuno. In conclusion, Pathways to Prosperity strives to ensure equal and rewarded participation of producers in global value chains by fostering good production practices, improving market access, and enhancing service provision. The seven-year Pathways to Prosperity Programme (2023-2029) is made possible with the financial support from the Netherlands Ministry of Foreign Affairs that aligns with Solidaridad's organizational strategy and complementary with our ongoing RECLAIM Sustainability! programme. It is proof that together, we can press towards transformative system change that benefits all stakeholders equally in Malawi, Southern Africa and beyond.



1.5 MLD STP at Bengaluru's Vibhutipura Lake Awaits Power Supply

It has been almost a month since Bangalore Water Supply and Sewerage Board (BWSSB) installed the sewage treatment plant (STP) at the city's Vibhutipura lake. The STP, however, is yet to begin functioning as Bangalore Electricity Supply Company (BESCOM) has still not given the power connection. The 1.5 MLD-capacity STP can fill up the lake and ensure the recharge of borewells in the vicinity. According to the residents of the locality, the lake rejuvenation work was taken up in 2017 at a cost of Rs. 3 crores and the contractor removed the silt. In August 2021, an STP was sanctioned here at a cost of Rs. 4 crores.

"The equipment was lying unused. In January 2023, the engineer concerned told us that the STP would be operational in one month after the BESCOM gave power connection. But it took them one year to fix the equipment. And now they are awaiting power supply from BESCOM. Had the officials expedited the process, the STP would have become operational in March 2024 itself," said a resident.

BBMP Executive Engineer (Lakes) Bhupradha told The New Sunday Express that the Palike, meanwhile, has taken up desilting work and the silt would be removed at the earliest. And the officials are also following up with BESCOM for the power connection. "Once the STP functions, the lake will always have recycled water," said Bhupradha.

BBMP Health Spl Commissioner writes to BWSSB. To prevent outbreak of communicable diseases in the city, Special Commissioner of Health, Bruhat Bengaluru Mahanagara Palike (BBMP) Surokar Vikas Kishore on Saturday wrote a letter to Bangalore Water Supply and Sewerage Board to take precautionary measures to prevent the spread of infectious diseases. Stating that the role of the water board is crucial in averting outbreak of communicable diseases, Surokar listed out measures that the BWSSB should follow. "BWSSB

must ensure that chlorination levels in the samples of water at the treatment plants and at the final distribution is maintained as per norms. It should cooperate with the health department to collect samples from manholes and drains in areas where epidemics have been reported. It should also check if water pipes are leaking and take appropriate action," listed Surokar. He further requested BWSSB to share a reply on the action taken on the suggested measures.

BWSSB extends deadline to install aerators to April 30. The Bangalore Water Supply and Sewerage Board (BWSSB) chairman Ram Prasat Manohar announced that the date to install aerators in taps in malls, commercial complexes, apartments, government buildings, luxury hotels, restaurants and public areas including religious places has been extended to April 30. Earlier, the last date for installation was April 7 but due to requests from consumers, the date was extended. The decision aims at restricting water flow in taps and unnecessary wastage of the same. Moreover, if the flow restrictor/aerator is not installed, water supplied by the Board will be reduced to 50% as per Section 53 of Bangalore Water Supply and Sewerage Act-1964 and an amount of Rs. 5,000 will be fined with an additional penalty of Rs. 500 per day.



Siddipet Has Enough Water Resources for Summer: Sulthania

Principal Secretary (Panchayat Raj, Rural Development and Rural Water and Sanitation) Sandeep Kumar Sultania said Siddipet district had enough water resources to meet the drinking water needs of summer and also until the monsoon sets in.

The Principal Secretary, along with Siddipet Collector M. Manu Chowdary, Engineer-in-Chief RWS Krupakar Reddy, Chief Engineer Vijay Prakash and other officials, visited the 40 ML sump and intermediary treatment plant at Akkaram near Gajwel, the water treatment plant at Mangol, and intermediary treatment plant at Kondapaka to examine the availability of drinking water availability. Later, he held a meeting with officials at the Siddipet Collectorate.



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Sulthania asked officials to work in coordination to ensure there would be no short supply of drinking water in any parts of the district. He asked them to have an action plan village and habitation wise. The Principal Secretary has also directed them to carry out a drive in the villages to identify the borewells and handpumps and restore them by doing the necessary repairs to utilise them in case of emergency. Sulthania warned officials that the government would take stern action if local officials fail to restore disrupted water supply within 24 hours.



Traditional Water Conservation with 10,000+ Trenches in Palghar

JM Financial Foundation (JMFF) has been implementing the Integrated Village Development Project in a cluster of seven villages and 15 hamlets of Mokhada block in Palghar, Maharashtra. Over the years, the project has attempted to establish the non-necessity of relying on large, constructed water conservation structures, by promoting continuous Contour Trenches (CCTs) along hill slopes in some of the most water-scarce areas of the block. A total of 10,794 CCTs were dug and deepened year on year, leading to in-situ water conservation, and natural recharge of groundwater, while also preventing run-off of surface water in the abundant monsoons in this region. Besides, the project has promoted rainwater harvesting with the digging of 294 small farm ponds (jalkunds).

Commenting on the project, Puja Dave, Executive Director and Head CSR, JM Financial Group, said, "Our efforts in Mokhada block have been focusing consistently on structured grassroots interventions, reaping visible results over the years. A region known for water crises, but surviving on agriculture, like Mokhada, needed focused investments in sustainable modes of water conservation, that are easily understood and adapted at a scale. Every summer, from April to June, CCTs have been dug, and we aim at digging further in the coming year. The trenches dug to date, cover an area of 180 acres, and have provided farmers, especially those from the Katkari community with an opportunity to earn locally, and not migrate at the beginning of

the year." Complementing water conservation, the Foundation has also supported the plantation of 1,722 saplings of mango and cashew, which beyond safeguarding soil health, also yields economic benefits for the landowning farmers. Being a central component of JM Financial Foundation's intervention, water harvesting and conservation feed into the objective of enhancing farmers' livelihoods. Since its initiation in 2018, the project has worked on enhancing agricultural yield, encouraging multi-cropping and farming in two seasons. These efforts have entailed regular, scientific training, followed by advanced agri-inputs being provided to 1,100+ marginal and small farmers, handheld throughout. Dovetailing initiatives in agriculture and water conservation are efforts made by the Foundation to link the community to public schemes and programmes designed for them. With the intervention of two helpdesks set up and run at Ase and Beriste Gram Panchayats, the Integrated Village Development Project has linked farmer families with benefits worth over INR 7 crores thus far.

Citizens Optimistic About STP, Lake Cleaning Projects' Timely Completion

water bodies, forcing the civic body to spend on removing the hyacinths all over again. So much so that the PMC has now increased its budget to clear hyacinths from Rs. 2 crores to Rs. 4.50 crores and its environment department has initiated the tendering process to remove hyacinths following complaints from citizens regarding the mosquito menace. The civic authorities had even experimented with the use of the chemical Dranzyme to destroy water hyacinths in Ramnadi. The experiment was successful as it was found that the water hyacinth had dried up and gave good results.

Official's Word

"During the site visits and inspections of STP projects and lake cleaning works, major issues such as rejuvenation of lakes and removal of hyacinths were discussed with officials of PMRDA and other stakeholders. Such inspections will be carried out on a regular basis to ensure that projects are completed within the timeframe specified and that river pollution is reduced," said Prithviraj Meena, additional commissioner of PMC.



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HMWSSB to Restart Two Water Treatment Plants

To address the ever-increasing drinking water demand in certain areas of the city due to the depleting groundwater table, the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB) is going to restart two Modular Water Treatment Plants (MWTPs) between the Osman Sagar water conduit line and Asif Nagar filter beds to draw raw water of two million litres per day (MLD) and two MLD plants will be set up on the conduit line. The two MLD plant will be ready and functional by this Wednesday or Thursday and the three MLD plant, by this weekend. These MWTPs will treat raw water and ensure water supply through tankers are delivered by establishing water filling stations to nearby local areas as well as Tadbund, Karwan, Shaikpet, Rajendranagar, Serilingampally, Jubilee Hills, Manikonda and other nearby areas.

These two MWTPs were procured in 2019 costing Rs. 70-75 lakhs each to draw raw water from Osman Sagar water conduit and supply it through water tankers after treatment at MWTPs. Now, they are being restored by the Water Board authorities to meet the additional water demand during the next three months, April to June, 2024. According to officials, the raw water passing through the Osman Sagar conduit to Asif Nagar filter beds, near Mehdiapatnam, will be tapped at the two MWTPs for treating the water to make it potable. Unlike the conventional treatment plants, modular treatment plants can be set up quickly, which follow the same treatment procedures but at a lower level and the water treated from them will be supplied for local areas. They said that the raw water from the water conduit will be taken to these plants, where the water goes through different treatments such as ultrafiltration, reverse osmosis and ozonation. Then, the treated water will be supplied through water tankers to the nearby areas. These water treatment plants are ideal for emergency, temporary and semi-permanent solutions, they added.

Kerala Minister on IT Companies in Bengaluru Over Water 'Crisis'

Kerala Industries & Law minister P. Rajeeve is inviting IT companies in

Bengaluru, Karnataka, to the state. The minister is wooing major IT companies from Bengaluru, facing a deepening water crisis. The state is highlighting its abundant water resources as a major advantage, contrasting it with Bengaluru's daily water shortage of 500 million litres. "After we read reports of the water crisis in Bengaluru, we wrote to the IT companies offering them all facilities as well as plenty of water," the minister told ET on Tuesday. "We have 44 rivers, big and small, in our state, so water is not an issue at all." This move comes as Bengaluru, India's IT hub, grapples with water scarcity. Traditionally the go-to destination for IT companies in India, Bengaluru's woes are prompting other states to step up their game. Kerala is showcasing its infrastructure strengths, including existing tech parks in Kochi, Thiruvananthapuram, and Kozhikode, along with plans for smaller parks in developing corridors. The state boasts a well-connected network of airports, roads, railways, and ports, making it an attractive location.

Kerala's ambition: To become a Silicon Valley style hub

While Rajeeve declined to name specific companies being targeted, he mentioned ongoing discussions and Kerala's ambition to become a "Silicon Valley" style hub. The state's existing talent pool of tech graduates is another advantage being highlighted. "We are in discussions with some of them," he said. "We want to develop our entire state on the lines of Silicon Valley. We have several advantages to host the tech sector, including a vast talent pool of technology graduates. Kerala has a clear goal: to increase its IT workforce from 2,50,000 to 1 million within five years. The government plans to achieve this by building four IT corridors along National Highway 66. This strategic move by Kerala highlights the growing competition among Indian states to attract the IT sector. With Bengaluru facing challenges, Kerala sees an opportunity to establish itself as a major player in the Indian IT landscape.

Water Management Strategies Implemented in Mangaluru Amidst Shortages

In response to dwindling water levels in key reservoirs, authorities in Mangaluru have unveiled a strategic plan to manage water resources effectively. Mayor of Mangaluru, addressing the issue, outlined the measures undertaken to mitigate water scarcity in the region. The mayor emphasized that if the water level in Thumbay drops to 5 meters, replenishment will be sourced from the AMR dam. Similarly, should the water level in the AMR dam decrease to 16 meters, replenishment efforts will be initiated from the Harekala dam. Highlighting the severity of the situation, the mayor noted that urban areas such as Ullal, Koteekar, and Someshwar are grappling with water shortages, necessitating water supply via tanker services.

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Additionally, five gram panchayats including Konaje, Balepuni, Narimogaru, Manjanady, and Pajiru are experiencing similar shortages in rural areas. The public has been urged to conserve water and collaborate with the district administration in these efforts. While rationing measures are currently not in place, the mayor stressed that their success in avoiding such measures relies heavily on public cooperation and adherence to water conservation practices.

Bengaluru Stadium to Get Treated Water Supply for IPL Matches Amid Crisis

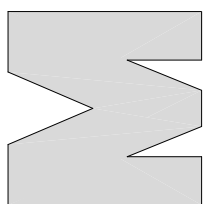
In view of the severe water crisis in Bengaluru, authorities have decided to supply treated water to the M Chinnaswamy stadium in the city for the upcoming IPL 2024 cricket matches. There are currently three matches scheduled to be held at the stadium, on March 25, 29 and April 2.

The Bangalore Water Supply and Sewerage Board took the decision at the request of the Karnataka State Cricket Association (KSCA) management board. The request was made to source the required water from the Cubbon Park wastewater treatment plant. Responding positively to KSCA's plea, BWSSB chairman Ram Prasad Manohar has committed to supplying treated water to the stadium.

Justifying its decision, the BWSSB cited the potential to prevent the misuse of groundwater and Cauvery river water while encouraging the optimal utilisation of treated water. Several factors, including reduced rainfall, depleting groundwater, and strained recharge options due to infrastructure, have contributed towards the severe water shortage in Bengaluru. On Monday, Karnataka Chief Minister Siddaramaiah said that the state capital is currently facing a shortage of 500 million litres of water per day (MLD) against the actual requirement of 2,600 MLDs.

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LANXESS' LEWAPLUS DESIGN SOFTWARE RECEIVES NUMEROUS NEW FUNCTIONS



Design and evaluation of mixed-bed systems. The new functionalities in the water treatment application area include a module for designing mixed-bed systems with ready-to-use mixed bed (MB) resins. The starting point for this was standard mixed beds for which reliable data on operating capacity are available. The module makes it possible to design the filter hydraulics and allows a good estimate of the expected cycle time. As soon as the database is sufficiently accurate for a realistic calculation of the cycle time, high-end mixed beds will also be integrated in a further update.

In addition to designing new systems, LewaPlus now also makes it possible to evaluate existing mixed-bed systems, optimize them, and monitor the performance of the installed resins. The MB-Check module was introduced as a logical next step. It is based on the proven Demi-Check module, a very efficient tool for evaluating the performance of systems by simulating the aging of the installed resins or changes in the composition of the feed water.

Determination of resin performance in condensate polishing applications. When it comes to condensate polishing, the further development of LewaPlus ensures a much more comprehensive calculation of resin performance. The revision of this module includes the following key improvements.

In an arrangement consisting of a strong acid cation exchange (SAC) resin and a downstream mixed-bed stage, the cycle times can be calculated separately. Such a configuration is often used if the raw condensate has a high pH value. The SAC stage removes most of the conditioning agent so that the mixed bed can be operated for a much longer time. The cycle time of the SAC stage can now be set individually, independently of the mixed bed. The volume ratio of SAC and strong base anion exchange (SBA) resin in the mixed bed can be varied in the range from 1:2 to 2:1. This means that the hydraulic requirements, such as compliance with the recommended minimum height or the maximum specific

volume load (BV/h), can be met without having to adjust the safety factor. The actual operating capacity and the theoretical maximum operating capacity are shown. Furthermore, the calculation of the silica capacity has been revised. In addition to the laboratory data, data from real applications was included in the calculation. This leads to a higher theoretical maximum operating capacity.

Food module expansion

For the first time, LANXESS is offering a feature within LewaPlus that can be used to estimate the use of mixed-bed ion exchange systems to produce the best possible sugar quality. Investment costs and potential savings in operating costs can also be identified. The former include the installation of the system and the procurement of the ion exchange resins. Operating costs include the cost of regeneration and water supply and disposal. With the help of a cost forecast, the user can estimate the costs over the planned total operating life of the system (total cost of ownership, TCO).

As a design tool for the industrial production of aqueous sugar solutions, the LewaPlus FD module helps to dimension new systems and check existing systems. To complete the portfolio of ion exchange processes for the food and beverage industry, LANXESS has expanded the existing module for corresponding applications. It is now also possible to design mixed-bed systems that are used as a polishing stage for sugar solutions in the production of high-purity sugar. Such sugar-containing solutions are either a component of end products that are produced from starch in a multi-stage process, for example glucose, dextrose or concentrated fructose syrup, or a liquid sugar obtained from sugar cane or sugar beet.



LANXESS has now released a new version of its LewaPlus design software with a significantly expanded range of functions. The calculation tool, which enables the dimensioning of ion exchange systems including individual process configurations, has been updated with improvements and additions in the modules for mixed-bed calculation, condensate polishing, and the design of polishing stages in food and beverage production. The software also enables users to check the efficiency of existing systems and identify potential savings in operating costs.

Dr. Nadja Hermsdorf, Technical Marketing Manager in the Liquid Purification Technologies (LPT) business unit at LANXESS, explained: "We often find that the capacity of the ion exchange resin units to be better utilized and that there is also potential for optimization in terms of water and chemical consumption. With LewaPlus, we provide a powerful tool for determining such operating parameters in advance or retrospectively using simulation. After all, sustainability considerations and data are becoming increasingly important for our customers in order to reduce operating costs."

QUA INAUGURATES NEW STATE-OF-THE-ART MEMBRANE MANUFACTURING FACILITY



QUA, a leading innovator in advanced membrane technologies for water and wastewater treatment, is proud to announce the commencement of production at its new state-of-the-art membrane manufacturing center in Pune, India. The new facility marks a significant milestone in QUA's ongoing expansion and reinforces its commitment to solving water scarcity and complexity.

The expansion increases production capacity by four times (4X), furthering QUA's strategic goals to deliver a broad portfolio of advanced technologies and exceptional customer service. This new facility is a significant upgrade from previous capabilities, utilizing the latest advanced manufacturing systems, process monitoring technologies, and commitment to safety and environmental stewardship. The facility features a state-of-the-art zero discharge solution, enhancing



sustainability by recycling wastewater from manufacturing operations. The expansion is driven by QUA's diversification of its product portfolio and international market growth, which has extended its presence to over 30 countries. The new manufacturing center will cater to increasing demands and support the production of QUA's expanding portfolio of innovations, including FEDI® GIGA fractional electrodeionization, EnviQ® RF submerged ultrafiltration membranes, and Q-SEP® Q-Connect hollow fiber ultrafiltration membranes.

"This facility is a testament to QUA's ongoing dedication to innovation and sustainability," says Sugata Das, Director of Manufacturing and Operations at QUA. "With this expansion, we are setting new benchmarks for membrane manufacturing and reaffirming our promise to deliver excellence to our customers."

For over 15 years, QUA has contributed to India's local economy and job market through its research and development, sales, and manufacturing operations. The new manufacturing center aligns with the "Make in India" initiative and demonstrates QUA's role as a leading brand in enhancing domestic production, supporting the local community, and addressing global water needs.

The new facility brings multiple advantages to our customers, including quicker delivery times and a steadfast commitment to high-quality product availability and innovation. This scale of operations improves productivity, allowing QUA to keep pace with evolving industrial and municipal water treatment needs.

About QUA

QUA is a pioneer of advanced membrane technologies for challenging water treatment applications. Headquartered in the United States with an international presence, QUA is committed to ongoing innovation, drawing from extensive research and development and the expertise of a highly experienced global team. QUA's diverse product portfolio includes FEDI® Fractional Electrodeionization, Q-SEP® Hollow Fiber Ultrafiltration membranes, CeraQ™ Ceramic Membranes, and EnviQ® Flat Sheet and Hollow Fiber Submerged Ultrafiltration Membranes. Learn more at www.quagroup.com.



GLOBAL W

DROPLETS

Bentley Systems Issues Call for Nominations for the 2024 Going Digital Awards in Infrastructure

Bentley Systems, Incorporated (Nasdaq: BSY), the infrastructure engineering software company, today announced its call for nominations for the 2024 Going Digital Awards in Infrastructure. The awards, which are judged by independent juries of industry experts, recognize infrastructure projects for going digital advancements in infrastructure. The deadline for nominations is April 15, 2024. Users of Bentley software are invited to enter their projects in the Going Digital Awards in Infrastructure program, no matter which phase the project is in – preconstruction/conceptual, design, construction, or operations. The three finalists chosen for each awards category win a trip to Vancouver to attend The Year in Infrastructure and Going Digital Awards event as guests of Bentley Systems. As part of the conference, the finalists will present their projects before the judges, industry thought leaders, and members of the media.

The 2024 Going Digital Awards in Infrastructure categories include:

- Bridges and Tunnels
- Construction
- Enterprise Engineering
- Facilities, Campuses, and Cities
- Process and Power Generation
- Rail and Transit
- Roads and Highways
- Structural Engineering
- Subsurface Modeling and Analysis
- Surveying and Monitoring
- Transmission and Distribution
- Water and Wastewater

These projects recognize innovative advancements and measurable impacts in infrastructure delivery and performance using Bentley software, including Bentley Infrastructure Cloud and Bentley's iTwin Platform for infrastructure digital twins. Projects may also be recognized for advancements that empower sustainable development goals in terms of climate action, energy transition and efficiency, circularity of land and water resources, and healthy communities.

In addition to the juried awards, Bentley's founders will honor select projects representing organizations or individuals whose undertakings contribute notably to infrastructure advancement and/or environmental and social development goals. Every project nominated for an award receives recognition across the global infrastructure community. Through the 2024 Going Digital Awards in Infrastructure program, participants:

- Get their infrastructure projects profiled in Bentley's Infrastructure Yearbook, which is distributed in print and digital formats to media, government, and industry influencers around the world.
- Enhance their competitive edge by demonstrating to existing and potential clients the value that the participants add to projects through their digital innovations.
- Receive coverage from global media and support from the Bentley team in marketing and promoting their respective projects to the media.



Egypt Secures \$66 Million Funding for Expansion of Wastewater Treatment Plant

Egypt has successfully secured €61.5 million (\$66.64 million) to advance the third phase of the Al Gabal Al Asfar wastewater treatment plant, according to a local Egyptian newspaper report. The funding, obtained from the French Development Agency (AFD) and the European Union (EU), is a significant step towards enhancing wastewater management infrastructure in the country.

The agreements, formalised by Egypt's Minister of International Cooperation (MoIC), Rania Al-Mashat, highlight the collaborative efforts between Egypt and international partners to address critical infrastructure needs. The completion of the third phase will boost the plant's capacity to process an additional one million cubic meters per day of wastewater. Leveraging tertiary treatment technology, the upgraded facility aims to produce water suitable for irrigation purposes while generating biogas to fulfill up to 80 percent of its electricity requirements.

African Development Bank Champions Private-Public Partnerships and Good Governance for Universal Water Access in Kenya

Kenya's Water and Sanitation Investors Conference 2024, held in the capital, Nairobi, concluded with a call for accelerated investment towards universal access to water and sanitation by 2030. The March 6-8 conference underscored the need for collaboration to support governments in bridging the financing gap through private sector funding, blended financing from commercial banks, Development Finance Institutions, and capital markets. Kenya requires about Ksh 995 billion (around \$7.5 billion) to achieve universal access to water and sanitation by 2030.

Mecuria Assefaw, Manager of the African Development Bank Water Security and Sanitation Division, highlighted the importance of diversifying investments in the sector to meet the financing gap. He stressed the significance of Private Public Partnerships in ensuring water

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and sanitation for all. “By facilitating collaboration for PPPs, we unlock a new door for investments and capital,” he said, adding that closing the financing gap in the sector requires long-term sustained efforts. Assefaw referenced successful PPP initiatives like the Rwanda’s Kigali Bulk Water Supply Project, co-funded by the Bank alongside other development partners, which has significantly improved water services for half a million people.

Julius Korir, Principal Secretary in Kenya’s Ministry of Water, Sanitation and Irrigation, affirmed the political goodwill in Kenya for PPP projects in the water sector, noting efforts to align the Water Act with the PPP legislation to operationalise such projects. The conference emphasized the importance of creating an enabling investment environment through good governance and regulatory structures. Emily Kilongi, a Senior Water and Sanitation Officer at the Bank, stressed that proper policy, institutional, and regulatory arrangements are vital for facilitating investments in activities that contribute to water security and safe sanitation.”

The Bank was represented in other high-level sessions, including the Catchment to Tap and Climate Change Investment Opportunities. Emmanuel Olet, Chief Water Development Officer, and Benson Bumbé Nkhoma, Principal Water Resources Management and Development Officer in the Water Development and Sanitation Department, called for innovative ways of conserving catchment areas while engaging with communities, given the emerging and growing challenges resulting from population growth and expanding land use. Edwin Mwangi, a Private Sector Specialist with the Bank, reiterated the critical role of the private sector in implementing the construction of water sector infrastructure and bridging the funding gap to achieve Sustainable Development Goals 6 through blended finance solutions.

Zuluf Water Treatment Plant Breaks Ground

Saudi Aramco and its developer partners have broken ground on the Zuluf water treatment plant project in Dhahran, Saudi Arabia. The project consists of a water treatment plant with a capacity to treat 1,85,000 cubic metres of water a day (cm/d). The plant will treat water produced at the Zuluf oil field before it is reinjected back into the oil field, located 240

DROPLETS

Mumbai Water Conclave 2024: Flowing towards Sustainability

On the occasion of UN World Water Day on 22nd March, Mumbai First is organizing a day-long conference ‘Mumbai Water Conclave 2024’ at the Trident Hotel, Mumbai. Mumbai, the bustling metropolis on the west coast of India, faces significant challenges regarding water management. With a burgeoning population and rapid urbanization, the demand for water in Mumbai and Mumbai Metropolitan Region has been escalating, putting immense pressure on the existing water infrastructure. The city relies heavily on diverse water sources, including rivers, lakes, and reservoirs, to meet its growing needs.

The need of the hour is to put into practice a water conservation policy to encourage wise water usage and lessen the demand from the MMR region’s freshwater supply to Mumbai. The city has made investments in cutting-edge recycling and water treatment facilities, allowing processed wastewater to be used for non-potable purposes. Incorporating green spaces into urban development and protecting natural water bodies are other tasks that authorities carry out for the same. With these initiatives, we hope to lessen the demand for freshwater resources and create a water management system that will be sustainable for both the present and coming generations.

The conclave aims at addressing the challenges to Mumbai’s water conservation, treatment, and sustainable use of water resources to combat the shortage of freshwater supply in the city amongst others. Through this Conclave, we will be focusing on the following objectives:

- To create awareness and promote a sense of responsibility and urgency in adopting water-saving behaviours in Mumbai.
- To highlight diverse water conservation strategies, and explore effective implementations to conserve water across Mumbai.
- To understand how innovation can optimize water usage and encourage the adoption and integration of technological solutions for sustainable water management.
- To know what water-saving methods are practiced by industries, housing societies, and other sectors in Mumbai.



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kilometres north of Dhahran. A team led by Madrid-headquartered Almar Water Solutions won the 25-year build-own-operate-transfer (BOOT) contract to develop and operate the facility. The contract, signed in December 2022, reached financial closure in March 2023. For the execution and operation of the plant, Almar Water Solutions is collaborating with a consortium.

Almar Water Solutions will work with a consortium of companies formed by Riyadh-headquartered Al Jomaih Energy and Water Company (AEW), Italy's Fisia Italmimpianti and US-based Aquatech International for the operation and management of the plant.

WaterAid and Microsoft launch water, sanitation and hygiene programs in India and Nigeria

Wateraid and Microsoft Corporation announced the launch of two new programs to deliver sustainable, climate-resilient water, sanitation and hygiene services to communities in India and Nigeria.



In India, a groundwater recharge program will serve more than 60,000 people and address water scarcity in the urban Hyderabad and rural Karnataka areas. These communities source 80% of their drinking water from the ground, but the growing intensity of rainfall and monsoons combined with groundwater overuse by the agricultural and industrial sectors has created the need to harvest rainwater and ensure the availability of sustainable groundwater while adapting to climate change. During the three-year program, rainwater harvesting and groundwater recharge will conserve and recycle more than 235M gallons of water, which contributes to increased groundwater levels and water security for future generations.

In Nigeria, the collaboration will reach more than 21,000 people over three years in rural and suburban communities in Lagos, where only 36% of schools and 29% of healthcare facilities have basic water, sanitation and hygiene services. Climate shocks including heat waves and flooding have further depleted the water supply and damaged water infrastructure. Behavior change campaigns, government partnerships and community participation will also be essential to maximize the benefits of improved access to clean water, decent

toilets and handwashing with soap. WaterAid and Microsoft Corporation announced the launch of two new programs to deliver sustainable, climate-resilient water, sanitation and hygiene services to communities in India and Nigeria. Globally 2.2 billion people don't have safe water, 3.5 billion don't have a decent toilet, and 2 billion lack soap and water to wash their hands at home. The consequences of increasingly extreme and unpredictable weather patterns are felt largely through water—flooding and droughts create either too much or not enough. With support from Microsoft, WaterAid is addressing these issues locally by building sustainable and climate-resilient water, sanitation and hygiene systems in communities in India and Nigeria that will last for years to come.

This collaboration between Microsoft and WaterAid comes as companies increasingly see the benefits of investing in water and toilets to drive health, wealth and prosperity. "Boosting Business," first-of-its-kind research released by WaterAid, proves the positive impact of water, sanitation and hygiene investment in a community. Productivity, punctuality, health, morale and loyalty all improve; absenteeism and staff turnover decrease - ultimately improving profit.



VA Tech Wabag and Peak Sustainability Ventures partner for 100 Bio-CNG plants at sewage facilities

Va Tech Wabag Limited (WABAG) has entered into an MoU with Peak Sustainability Ventures (PEAK) to establish 100 Bio-CNG plants at sewage treatment facilities across India and other mutually agreed-upon locations in the GCC, Africa, and European countries. Through this partnership, the companies aim to harness the unutilized potential of Sewage treatment plants and to generate Bio-CNG which can be used for mobility application in trucks and heavy duty vehicles, and for industrial applications, thereby reducing the need for fossil fuels.

This initiative would not only meet the growing energy demand in a responsible and eco- friendly manner, but also contribute to India's commitment to GHG emission reduction and to reduction of air



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pollution from methane, which has much higher Global Warming Potential (GWP) than carbon dioxide. WABAG is the 3rd largest private water operator globally with providing safe and clean drinking water and sanitation to over 88.8 million people across the globe. This strategic tie-up will further boost WABAG's commitment towards a cleaner and greener world. WABAG has already implemented around 40 large biogas generation facilities in its various projects globally.

The business potential for the establishment of 100 Bio-CNG plants is expected to be over USD 200 Million and this collaboration aims to generate over 73 Million Kgs of Bio-CNG per annum. PEAK manages an Alternative Investment Fund (AIF) which invests across 4 verticals: new energy (renewables, energy storage, waste-to-energy, hydrogen etc.), food systems, water and other climate related sectors to address the mitigation and adaptation objectives of the SDG goals. WABAG with its experience & know-how in implementing sustainable solutions will play the role of a technology partner and will be responsible for execution, commissioning and O&M of the Bio-CNG plants. PEAK would provide inputs in energy related areas and assist in raising capital for financing projects at scale.

The business potential for the establishment of 100 Bio-CNG plants is expected to be over USD 200 Million and this collaboration aims to generate over 73 Million Kgs of Bio-CNG per annum. This will be a significant boost to the local and agrarian economies and will also result in employment opportunities while simultaneously providing immense ecological benefits, further empowering the G20 initiative of the Global Biofuel Alliance and enhancing the energy security of the country. Bio-CNG production from sewage treatment plants exemplifies an innovative and environmentally conscious approach, transforming a once-discarded resource into a valuable and versatile energy asset.

ADB approves \$200M loan to improve sanitation in Indian cities

Asian Development Bank (ADB) has approved a \$200 million loan to improve solid waste management and sanitation in Indian cities.



ADB's financing will support the Government of India's Swachh Bharat (Clean India) Mission—Urban 2.0 which commits all cities to be garbage free by 2026. The Swachh Bharat Mission 2.0 – Comprehensive Municipal Waste Management in Indian Cities Program will introduce international best practices, new technologies, and mainstream climate- and disaster-resilient approaches in municipal solid waste management. It will strengthen women's participation in sanitation and service delivery and harness private sector participation.

"Municipal waste management is a major issue in India's rapidly growing urban centers. This ADB program will help develop municipal solid waste management and sanitation facilities and practices in 100 cities across eight states," said ADB Urban Development Specialist Alexandra Conroy. "Having a clean environment free from garbage and pollution coupled with quality urban basic services like water supply and sanitation will ensure that citizens are healthy, happy, and productive—essential to the country's sustainable economic growth." The Asian Development Bank (ADB) has approved a \$200 million loan to improve solid waste management and sanitation in Indian cities.

ADB's support will upgrade and establish waste management facilities such as bio-methanation plants, composting plants, managed landfills, material recovery facilities, and plastic waste processing facilities. It will also support the construction of communal toilets and urinals and the purchase of sweeping equipment. These facilities and delivery of urban services will include climate- and disaster-resilient, gender equality and social inclusion-responsive features.

The program will build urban local bodies' capacity on waste management and sanitation, encourage peer-to-peer learning, and proactively engage with the private sector. It will help conduct annual reviews and progress updates of citywide solid waste and sanitation action plans. Training and awareness campaigns for sanitation workers and communities will be conducted to improve waste segregation and waste collection.

ADB will provide an additional \$3.15 million technical assistance (TA) grant from its Urban Resilience Trust Fund, Republic of Korea e-Asia and Knowledge Partnership Fund, and the Sanitation Financing Partnership Trust Fund. The TA grant will support program implementation, capacity building of selected states on financial management and monitoring and evaluation and facilitate twinning or city-to-city partnerships. ADB is committed to achieving a prosperous, inclusive, resilient, and sustainable Asia and the Pacific, while sustaining its efforts to eradicate extreme poverty. Established in 1966, it is owned by 68 members—49 from the region.



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World Bank program to strengthen urban water, sewerage system for 2 million in Tamil Nadu, India

World Bank's Board of Executive Directors today approved a new program to support Tamil Nadu and provide around 2 million people with more and better access to water and sewerage services in cities. Tamil Nadu is one of the most urbanized states in India and faces increasing impacts of climate shocks like floods and droughts. For its rapidly growing population, access to services like water and sanitation is essential for more climate-resilient cities. The \$300 million Tamil Nadu Climate Resilient Urban Development Program will help 21 Urban Local Bodies (ULBs) update their delivery systems and provide quality and efficient water supply and sewerage services to consumers.

"By 2030, almost 70 percent of India's new jobs will be generated in cities and more than 18 million people will move to cities," said Augustine Tano Kouame, the World Bank's Country Director for India. "As centers of economic growth, it is critical to strengthen their ability to cope with the impacts of climate change and ensure continuity in basic service delivery."

Besides helping to gain better access to water supply to households, the Program will support ULBs to increase designated areas for green spaces and parks. "This Program aims to leverage the private sector by introducing performance-based contracts. In addition, it will issue municipal bonds and support urban governance reforms to improve the fiscal health of ULBs and secure the future needs of the urban population," said Raghu Kesavan, Mansha Chen, and Lilian Pena P. Weiss, the Task Team Leaders for the project. "Communities, especially women, will also play a key role in designing and supporting effective climate action plans for cities."

For the past two decades, the World Bank has engaged with Tamil Nadu and ULBs to establish and scale-up a state-level urban institution as a public-private partnership facility that leverages various sources of finance for urban infrastructure projects in cities.

The \$300 million loan from the International Bank of Reconstruction and Development (IBRD) will use the blended financing instrument of Program-for-Results (PforR) with Investment Project Financing (IPF) to link disbursement of funds directly to the achievement of results while providing technical assistance. The Program loan has a maturity of 32 years with a grace period of 7 years.



CNR selects Cosmo Tech to enhance asset management

French renewable energy producer CNR has entered into a five-year partnership with Cosmo Tech, an AI Simulation and Enterprise Digital Twins software company. The collaboration aims to enhance CNR's asset management efficiency, supporting its strategic and tactical planning decisions with advanced AI-Simulation software. The goal of integrating Cosmo Tech into CNR's operations is to aid in forecasting the impact of asset renewal and maintenance decisions on overall performance. This strategic partnership aims to optimize investments and enhance operational efficiency across CNR's diverse portfolio of hydroelectric and solar power plants, dams, and locks in France's Rhône Valley. "Through 90 years of experience in producing renewable energy and developing the navigability of the Rhône river, CNR has continuously innovated and gained expertise in managing industrial equipment," said Mathieu Stortz, General Director at CNR. "Our choice of Cosmo Tech's AI Simulation capabilities marks a significant advancement towards supporting our 2030 strategy. This collaboration is set to increase the profitability of our capital-intensive industrial facilities and optimize the management of the Rhône's natural resources, further fortifying our role in the region's energy transition."

Cosmo Tech's software acts as a navigator for business decision-making, generating thousands of scenarios to predict various outcomes. This empowers CNR to simulate the impact of different actions on overall performance and make informed decisions to drive efficiency and sustainability. "For the past 10 years, we have partnered with major asset-intensive manufacturers and energy players. They are all facing significant changes and modernization challenges with their aging assets in line with the accelerated energy transition. We have witnessed how navigating complexity and uncertainty with AI



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Simulation is a key to their success, significantly helping them drive transformation through asset management” said Hugues de Bantel, co-founder and CEO of Cosmo Tech.

CNR fulfills three roles for the Rhône river region in France: electricity production, navigation, and the irrigation of agricultural land. Its 49 hydropower plants, 59 solar plants, 19 dams and 59 wind farms, and 330km of navigable waterway between Lyon and the Mediterranean, industrial and port sites make it a key player in the energy transition of the region. Spread out along the Rhône Valley, these facilities also form a complex system where any action at one site can have an impact on the others, creating cascading effects across the Rhône Valley and affecting the river's flow, which must be maintained at a specific height, whatever the weather conditions.

Michel Morvan, Co-Founder and Executive Chairman of Cosmo Tech also added, “We are excited to provide CNR’s teams with the software to optimize their decisions, aligning all stakeholders on common objectives, with a clear and tangible vision of the impact of strategic and tactical decisions across CNR’s operations. This partnership not only highlights the potential of AI Simulation in managing complex systems but also cements Cosmo Tech’s commitment to aiding sustainable transition in industry.

Hydro Tasmania CEO Ian Brooksbank announces departure, interim changes at Entura

Hydro Tasmania Chair Richard Bolt has revealed that CEO Ian Brooksbank will be stepping down from his position on October 3rd, marking the end of an era for one of Australia’s prominent renewable energy companies. Brooksbank’s departure is expected to usher in a new chapter as the company focuses on driving major initiatives in generation and storage infrastructure to bolster power reliability and support Tasmanian industry growth. Bolt commended Brooksbank for his leadership over the past three years, citing his instrumental role in shaping Hydro Tasmania’s strategic direction. “Ian is respected and admired across the company and the energy industry.



He is a skilled and compassionate leader, with a sharp business mind and deep knowledge about a sector which is undergoing a major transition,” Bolt said.

“In his time as CEO, he has set a clear strategic path for the business, driving proposals for major new generation and storage projects, delivering strong financial results and championing a significant shift in culture. “He has been particularly adamant about the importance of safety, and it’s no coincidence that under his leadership we achieved the lowest ever rate of injuries,” Bolt added. Brooksbank has worked in the energy industry for decades, including executive roles at Blue NRG and AGL, where he managed the Bayswater and Liddell Power Stations. He started at Hydro Tasmania as Chief Financial Officer in 2019, acted in the CEO role from August 2021 and was appointed CEO in July 2022.

“I feel incredibly privileged to work with the team at Hydro Tasmania and proud of our record over these past few years,” Brooksbank said. “We’ve positioned the business to be at the forefront of the national transition to renewables, which has the potential to deliver enormous benefits to Tasmania and to Australia. “The path ahead is very exciting, but it’s time for another leader to take the reins and drive what is an ambitious agenda. And it’s time for me to slow down and spend more time with my partner and my family. Communication technology is great these days, but it’s not the same.”

A recruitment process for the new Hydro Tasmania CEO will commence in the coming weeks. Meanwhile, Entura, a subsidiary of Hydro Tasmania, announced interim changes within its management team. Tammy Chu, the longstanding Managing Director, will assume the role of Hydro Tasmania’s Interim Executive General Manager Construction, overseeing the implementation of the Battery of the Nation program. Chu’s transition marks a strategic move to enhance focus and coordination in advancing critical projects.

“I’m excited to take on this new challenge, and after 13 years as Managing Director at Entura, I know I’ll miss working alongside the amazing team of people that drives the success of the business. However, I’m not far away, and with the work involved with Battery of the Nation, I know I can rely on the Entura team to support and partner with us for success,” said Chu.

Dr. Amanda Ashworth has been appointed as Acting Managing Director for Entura, bringing her extensive experience spanning 23 years with the company. or the past five years she’s been part of Entura’s Executive Team, most recently as Director of Strategy, Sales and Commercial. She is well known for creating and driving the Entura



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clean energy and water institute (ECEWI) since its launch in 2012, which has delivered training to Entura's clients nationally and internationally. Through ECEWI and other connections, Ashworth has maintained a significant international profile across the Indo-Pacific. The interim appointments are slated to end in December 2024.

ETH Zurich researchers developing solutions to optimise Swiss hydropower plants

In a bid to bolster Switzerland's iconic hydropower industry, researchers at ETH Zurich, led by Robert Boes, are developing specific solutions to optimize electricity production from Swiss hydropower plants. Their efforts are geared towards ensuring that hydropower continues to serve as the linchpin of Switzerland's electricity supply in the face of evolving challenges.

Boes and his team have embarked on a multi-faceted research project, addressing critical issues such as reservoir silting and turbine wear caused by sediment. Their findings offer promising pathways to enhance efficiency, prolong equipment lifespan, and mitigate environmental impact within the hydropower sector.

A recent breakthrough unveiled by the researchers underscores the potential for optimizing water management strategies to amplify electricity generation along the River Limmat. Through meticulous analysis, they determined that judicious regulation of Lake Zurich's water levels, in alignment with adapted protocols, could yield a substantial 2% increase in electricity output from power plants dotting the Limmat's course. By leveraging weather models to fine-tune water level adjustments and enhance predictive capabilities, the researchers aim to harness the power of precision in managing hydropower resources. Furthermore, Boes and his team have delved into the realm of sediment management, crucial for safeguarding

turbine integrity and maximizing operational efficiency. Their investigations into refining "sand traps" have yielded insights into optimal trap designs that minimize turbine abrasion. By advocating for longer traps with gentler gradients, the researchers advocate for a nuanced approach that balances effectiveness with economic feasibility.

Addressing the scourge of sedimentation, the team has also championed the implementation of bypass tunnels as a structural defense mechanism for reservoirs. Through meticulous experimentation and analysis, they've identified high-strength granite as the optimal material for lining tunnel floors, ensuring resilience against erosion and prolonging infrastructure longevity. Case studies, such as the Solis reservoir in Graubünden, serve as compelling demonstrations of the tangible benefits conferred by strategic bypass tunnel deployment.

Moreover, Boes and his collaborators have revolutionized turbine maintenance strategies, employing predictive modelling to anticipate wear-induced efficiency losses and optimize maintenance schedules. By proactively identifying turbine degradation, power plant operators can pre-emptively address performance declines and maximize electricity production.

Beyond addressing immediate challenges, the researchers have also embarked on ambitious endeavors to expand Switzerland's hydropower capacity. Through site assessments and stakeholder consultations, they've identified promising locations for new reservoirs and proposed strategies for augmenting existing dams. These initiatives hold promise for bolstering Switzerland's renewable energy portfolio and securing its energy future.

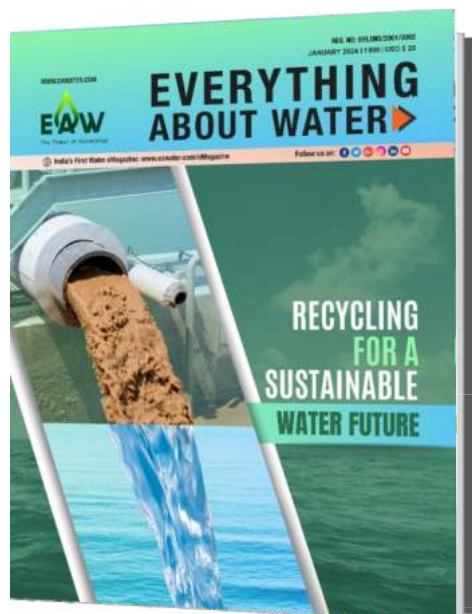


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AI TO DIAGNOSING & MONITOR WATER QUALITY FOR CITY WATER SUPPLY SCHEME

Dilip Yewalekar, Senior Vice President, Jain Irrigation

Manisha Kinge, M.Tech-Agri Engg, Jain Irrigation

Public are more vigilant and cautious about health related to water quality at home, in the office, in the hotel, and in travel. Although Municipal Corporations/Water Supply Agencies are adopting various steps to purify water and attempting to deliver water at the gate of the community in potable form, it cannot be guaranteed, because during the transit contamination of water could take place. That's why water purification, RO & desalination units are in more demand in the world and are procured by an individual to have safe potable water for drinking and to avoid the risk of the spread of water born disease. Awareness & marketing campaigns of water purifiers & RO units in Television, Newspapers, magazines, and media are in full swing.

Everybody is aware of the community water supply system (city water supply) is under the control of a municipal corporation or local government, and the scope of work is limited to bringing water up to the main road. And for getting water connections, an individual or society (Apartment) needs to apply to them. Central & State Governments are continuously following up to implement various water supply schemes (Amrut Yojana, Jal Jivan Mission) in the countries to provide potable water to communities in rural to metro and to sort out drinking water issue which was lying since many decades.

AI – HOW IS IT USEFUL?

With the rise of artificial intelligence (AI), there has been a revolutionary shift in how we monitoring, highlighting its features, application and instrumentation.

AI has significantly enhanced the efficiency and accuracy of water quality monitoring and entire management of water supply networks. One key advancement in data collection and analysis. Various kinds of sensors and instruments equipped with AI algorithms can detect a wide range of pollutants in real time, from heavy metals to organic compounds and accordingly controlling can be programmed. These sensors continuously gather data, providing a comprehensive view of water quality trends. Additionally, AI-driven predictive model can forest changes in water quality based on various factors like weather, land use, human activities and intrusion of factory pollutant in principal water source. This early warning system is invaluable for preventing contamination and ensuring timely responses.

AI-can be integrated at every stages right from water source to end users. For more clarity entire water supply system can be structured into two parts.

1. Structure of Water Supply System under scope of Government Agency

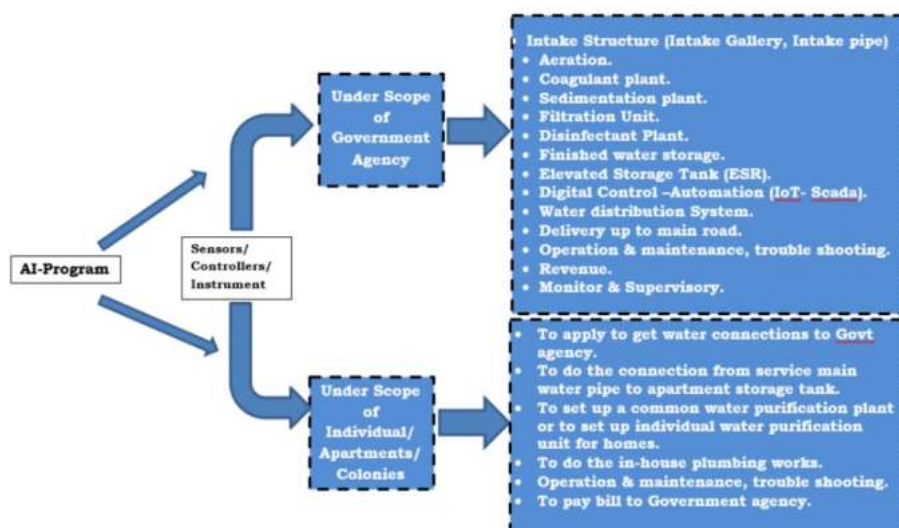
2. Distribution & Monitoring Structure of water supply to end users.+

General Configuration of Water Supply System:

Water Supply System comprises of following components and integrated with sensors, electronic devices and AI program.

- Water Source (River/Lake/Dam).
- Intake Structure (Intake Gallery, Intake Pipe, motor-Pump Set).
- Aeration.
- Coagulant Plant.
- Sedimentation Plant.
- Filtration Unit.
- Disinfectant Plant.
- Finished Water Storage.
- Elevated Storage Tank (ESR).
- Water Distribution System.
- Billing & revenue.
- O & M.
- Water Quality Monitor & Control.
- AI-Based-Automation-SCADA System.

Each stage is unique and featured its own scope of work and standard operating procedure in the water supply System. Apart from hardware and software, human skill and (AI) Artificial Intelligence can be



clubbed together to achieve, and optimize better performance & in economize way by each piece of equipment associated with the water supply system.

IOT-based Sensors and Instruments.

Artificial Intelligence cannot run on its own and it needs to integrate with sensors and electronic equipment as under. Wireless (Radio/wi-fi) network or cable are used to establish communications among sensors, devices, controllers and AI Program. Some of the common sensors and equipment are elaborated as under.

1.(Digital) Water meter

A combination of digital water meter with flow control valves are available in the market. It gives accurate reading of water uses and stored the data in pc. Digital water meters are interlinked to AI program and accordingly billing done and revenue collected.



2.Pressure sensors

(Electronic) Pressure sensors are essential to install in the piping network at various points where the high risk of pressure occurs during the operation of system. This pressure sensors are inlinked to hydraulic pressure relief valves and controllers to protect the piping network incase of any malfunction happened during working. On PC it gives clears indication / displays and record data about the pressure. It helps to point out the exact location in the system where rectifications can be done in lesser time and low cost.



3.Flow sensors

Electronic flow sensors are also needed in the system as like pressure sensors to signal the flow of water in the network. Water supply networks are spread up in the in cities thru the tiny lanes, roads and so practically it is very difficult to inspect physically the flow of at various places. Flow sensors will help to display the flow of water in entire water distribution network. It is connected to controllers.



4.Chlorine injector

Chlorine injector is used for injection of liquid chlorine for disinfections purpose. It is interlinked to controller for automatic injection of liquid chlorine. Dosaging of chlorine is done in proportional as per the required concretation of chlorine.



5.EC/pH controllers & Sensors

It is necessary to maintain desired EC/pH/TDS level as per WHO norms in water and make it potable for drinking purpose. It is interlinked to controller and can be program to control the application of chemical to maintain EC/pH/TDS level.



6.RTU (Radio Terminal Unit)

It is wireless device powered by solar panel. It receives signals from controllers and does the various actions like on/off valves, water meter, chlorine injectors, EC/pH/TDS sensors etc and send feedback to controller. It is placed in the range 1 -2 km distance or in visibility range.



7.Controller (Micro Processors)

It is programmable controller, has inputs 24 and outputs 8/16/32/64. Input from water meter, EC/pH/TDS sensors, pressure sensors, flow meter, injector pump, weather station and out put.



8. Weather Station

It includes Temperature sensors, RH sensors, Rainfall sensors, Solar radiation sensors, Wind Speed & directions, Evaporation sensors. Recording of all data is set on hourly basis and displays and process data. It helps to take precautionary measures during rain & flood, determine the treatment to water and per capita water demand.



9. Laptop/PC

Laptop/PC is used to run the water supply program including billing / revenue collections.



10. Electronic Temperature sensor and RH

Electronic temperature sensors and Relative Humidity Sensors used to measure the temperature of water at various places right from water source till end users. Similarly relative humidity in the air can be measured at various places during transportation of water from water source to end users.



11. Turbidity Sensors

Online Turbidity sensors are very much essential in the entire water supply system at every stages of process of water treatment. It helps to monitor and control process of water treatment and keep record for future reference.



12. e-Coli Sensors & Monitor

This is new device and can be used to sense & monitor the e-Coli microbial contamination in water at various stages.



13. BOD & COD Sensors

BOD (Biological Oxygen Demand) and COD (Chemical Oxygen Demand) are also essential parameters need to be control while monitoring water quality for humand consumptions.



14. Chlorine Sensors

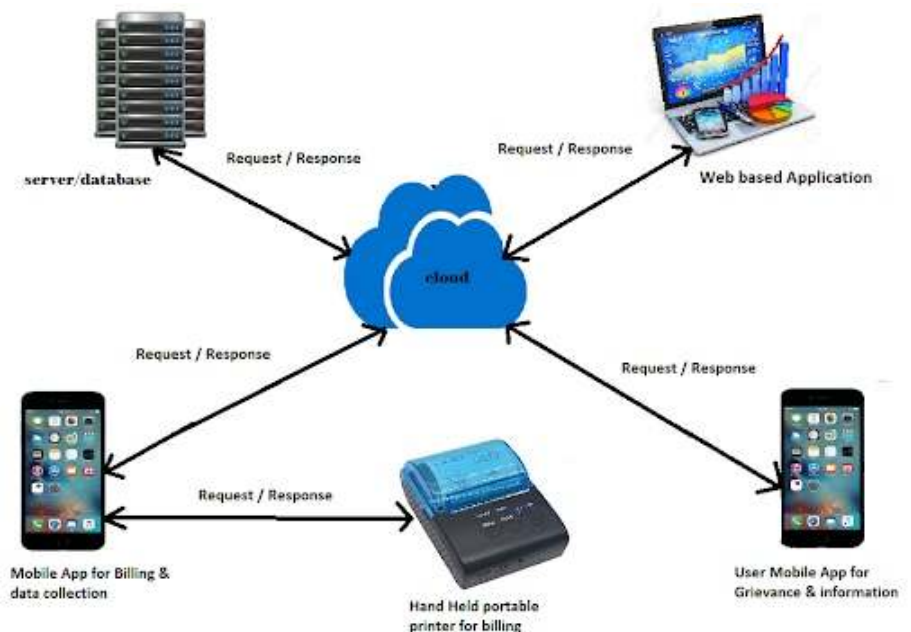
Chlorine Sensors are very much important to measure & control the residual level of chlorine in water.



designated water quality for community in the system. AI can undertake, supervise and monitor following tasks

- Water Supply by Pre-paid /Post-paid meter to end-users.
- Leak detections in the system.
- Pressure check and regulation.
- Water quality check and control entrances –exist for a cluster network.
- Chemical treatment such as Chlorine / Ozone to cluster network/zone
- Operation of hydraulic valves based on sensors or flow meter or water meter.
- Alarming/warning in case of fault and manual overriding.
- Quantification of water used / demand.
- Trouble shooting in the operation of the system.
- Assessment of risk factors and remedies.
- Record water volume and accurate billing.
- Optimizing water price to end-user.
- Water conservation.
- Power conservation.
- Assessment of risk factors and mitigation.
- Storage of all data in hard disc and
- Monitoring /Accounting: cost – economics.
- Optimization of the entire process and future planning.

AI- Artificial Intelligence



Artificial Intelligence (AI) is a guaranteed program for city water supply scheme and it assured delivery of

- Billing, Cost Control & Revenue.

Integration with Remote Sensing Technologies

AI techniques are increasingly being integrated with remote sensing technologies such as satellite imagery for water quality monitoring. These technologies can provide wide area coverage and spatially explicit information on water quality parameters like turbidity, chlorophyll concentration and algae. As well as ecology of water systems, predicting potential disease outbreaks.

Aquatic Drone Technology

AI is being integrated into aquatic technology for autonomous water quality monitoring. These drones equipped with AI algorithms can navigate water bodies, collect samples and analyze water quality parameters on site. They can detect and assess pollutants, contamination, pH, BOD, COD and transmit data in real time to control stations in an efficient way.

CONCLUSION

In conclusion, AI is revolutionizing water quality monitoring, offering unprecedented opportunities to protect our precious water resources. Despite challenges, its advancements are evident in real-world applications globally. As we look to the future, continued research and investment in AI technologies will be crucial for enhancing water management strategies worldwide. By harnessing the power of AI, we can ensure clean and safe water for generations to come.

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Tariq Siddiqui, Chief Strategist, TS Advisory Services

Digitalization is revolutionizing every facet of our society, reshaping industries ranging from finance, services and education to natural resource management. It's not just altering the way we conduct our daily activities, but also revolutionizing how we interact and communicate with one another. From streamlining processes to fostering global connections, its impact is profound and far-reaching. The adoption of digital technology in any industry is a dynamic process, necessitating shifts in organizational culture alongside the seamless incorporation of digital tools to propel the sector's advancement. Among modern technological interventions, Artificial Intelligence (AI) stands out as a pivotal technology in the digital transformation.

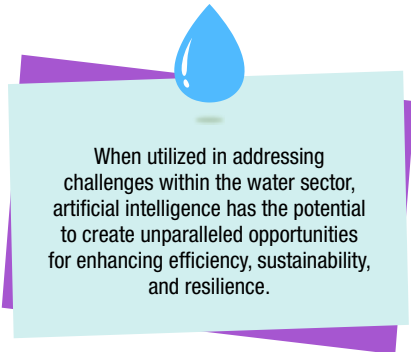
According to a United Nations' report on global clean water and sanitation, it is alarming that over 40% of the world's population lacks access to safely managed drinking water. The report also reveals that a staggering 4.5 billion people, representing more than half of the global population, lack access to safe sanitation facilities. It is disturbing that nearly 2 billion people are reliant on water sources contaminated with sewage. The urgent and noble objective of providing clean water and sanitation demands significant attention and innovation. It must be promptly addressed by amalgamating sustainable development practices with intelligent infrastructure management.

There has been considerable speculation regarding the potential of emerging technologies such as Artificial Intelligence to benefit various sectors, including water management. While it may appear as a distant concept to some utilities, the reality is that as we progress into 2024, water utilities worldwide are actively turning this vision into reality. Its applications extend to real-time monitoring, predictive maintenance, process control, and forecasting,

among other crucial functions, showcasing its transformative impact on the water sector.

Artificial intelligence (AI) is increasingly proposed to address deficiencies across water systems. It is poised to enhance supply insights, resource management and emergency response, improve treatment plant and distribution network design, operation and maintenance, and advance service availability, demand management and water regulations.

AI and its subdivision of machine learning (ML), is the latest technological intervention proposed to solve problems across water systems by building climate resilience, enhancing performance of infrastructure and assisting WASH efforts. AI holds promise in addressing challenges pertaining to clean water and sanitation. It aids utilities and municipalities in more effectively managing their water and wastewater systems, thereby ensuring a supply of clean and sanitized water. Several utilities and water-intensive industries have already begun leveraging AI to enhance services related to water delivery and sanitation. With AI, they now possess a more efficient means of monitoring water quality, managing usage, and predicting maintenance needs for aging infrastructure.



When utilized in addressing challenges within the water sector, artificial intelligence has the potential to create unparalleled opportunities for enhancing efficiency, sustainability, and resilience.

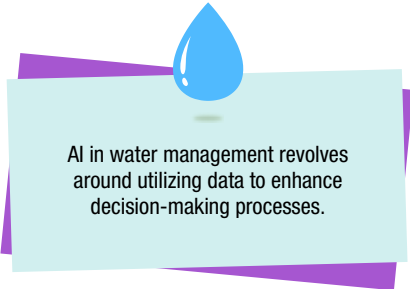


The added benefit AI provides to a water utility encompasses enhanced efficiency in operations, improved decision-making through data-driven insights, proactive maintenance to prevent system failures, optimized resource allocation, and ultimately, the ability to ensure a more reliable and sustainable water supply for domestic and industrial sectors. The significant benefits that it brings to the operation of a utility involve:

- Water utilities are increasingly managing vast and complex datasets; AI plays a crucial role in transforming this data into actionable insights for informed decision-making.
- By integrating AI into existing systems, utilities can enhance operational efficiency, improve planning processes, and track resource flows more effectively.
- AI enables the development of innovative concepts like Digital Twins, which are digital replicas of water utilities that simulate real-time operations. These digital twins serve as powerful tools for decision-making and future projections in the water sector.
- AI enhances the capabilities of other technologies such as Virtual Reality and Blockchain applications, further advancing the

efficiency and effectiveness of water utility operations.

- AI technology, integrated into existing IT infrastructure, enhances the efficiency of water treatment facilities by reducing operating expenses (OPEX).
- AI-powered software solutions learn from treatment plant's historical performance data and prescribe optimal control actions based on energy and chemical objectives, as well as real-time and forecasted conditions.
- Intelligent plant operations driven by AI facilitate predictive control at every stage of the wastewater treatment process. This includes optimization of aeration, anaerobic digestion, membrane bioreactors, membrane recovery, membrane cleaning schedules, and chemical dosing to ensure the effluent leaving the facility meets prescribed safety standards.
- AI-assisted solutions utilize machine learning to analyze data from wastewater treatment plants, offering predictive recommendations to meet clean water and sanitation goals at minimal operating cost.
- AI-based systems detect leaks, pipe bursts, and other failures in water supply networks. These detection systems automatically process pressure and flow sensor data in real-time, forecasting signal values to anticipate potential issues.
- AI-based solutions automate urban drainage systems, where the integrity of the pipe network is crucial to avoid pollution and flooding incidents caused by undetected structural faults such as displaced joints or cracks.
- During rainfall, AI detects flows and blockages in sewers, assessing whether they exceed critical levels or deviate from expected flow patterns, helping to prevent potential overflows or backups.
- Targeted AI applications could help reduce the unnecessary consumption of freshwater in agriculture sector.
- At the household level, AI-based smart water-saving devices may curtail household water



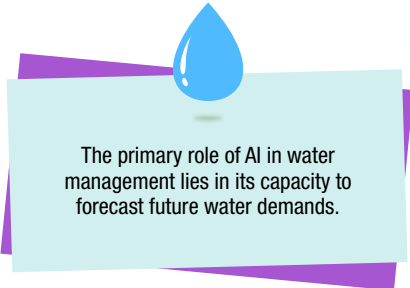
AI in water management revolves around utilizing data to enhance decision-making processes.

consumption, while smart meters coupled with predictive demand and pricing analytics could provide incentives to drive behavioral change towards water conservation.

THE CHALLENGES

The global progress towards achieving Sustainable Development Goal 6 is faltering, with more than 1.6 million deaths yearly attributed to unsafe water and inadequate sanitation. Climate change is poised to worsen these issues. While AI is publicized as a solution, it's not a panacea.

There are issues related to data quality, availability, and compatibility across various systems and sources that hamper the AI ability to process it correctly to make informed decisions. The complexity



The primary role of AI in water management lies in its capacity to forecast future water demands.

of water systems and the need for domain-specific expertise make it challenging to develop effective AI solutions. Mismanaged AI adoption may create progress traps, worsening water security challenges. As AI adoption remains limited, especially within the water sector, there is a scarcity of empirical data on real-world applications. Overcoming these challenges requires collaborative efforts among stakeholders and careful planning to ensure successful AI implementation in the water sector.

GOING FORWARD

Digital technologies have profoundly enhanced various aspects of our lives, and their impact on water management is equally significant. Intelligent technologies have the potential to revolutionize routine maintenance tasks and minimize downtime. In developing countries, water network leakage causes the loss of about 45 billion liters of potable water daily, enough to hydrate 180 million people. AI-enabled leak identification applications improving the accuracy of pipeline networks.

The effectiveness of AI relies heavily on the integration with existing systems and the expertise of those involved in its development. Many of the potential AI applications mentioned earlier necessitate well-established water infrastructure, robust information and communications technology (ICT) infrastructure, and domain expertise to be successfully implemented. It is imperative that we thoroughly comprehend these technologies and continue to foster their advancement to ensure ongoing improvements in our lives and the sustainability of water resources for future generations.



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UNLOCKING THE FUTURE OF SUSTAINABLE WATER MANAGEMENT BY DANFOSS

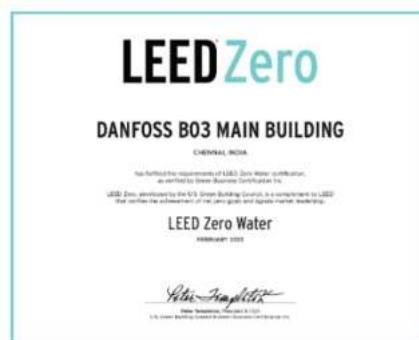
Ravichandran Purushothaman, President, Danfoss India

As Commitment to Sustainability, Danfoss' Chennai campus stands out not only for its manufacturing prowess but also for its unwavering dedication to sustainability. Central to this commitment is the innovative approach to managing industrial water and wastewater assets, epitomizing the campus's pursuit of the prestigious LEED Zero Water certification. This symbolizes a year-long net zero potable water usage. Lets explore the factors that drive Sustainability at the Chennai Campus

THIRD IN THE COUNTRY TO BE LEED ZERO WATER CERTIFIED – DANFOSS CHENNAI CAMPUS SOLIDIFIES ITS POSITION AS A LEADER IN SUSTAINABILITY

The Danfoss Chennai Campus has set a remarkable standard in sustainable water management by achieving the LEED Zero Water Certification, demonstrating a commitment to eco-friendly practices.

This distinction further solidifies Danfoss Chennai's position as an industry leader in environmentally responsible building practices, particularly as it has obtained LEED Platinum certification for key buildings while maintaining a strong focus on renewable energy initiatives. This accomplishment exemplifies the campus's steadfast dedication to environmental stewardship and positions Danfoss among the select few campuses in India to achieve such a distinction. Moreover, combined with its strong focus on green energy and renewable sources, this achievement underscores its pivotal role in promoting sustainability and eco-conscious practices in the region.



SYSTEMATIC APPROACH FOR DECARBONIZATION - REDUCE, RE-USE, AND RE-SOURCE

The Danfoss Chennai Campus incorporates robust decarbonization and water conservation initiatives, reflecting a commitment to sustainable practices. In sync with its 2030 goal for carbon neutrality, Danfoss intertwines its decarbonization agenda with comprehensive water management strategies. Through advanced treatment systems and a focus on recycled water usage, the campus optimizes water consumption, minimizing waste, and reducing carbon footprints significantly.

The Campus achieves decarbonization through a systematic approach based on three key steps: Reduce, Re-use, and Re-source. The reduction phase involves implementing energy-efficient solutions such as heat pumps to save energy. The re-use step includes recycling existing energy by utilizing excess heat from buildings, processes, and data centers. The final stage, Re-source, focuses on transitioning to green energy by phasing out fossil fuels and sourcing renewable energy. When necessary, the campus

considers climate compensation for any remaining emissions that cannot be eliminated through other means.



SMART SYSTEMS, SMART WATER - DANFOSS' TECHNOLOGIES IN REVOLUTIONIZING WATER CONSERVATION:

Grounded in technological prowess, Danfoss Chennai Campus offers a suite of Water Saving Solutions designed for efficiency and sustainability across industrial and commercial sectors. By integrating IoT and data analytics, Danfoss ensures precise monitoring and management of water systems, driving operational efficiency.

Water Asset Management With IoT & Data Has Led To Conserving 5000 KL Of Water

Danfoss's adoption of IoT technology for real-time water consumption analysis ensures real-time leak detection, enhancing water efficiency and reducing wastage. Danfoss' IoT Data Platform aggregates, granulates, and analyzes data from various sources such as sensors and components, enabling real-time analytics functions. By utilizing data-gathering

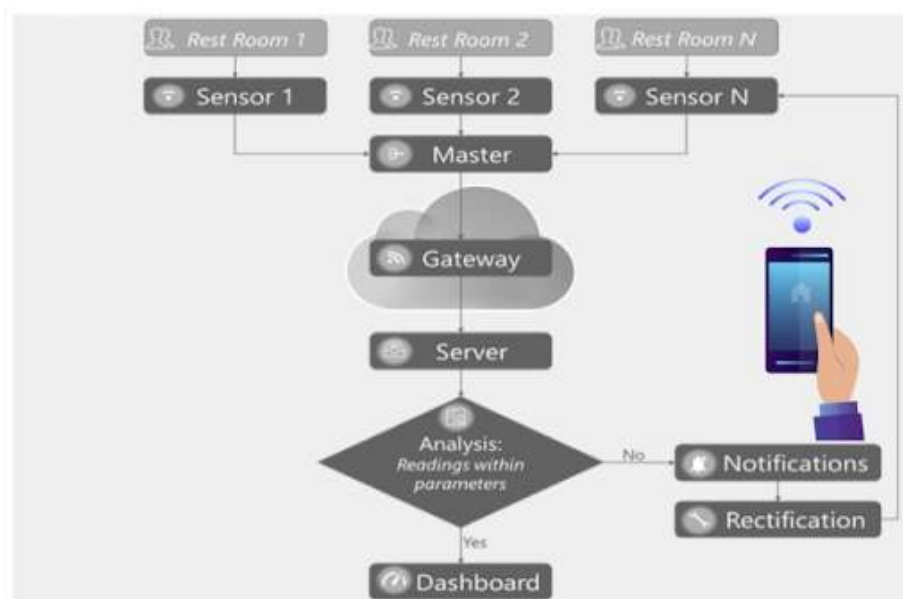
sensors, mobile networks, cloud-based computing services, and advanced analytics software, Danfoss can predict maintenance needs in real-time and alert operators before major leakage occurs, thereby reducing downtime in the field.

For instance, The Chennai Campus' integration of SMS and email alerts, allows users to receive instant notifications regarding water-related activities and issues, enhancing prompt decision-making and response mechanisms. The system enables the tracking and analysis of daily water consumption trends, providing valuable insights into usage patterns and facilitating efficient water resource management strategies. Danfoss' IoT water management initiative in Chennai has contributed to conserving approximately 5000 kiloliters of water, promoting sustainable practices and environmental stewardship. Their implementation of IoT-based water management on the campus has led to a remarkable 45.7% reduction in per capita water consumption.

is able to reduce energy consumption in these processes by up to 75%, thus enhancing energy efficiency in water treatment. Danfoss' Cutting-Edge Reverse Osmosis Plant in the Chennai Campus Enhances Water Quality, Setting a New Standard for Environmental Excellence.

Through the application of ZLD and MLD systems, the company contributes to tackling water scarcity, meeting discharge and water reuse requirements, and supporting the global effort to protect the environment by treating industrial wastewater and relieving pressure on freshwater reserves. Moreover, the company focuses on the mutual dependence of energy and water, aiming to create an energy-neutral water sector by combining water management and energy generation technologies.

HOW THE CHENNAI CAMPUS REDUCED WATER CONSUMPTION BY ALMOST 50%, DRIVING SUSTAINABLE EXCELLENCE IN WATER MANAGEMENT:



Championing Water Sustainability using Danfoss' ZLD and MLD System:

Danfoss utilizes Zero Liquid Discharge (ZLD) and Minimal Liquid Discharge (MLD) for efficient water conservation in wastewater treatment. These processes ensure that industrial wastewater is fully treated before being discharged into the environment, subsequently reducing the volume of industrial wastewater discharge and improving water reuse. By using optimized reverse osmosis processes, Danfoss

The sustainable excellence in water management at the Danfoss Chennai campus is evidenced by its unwavering commitment to renewable energy sources, leading to a substantial reduction in CO2 emissions. The campus achieved 100% coverage of its energy consumption through renewable sources since 2024, resulting in an annual reduction of 9,500 tons of CO2 emissions. This accomplishment aligns with Danfoss' dedication to being 100% carbon neutral by 2030 and substantiates its commitment to creating a sustainable and greener future.

Embracing innovation, the Danfoss Chennai campus strides towards water self-sufficiency through transformative practices like rainwater harvesting and efficient wastewater treatment. By significantly reducing water consumption from 105L/person per day to a remarkable 57L/person per day. The campus showcases its efficiency drive. Harnessing rainwater via smart capture systems not only secures a reliable supply but also aligns with broader sustainability goals, alleviating strain on municipal resources.

BUILDING ON THEIR IMPRESSIVE LEED ZERO WATER CERTIFICATION, THE DANFOSS CHENNAI CAMPUS CONTINUES TO CHAMPION WATER CONSERVATION WITH ITS INNOVATIVE USE OF WATER COLLECTION PONDS.

The Danfoss Campus Has Implemented Robust Water Conservation Practices, Ensuring Self-Sufficiency For Up To Six Months

At the Chennai campus, a Periphery Drain is strategically placed to gather rainwater runoff from both the roofs and roads surrounding the area. This specifically designed drain has a generous capacity of 3600 kiloliters to effectively secure the collected rainwater. Impressively, an estimated 26000 kiloliters of rainwater is utilized annually for a range of purposes including domestic, process, and irrigation needs. This ensures the campus to function without external water sources for an impressive six months, solidifying its self-sufficiency.

Sewage Treatment Plant

The Sewage Treatment Plant at Danfoss Chennai Campus is a crucial infrastructure component designed to efficiently manage and treat the wastewater generated within the facility. This facility incorporates advanced technologies and processes to ensure the effective removal of contaminants and pollutants from the wastewater, adhering to stringent environmental regulations and sustainability standards.

Enhanced by Effluent and Sewage treatment plants with Zero Liquid Discharge (ZLD) facilities, the water is recycled for various purposes, making the campus water positive. Every 100 liters of sewage processed through recycling yields a remarkable 92% water for irrigation purposes, and 8% nutrient-rich manure, contributing to sustainable practices.

The implementation of the Sewage Treatment Plant underscores Danfoss's commitment to environmental responsibility and sustainable operations, aligning with global best practices in wastewater management



Pioneering Water Conservation For a Green Today and Tomorrow

Much like the Danfoss **Koyembedu wastewater treatment plant**, known for its significant reduction in energy consumption through efficient pumping systems, the Danfoss Chennai Campus exemplifies the company's unwavering commitment to sustainable excellence in water management across its operations in India. The Danfoss Chennai Campus' groundbreaking achievements in sustainable water and wastewater asset management, culminating in the LEED Zero Water Certification, underscore its

leadership in sustainability practices. Through a harmonious blend of rainwater harvesting, cutting-edge technologies, and a relentless drive towards efficiency, the campus serves as a beacon of inspiration for a greener and more sustainable future. Danfoss not only leads by example but sets a new standard for sustainable water management globally, epitomizing a commitment to environmental stewardship and sustainability.

About the Author



Ravichandran Purushothaman
President,
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Ravi is the President Danfoss Industries Pvt Ltd, a 100% subsidiary of leading family owned Danish MNC, Danfoss A/S headquartered in Denmark & present in over 100+ countries across the globe.

Danfoss is a world leader on Decarbonization technologies within Mobile Hydraulics, Cooling & Refrigeration, Electrification, Drives and District Energy.

Ravi has been handling several roles since 2002 in Danfoss across several markets in Asia Pacific which included South Asia, Korea, Japan, Australia NZ and Germany. He has been with Danfoss since 2002 and earlier with Siemens in India & Germany.

Ravi is a Member of Danfoss Global management team, Board member & Global Mentor since 2013. He has been active working in Energy, Water, Food & Agri, Technology space supporting and mentoring several early-stage start ups in India in various roles.

Ravi's areas of work covers Climate change, Energy efficiency, Decarbonization & Food loss; contributing to the field through several thought leadership initiatives.

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A SYSTEMATIC REVIEW ON WATER QUALITY PARAMETERS: THEORY AND APPLICATIONS WITH RECENT DEVELOPMENTS

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ABSTRACT:

Water is the furthestmost significant component in the terrestrial foundation and regulating the climate. It is one of the chemicals that affects life the most significantly. Typically, the characteristics of water's physical, biological, chemical, and constitution are utilised to define it. Groundwater resources are being depleted and are becoming significantly and diversely contaminated as a result of rapid economic development and the unrestrained use of chemical pesticides and fertilisers in agriculture. In-place sewage systems, landfill leachate, wastewater treatment plant effluent, leaking sewers, hydraulic fracturing, gas stations, or excessive fertiliser use in agriculture are the usual causes of ground water adulteration. Pollution can also be brought on by natural contaminants like fluoride and arsenic. Use of tainted groundwater exposes the entire public to illness or injury. Poor water quality can lead to a range of negative effects, including subpar goods, low earnings and serious risks to human health. This document provides detailed information on underground water quality characteristics, including pH, temperature, biological oxygen demand, dissolved oxygen, alkalinity, chemical oxygen demand, nitrite, hardness, ammonia, nitrate, sulphate and phosphate.

KEYWORDS:

Water Quality Index (WQI), Dissolved Oxygen (D.O.),

Biochemical Oxygen Demand (BOD), Alkalinity, Eutrophication, Heavy metal.

INTRODUCTION

The lack of access to clean water is a global issue that affects all countries. The strong human desire to improve living standards has inevitably resulted in water pollution, with cumulative efforts and activities establishing as heavy industrial development and incessant urbanization, leading to progressive pollution of aquatic system [1-4]. When it comes to drinking, irrigation of crops, waste disposal, transportation, recreation, irrigation of crops, and industrial production, humans are utterly dependent on renewable resources of freshwater. The quality and quantity of water that can be used to placate human necessities are already threatened in many parts of the biosphere due to rising water usage, growing population, climate change and a rising water usage, the gap between freshwater availability and demand will worsen over the next century. About 80% contamination of Indian water resources, according to estimates by WHO, is caused by inhabited refuse. Water system management issues could have a substantial impact on the supply of drinking water [5-6]. Industrial waste is the main basis of water contamination. When wastewater from various industries is disposed of in the water without being properly treated [2]. Water's biological, physical and chemical properties have been changed in such a way

that they are no longer useful for the intended application [7].

A change in the underlying sediments' and aquifer's chemical make-up also affects the variation in water quality. Surface sources like canals, lakes, dams, and rivers provide around one-third of the world's drinking water needs. Water is used in some way or another by an organism's chemical and physiological processes. In numerous aspects of existence, water is crucial. In order to research numerous physicochemical water characteristics including B.O.D. (biochemical oxygen demand), WQI (water quality index), D.O. (dissolved oxygen), Eutrophication, heavy metal, alkalinity, etc., water samples from rivers and lakes provide an appropriate platform. Many scientists have occasionally studied the physicochemical properties of water bodies. The physicochemical features will also aid in the continuation of eco-biological impact research, the detection of pollution sources and the beginning of remedial action procedures for polluted water bodies [8-10]. Numerous scholars in India have studied the physicochemical and biological properties of reservoirs and rivers. Since a variety of physical and chemical elements can combine to affect primary production levels, which in turn affect total biomass and trophic structure across the aquatic food web, water quality must be taken into account when evaluating wetland habitat.

In the current review work, certain parameters for evaluating the quality of water have been presented together with earlier research on the subject by academics and scientists.

ANALYSIS OF WATER QUALITY

Before using water for drinking, residential, industrial or agricultural purposes, it must first be tested. Different biological, physical and chemical factors must be used to test water. The only factors considered when selecting water testing parameters are the envisioned use of the water and the level to which its purity and quality are required. [11-14]. Different kinds of microbiological, dissolving, suspended, floating, and bacteriological pollutants are present in water. Physical tests should be conducted to evaluate the substance's odor, colour, temperature, pH, TDS, turbidity and further physical characteristics. Chemical tests should be conducted to evaluate the substance's COD, BOD, alkalinity, hardness, DO and other characteristics [15]. Water must be verified for heavy metal trace, organic and metal contaminants like pesticide scum in order to obtain more and more pure, high-quality water. It goes without saying that potable water must satisfy all of the required parameters during tests and contain the necessary amount of minerals [16-17]. Only in wealthy nations are all these requirements properly checked because there are very few organic and heavy metal pesticide contaminants in water, necessitating extremely analytical equipment and skilled labor. To monitor the water quality, a variety of physical-chemical parameters must be used.

TEMPERATURE MEASUREMENT

Using a digital thermometer, the temperature is determined by dipping the thermometer in the sample and recording the result [18]. Temperature is the degree of heat or cold in an aquatic organism's body, whether it is in water or on land. Despite having cold blood, fish experience body temperature changes in response to their environment. These changes have an impact on the fish's physiology and metabolism as well as its production. The micro biota's rate of metabolic activity as well as their rate of respiration both increase with temperature because of the rise in oxygen demand. It also results in increased ammonia levels in water and decreased oxygen solubility. However, with prolonged ice cover, chemicals such as carbon dioxide, methane and hydrogen sulfide can build up to dangerous levels and affect the health of fish. (Fig. 1 and 2).

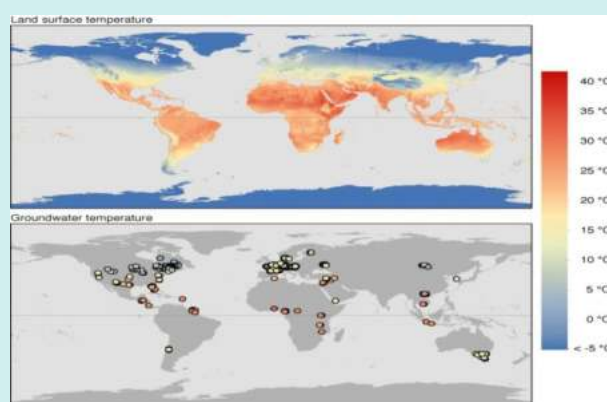


Fig.1
Global map of temperature of shallow groundwater and land surface (GWT). LST is calculated using the daily MODIS products MOD11A1 and MYD11A1 averaged over a 10-year period (01/2005–12/2014). With regard to seasonal fluctuations in cloud cover, the bias in favor of cloud-free days was rectified. The same time frame saw the collection of (multi)annual mean GWTs at depths of up to 60 m [19].

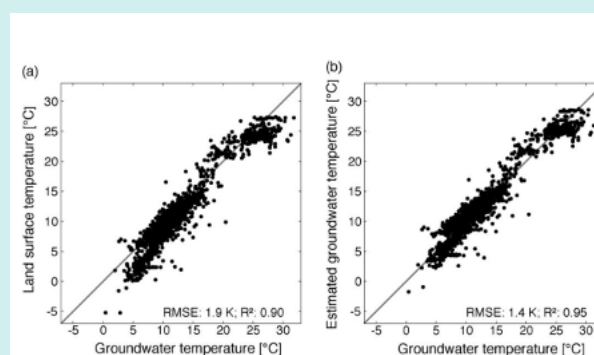


Fig.2
Relationship between (a) and temperature of land surface (LST) and groundwater temperature (GWT) and (b) estimated and measured GWT. The equality line is shown in dark grey [19]

pH MEASUREMENT

The pH of water is a significant factor in determining its acceptability for a variety of uses, bathing, cooking, including drinking, agriculture and washing, among others. According to the BIS, water's pH should not overlie on either side of range 6.50–8.50. With a pH of 7, pure water is considered to be neutral. Acidic water is that which has a pH below 7.0, and basic or alkaline water is that which has a pH over 7.0 [20].

DO MEASUREMENT

Determining the amount of dissolved oxygen in a river is crucial since aquatic life there depends on it and needs at least 4ppm of DO to survive [8, 18, 21]. DO tests are carried out to confirm this. The Digital Dissolve Oxygen Meter is used to measure the DO test at the location of the sample collection. When measuring DO on-site, the results are correct, but if DO is measured later, the results will alter due to changes in the atmosphere and temperature [10, 14].

BOD MEASUREMENT

The BOD is a measurement of how much total dissolved oxygen is used by microorganisms during

the biodegradation of organic materials, such as sewage or food particles. Rural ponds may have an excessive amount of phosphate, cow waste, and domestic sewage from non-point sources, which all contribute to a high organic load and a higher BOD level [22].

COD MEASUREMENT

Chemical oxygen demand, which is typically combined with biological oxygen demand, is a measure of the amount of organics in water (BOD). The COD is a measurement of the amount of organic matter in a sample that can be oxidized by a potent chemical oxidant. [23-26]. The COD is frequently employed as a gauge of the organic and inorganic materials' susceptibility to oxidation in water bodies, industrial plant effluents and sewage discharges [27]. As a result, the COD is an accurate indicator for determining the degree of water pollution (Fig. 3). As organic and inorganic matter concentrations rise, so does the COD of water [28–29]. According to Garg [30], the COD concentration in Ramsagar reservoir ranged from 3.600 to 17.400 mg/l.

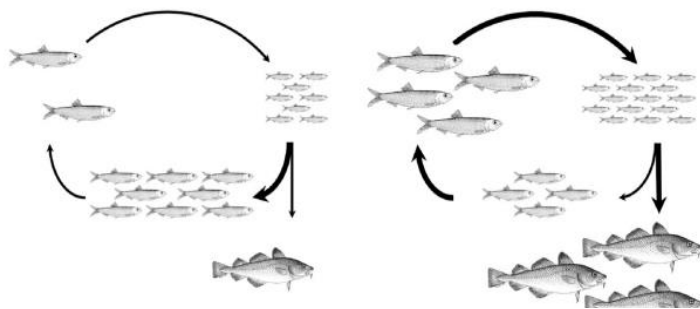


Fig. 3

Distribution of the stage of population of sprat in the two possible community conditions that give birth to the COD Allee effect. Right: Staffing to big size classes of sprat is strong with the presence of COD and high predation, especially on minor sprat, as a result of decreased intra-specific competition. Left: In absence of COD and low predation, individuals amass in the trivial-adult stage (stunted population). As a result, the remaining sprats grow quickly and produce a lot of progenies (arrows), which (mainly young) cod can eat. Even though cod target all sprat size classes, only the flow of biomass illustrating predation on young sprat is depicted because this interaction is what ultimately results in the other community states [31]

CARBON-DI-OXIDE MEASUREMENT

Unrestricted carbon dioxide, an exceedingly soluble gas in water generated by animal respiration, serves as nature's primary source of carbon. It can exist in water as dissolved or bound bicarbonate or carbonates in coral reef habitats, the earth's crust, and limestone. The pH of any system, especially those with inadequate buffering, is reduced when carbon dioxide is dissolved in water. This pH decrease can be harmful to aquatic life [32].

ALKALINITY MEASUREMENT

Alkalinity, a measurement of the inclusive concentration of bases in pond water that includes dissolved calcium, magnesium, and other compounds as well as, bicarbonates, hydroxides, borates, phosphates, and carbonates, is the volume of water to engross variations in pH. Alkalinity is primarily increased by lime leaching from cement ponds or calcareous rocks, photosynthesis, sulfate reduction, and de-nitrification and it is primarily decreased or consumed by sulfide, respiration, and nitrification [33], as well as to a lesser extent by evaporation and decomposing organic matter. However, in case of insufficient alkalinity, even minor bit of acid might source a large pH change.

NITRITE-N (NO₂-N) MEASUREMENT

An intermediate in the transformation of NH₄⁺ or NH₃ into NO₃, nitrite, that is a by-product of oxidized NH₃ or NH₄⁺. Nitrification, which is carried out by the system's naturally occurring highly chemo-autotrophic bacteria, aerobic, gram-negative, completes this process. Due to the rapid nature of the dialogue, large nitrite amounts are not frequently seen.

The "brown blood illness" is a condition where high amounts of the substance do, however, result in hypoxia brought on by the hemoglobin in fish blood becoming inactive [34]. Boyd [35] asserts that less than 0.3 mg/l of nitrite is the ideal level for aquaculture. The concentration of nitrite at cage stations was greater than the standard permitted value due to the influence from fish waste and more feed, according to research [36–42] that found the concentration of nitrite-N lied in the range of 0.001 - 0.28 mg/l in cage culture systems. It has been discovered that a higher less dissolved oxygen, more ammonia and pH can make it more poisonous.

NITRATE-N (NO₃-N) DETERMINATION

Nitrate is created via the process of nitrification, which is the oxidation of NO₂ to NO₃ by aerobic bacteria. De-nitrification of nitrate that aquatic plants cannot directly absorb occurs in anaerobic sediments [43]. According to Boyd [35], the ideal nitrate content for aquaculture is between 0.2 to 10 mg/l. Sewage and other pollutants high in nitrates can also contaminate surface water. Drinking water with higher nitrate content is harmful [44]. The Environmental Protection Agency (EPA) has determined that 10.00 mg/l of nitrate is the maximum contamination level (MCL) for water to be used for drinking purpose [45]. The concentration of nitrate in receiving waters is significantly impacted by runoff from farming operations and waste disposal sites. The usage of fertilizers on farms may have contributed to receiving streams' elevated nitrate levels through leaching and surface runoff during heavy rains. [29].

AMMONIA (NH₃) DETERMINATION

Ammonia is a consequence of the protein metabolism

that fish harvest, as well as the breakdown of bacterial of biological waste like dead planktons, food scraps and manure. Both ionized or unionized and ammonia are referred to as "total ammonia," yet only the unionized form (NH₃) is extremely toxic [31].

TSS MEASUREMENT

Total suspended solids, also known as non-filterable solids, are those solids that are retained by a filter with 1-micron holes. By running a known volume of sewage sample through a glass fiber filter equipment and weighing the dry residue that remains, their amount may be calculated [46].

TOTAL DISSOLVED SOLIDS (TDS) MEASUREMENT

Total dissolved solids, also known as filterable solids, are those solids that are not retained by a filter with 1-micron holes. By running a known amount of sewage sample through a glass fibre filter equipment and weighing the dry residue that remains after boiling the filtrate sewage, their quantity may be calculated.

MEASUREMENT OF TURBIDITY

As soon as you can after the sample is taken, determine the turbidity. Before examination, gently stir all samples to achieve a representative measurement. If sample preservation is not possible, start the analysis right away. If storage is necessary, refrigerate or cool to 4°C to reduce the amount of microbial degradation of solids. For the best outcomes, test the turbidity right away without changing the pH or temperature of the original sample. A digital turbidity meter is used to measure turbidity. This was calibrated using a standard NTU [46].

HEAVY METALS MEASUREMENT

Each sample of acid-digested water weighed 100 cm³ and was placed in a beaker. The beaker was then placed in a 70°C oven to condense the water to 50 cm³. Using an atomic absorption spectrometer, the concentrations of Co, Cu, Cr, Cd, Zn, Pb and Ni in each sample of water were measured (AAS: AAS: LABINDIA: AA- 7000) Prior to analysis, AAS required phase of acid digestion, which was accomplished by exposing the samples to concentrated HNO₃ [29]. Samples are digested using the methods endorsed by the American Public Health Association (APHA). The suggestions in the instruction manual were used to determine the instrument settings (IO).

INDEX OF WATER QUALITY (WQI) MEASUREMENT

The WQI is premeditated in three steps. Each criterion was given a weight (Wi) in the first phase based on its relative significance to the overall quality of water

intended for consumption. Nitrate has been given a maximum weight of 5 due to its significant role in determining the water quality [48]. The relative weight is computed using Eq. 1 in the second step.

$$(1) \quad W_i = \frac{w_i}{\sum_{i=1}^n w_i}$$

Where n is the number of parameters, relative weight is denoted by W_i and w_i represents the weight of each parameter. The parameter's calculated W_i values are provided in Table 1.

In the third stage, by dividing each parameter's concentration in each water sample by the relevant standard, according to the BIS specifications, and multiplying the result by 100, a quality rating scale (q_i) is obtained for each parameter (Eq.2)

$$(2) \quad q_i = \left(\frac{C_i - C_{io}}{S_i - C_{io}} \right) \times 100$$

Where S_i is the BIS-recommended standard for Indian drinking water in mg/l for each chemical parameter and C_i is the concentration of each chemical parameter in every single water sample in mg/l. The parameter's optimal value in clear water is C_{io} . With pH, q_i is equal to $(C_i - 7)/(S_i - 7)100$ and C_{io} is equal to 7. For the remaining parameters, the optimal value is 0.

Table 1. Chemical parameters and their relative weight [49]

Chemical indicators	Weight	Indian Standard	Relative Weight (W_i)
Magnesium	2.00	30.00	0.091
Total hardness	2.00	300.00	0.091
Calcium	2.00	75.00	0.091
TDS	4.00	500.00	0.182
Chloride	3.00	250.00	0.136
pH	4.00	6.50 - 8.50	0.182
Nitrate	5.00	45.00	0.227

Each parameter's sub index (SI_i), which is utilized to calculate the WQI in accordance with Equations 3 and 4, is first determined in order to calculate the WQI.

$$(3) \quad SI_i = W_i \times q_i$$

$$(4) \quad WQI = \sum_{i=1}^n SI_i$$

The i^{th} parameter's subindex is SI_i . The estimated WQI values are classified into five categories in Table 2.

Table 2. Classification of water quality based on WQI value [49]

Water Quality Index	Water Quality Index
>300.00	Unsuitable
200.00-300.00	Very Poor
100.00-200.00	Poor
50.00-100.00	Good
<50.00	Excellent

The five categories range from "good water" to "unfit for drinking water", according to the computed WQI values (Table 2). The WQI has an inter-seasonal range of 28 to 267, with 24% of water-bodies rated outstanding in the pre- and post-monsoon seasons and 18% rated excellent during the monsoon season. Approximately 62%, 58% and 60% of water bodies are in good quality during the monsoon, pre-monsoon and post-monsoon seasons, respectively in pre-monsoon, monsoon and post-monsoon seasons, respectively. 14%, 16% and 12% of water bodies were found to be poor water bodies in the respective seasons. The remaining 6%, 2% and 4% of water bodies were very poor water bodies in aforesaid seasons. 16% and 48% of water bodies are in excellent and good water bodies throughout the monsoon and post-monsoon seasons. Limits for the physicochemical properties of lake water in India are shown in Table 3.

Table 3. Physical and chemical features of Indian lake water [50]

Sr.	Parameter	BIS Specification
1	PH	6.50-8.50
2	Color	5 Hazena max
3	Appearance	Clear
4	Turbidity	5 NTU max
5	Alkalinity	200 mg/L max
6	EC	Lacking mention
7	Chloride	250 mg/L max
8	Fluoride	1 mg/L max
9	Sulfate	200 mg/L max
10	Phosphate	Lacking mention
11	Ca H	75 mg/L Max
12	T H	300 mg/L Max

13	TDS	500 mg/L Max
14	Mg H	30 mg/L
15	FRC	0.25 mg/L
16	Silica	Lacking mention
17	COD	Lacking mention
18	Hydrazine	Lacking mention
19	DO	Lacking mention
20	BOD	Lacking mention
21	NO ₃	50 g/L
22	So ₃	Lacking mention

PHYSICOCHEMICAL REVIEW OF SOME WATER SAMPLES FROM INDIA

The study of physical-chemical parameters is crucial to obtaining a precise understanding of the water quality, and it allows us to compare the results of various chemical and physical parameter values with reference values (Table 3). Here is a brief summary of some previous research studies. Pulp and paper sector effluents are one of India's most polluting industries, according to Tripathi [51]. Small and large pulp and paper mills use several procedures that produce effluents with drastically varying physical-chemical characteristics due to their disparate production capacities and raw material sources. To diminish the impact of various pollutants on the environment, before being released into the drainage channel, such contaminated effluents must undergo sufficient treatment. Based on the findings presented here, it can be stated that the effluent emitted from both paper industries is extremely contaminated and exceeds the limits set by Indian regulatory agency norms. Furthermore, it is claimed that the pollutants produced at various stages of the paper manufacturing process can be reduced either by replacement of some current bleaching and pulping techniques with ECF (Elemental Chlorine Free bleaching), bio-pulping, TCF (Total Chlorine Free bleaching), bio-bleaching, and ozone bleaching, or by treating the effluent with physical, biological or chemical methods. This monitoring research of pulp and paper mill effluent collected from wood-based and agro-based sources resulted in the creation of a data bank that may be used to successfully anticipate their toxicity and implement appropriate management. Agarwal's [52] research shows that the water in the Bihar River can perform as a good habitat, provides educational data, and aids in understanding water features. The pH value suggests that the alkaline water in May have resulted from the high temperature, which suggests that CO₂ is soluble in the water. The Bihar River's Baba Ghat's water quality metrics, including alkalinity, total hardness, chloride ion, pH, BOD, COD are all well within the acceptable range, according to the analysis.

Consequently, appropriate methods should be developed. According to research by Vyas [53], the majority of fresh water bodies world-wide are becoming contaminated by human waste, industrial waste, sewage, , agricultural waste, and religious practices like idol immersion. The Central Pollution Control Board [54] has created a thorough set of regulations regarding the act of immersing idols in oceans, lakes and rivers (Guidelines for Idol Immersion, CPCB, 2006). These regulations outline and define the function of state pollution control boards in evaluating the water quality of aquatic bodies and categorizing them according to specific physiochemical parameters. If these recommendations are followed and put into practices, the quality of the river's water after idol immersion could significantly improve. Tamot [55] asserts that the most crucial metric for determining the water quality is DO, which was discovered to be Nil at seven places despite being necessary for all aquatic creatures' metabolism.

Ganai and Parveen [56] came to the conclusion that water temperature and water chemistry are the primary influences on phytoplankton dispersal, chloride, transparency, dissolved oxygen, alkalinity, TDS and CO₂. Hardness and Conductivity, on the other hand, have less of an impact on the distribution of phytoplankton groups. Rani Lake water displays low high COD, BOD, DO, hardness, turbidity, alkalinity, chloride, TDS, nitrate and phosphate during 2008 and 2009, according to Mishra [57]. These parameters' values were discovered to be over the allowable limit (IS: 10500). A higher pH number implies that the water is slightly alkaline. The results unambiguously show that sewage discharge and other anthropogenic activities have caused this lake to become contaminated and entropic in character. The amount of oxygen utilized during aerobic processes of organic material degradation brought on by microorganisms is measured by biological oxygen demand. Therefore, the BOD provides details on the proportion of an organic substance in a sample of water that can be

converted biologically. As a result, it is necessary to take into account how susceptible certain materials are to oxygen oxidation. The pre- during, and post-immersion activities yielded the ranges of 1.4-35, 4-55, and 3.3-38 mg/L. At Site-7, the immersion period produced the highest BOD value (Majnu Ka Tila). Analysis was also done on the COD, which is frequently used to estimate indirectly how many organic chemicals are present in water. COD is a helpful indicator of water quality because the majority of its applications estimate the volume of organic contaminants present in wastewater or surface water (such as lakes and rivers). As indicated by a number of researchers [58-61], the value of COD in conjunction with BOD is beneficial in determining the hazardous circumstances and existence of physiologically resistant organic compounds.

CONCLUSION AND RECOMMENDATIONS

The water quality of rivers and lakes has declined as a result of all the aforementioned effects. It provides a hint for municipal authorities to create effective management plans. The main factors influencing temperature variation are atmospheric temperature and weather. The industrial effluents that were released may have contributed to the pH decrease in Indian water bodies. This outcome is consistent with prior scientists' reports. The decrease in water volume due to rapid evaporation at high temperatures, high loadings of organic compounds, chlorides, detergent and other pollutants are all responsible for the increase in hardness. Low levels of DO as a result of wastewater discharge from enterprises that were discharging some biological wastes that demanded a lot of oxygen. An important factor that is frequently used to estimate the pollutant load of waste water is biological oxygen demand. The purpose of the BOD test is to quantify the quantity of carbonaceous matter that is biochemically oxidized. Values of BOD were caused by a faster rate of organic matter decomposition with turbidity, at a higher temperature and slower water current. A test called chemical oxygen demand is used to gauge how polluting household and industrial waste. This provides important information regarding the possibility for pollution from home sewage and industrial effluents. Many aquatic zones in India have high COD value, which shows that industrial effluents released by industrial units are mostly to blame for the pollution there. Therefore, it is crucial to check the water's purity using the several criteria listed above before utilizing it.



About the Author



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Mr. Abhijeet Das works as a Research Scholar in the Department of Civil Engineering at C.V. Raman Global University (CGU), Bhubaneswar, Odisha, India. He has teaching experience of about 8 years and Research experience too, and his area of specialization is Water Resource Engineering.

He has published more than 10 papers in reputed journals and presented papers in various national and international level conferences and published four book chapters recently.



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ESSENTIAL ENERGY LOWERS COSTS AND CARBON FOOTPRINT ACROSS AUSTRALIA'S ENERGY SECTOR

Bentley Systems India Private limited

EXTENDING INTELLIGENT DIGITAL DESIGN TO SMALL CAPITAL PROJECTS

With a network spanning 737,000 kilometers, covering approximately 95% of New South Wales, Australia, Essential Energy distributes electricity services to more than 870,000 homes and businesses in 1,500 regional, rural, and remote communities. Despite their large coverage area, Essential Energy has a small customer density of 1.7 customers per square kilometer, resulting in a significantly higher operational cost to customer ratio than many other distribution network service providers. With a minimal customer base to finance the maintenance and support of over 184,000 kilometers of power lines held up by 1.4 million poles, and pressure to lower operating costs, Essential Energy needed to assess their capital works projects to find a low-cost, low-resource solution. "How do we lower energy costs but unlock value across our complete portfolio of works?" asked Matthew Turvey, senior electrical engineer with the substation design team at Essential Energy. The company embraces going digital, so they wanted to create an intelligent digital design system (IDDS). While intelligent digital design has been available for several years, it has only been predominantly used on large-scale projects with capital budgets exceeding AUD 100 million. Essential Energy's substation design team is comprised of less than 15 members who are responsible for managing the design of all capital investments related to the

refurbishment, replacement, and construction of substation assets. This team had a goal to bridge the gap between large-budget projects, extending the same end-to-end benefits of IDDS to small capital works. "There are tens of thousands of design teams like ours working with state or private utilities that need a low-cost, low-resource solution so they can also take the next step to unlock value that an intelligent digital design system can offer," said Turvey.

INVESTIGATING SUBSTATION DESIGN PROCESSES

Committed to improving design performance and digital efficiency across their portfolio of works, Essential Energy and their substation design team selected the Brewarrina Substation to investigate the substation design process and the feasibility of using digital technologies to replace time-consuming manual tasks. A 22- to 66-kilovolt rural site with total capacity of approximately 5 megavolt amperes, the area is prone to severe weather events, including flooding, lightning, strong winds, and dust storms. These site conditions presented data acquisition challenges, making traditional on-site surveys dangerous and inefficient in terms of time and accuracy. Several options, including ground scanning and LiDAR, were trialed, and the captured images were converted to 3D models and used as the basis of new designs.

STREAMLINING DIGITAL WORKFLOWS

Already familiar with Bentley applications, Essential Energy initiated their IDDS workflow for Brewarrina by creating digital reality models of the site using ContextCapture. "The digital reality model is then copied into ProjectWise and forms the foundation to create both primary and secondary drawings for the project using Bentley's OpenUtilities Substation," said Jess Hammond, senior drawing officer at Essential Energy. All reality models, CAD drawings, and related documents were stored and shared via ProjectWise, using links instead of manually sharing drawing files, which led to eliminating uncontrolled versions. The team used OpenUtilities Substation for all design and drafting tasks. As a result, Essential Energy used Bentley's applications to create an IDDS, enabling virtual design reviews, and streamlining the design and drawing approval process.

The interoperability between Bentley's applications and Microsoft 365 allowed Essential Energy to automate conversion of the approved drawings into PDF copies that were immediately accessible to the on-site construction crews via their mobile devices, ensuring all relevant parties always had the most up-to-date information. "It wasn't until we could take advantage of Bentley's partnership with Microsoft 365 that we were able to formulate a working system, [an] end-to-end solution," said Rogers. Upon completion of construction, Essential Energy resen

t drones to capture photos of the site and generate an as-built model with ContextCapture, closing the loop by performing a post-construction audit against the initial design.

DRIVING SMART SOLUTIONS IN THE ENERGY SECTOR

By automating previously manual processes, Essential Energy significantly reduced substation design hours. The implementation of their Bentley-based IDDS has reduced project costs for design at Brewarrina by 50%. “We now believe we have bridged the gap in making IDDS not just financially viable for large-scale budget projects, but [now we can] also offer the same end-to-end project benefits in a low-cost solution,” said Turvey.

Using low-cost 3D reality models, clash detection, and automated workflows rather than traditionally manual methods improved quality and efficiencies, reduced rework associated with design and construction errors, minimized travel, enhanced safety, and decreased Essential Energy’s carbon footprint. “IDDS and reality models provide accurate information and revolutionary viewing angles, which enable quick and safe design decisions and allow construction crews to reduce outage times, resulting in a resilient network,” said Rogers.

Essential Energy has achieved numerous benefits moving to an IDDS, which has also helped position Essential Energy to transition to a more comprehensive digital twin and adopt new technologies. With the increasing push to lower operating costs across the energy sector, Essential Energy is on an asset management journey to transform their view on capital works projects and how they use technology. They aim to integrate bidirectional data flows and real-time visualization between their IDDS and asset management system and identify high-risk assets, driving improved operations and maintenance processes across Australia’s energy sector. “As for the digital future, as Essential Energy builds its data lake of reality models, we will be able to use artificial intelligence to help identify defects in assets and use historical data to show time lapse visual conditioning models,” said Rogers.

PROJECT SUMMARY

Organization: Essential Energy
Solution: Grid
Location: Port Macquarie, Australia

Project Objectives:

To lower operating costs and minimize the carbon footprint within Australia’s energy sector.

To establish an intelligent digital design system for small capital projects.

Project Playbook: ContextCapture, OpenUtilities, ProjectWise

FAST FACTS

- Essential Energy explored the feasibility of using an intelligent digital design system (IDDS) to lower network operating costs and unlock value across small capital energy

projects.

- They investigated the substation design process at their rural Brewarrina site, digitizing previous manual survey, design, and construction workflows.
- Bentley’s applications provided an intelligent reality modeling-based solution to overcome challenges related to data acquisition, compatibility, and construction drawing accuracy.

ROI

- EE’s IDDS reduced environmental impact, lowered project design costs by 50%, and cut design-related travel by 80%.

Callout Quote: “A completely intelligent digital end-to-end solution has enabled us to reduce costs, increase safety, and remain agile, while increasing transparency and reducing our carbon footprint.” — Matthew Turvey, Senior Electrical Engineer, Substation Design Team, Essential Energy



QDOS CWT CHEMICAL METERING PUMP DOSES CHLORINE WITHOUT FAIL FOR OVER 15,000 HOURS AT ERGON INC.

Adeel Hassan, Product Manager, Watson-Marlow Fluid Technology Solutions

A Qdos CWT (Conveying Wave Technology™) chemical metering pump ran for over 21 months dosing chlorine at Ergon – West Virginia Inc.'s paraffinic refinery in Newell, West Virginia in the United States, after replacing a diaphragm pump which lasted less than half the time on average.

The Qdos CWT pump, which is now available with 130 PSI (9 bar) pressure capability, is dosing chlorine into the raw water stream as part of a process to produce sodium hydrosulfide (NaHS) for the paper and pulp industry.

Diaphragm injection pumps were lasting eight to ten months in the chlorine application for Ergon, which wanted a longer lasting, lower maintenance alternative option.

Ergon installed a Qdos CWT pump, which ran continuously from February 8, 2022 to November 21, 2023.

Qdos CWT, part of the Qdos range from Watson-Marlow Fluid Technology Solutions (WMFTS), has improved reliability and reduced maintenance for Ergon for this application at the crude oil refinery, which has a wide customer base for a variety of

paraffinic process and base oils Ergon produces at Newell.

Bob Bowers, Maintenance Planner/Coordinator at Ergon West Virginia, Inc., said: "The pump is dosing 200 ppm (parts per million) chlorine into the raw water stream for our softener that feeds the fuel gas treatment system. It pumps 6 mL per hour, day in and day out without a hitch. The water from the softening system is used to help flush hydrogen sulfide (H₂S) from our refinery fuel gas and carry it to our NaHS unit, a product which is used in paper mills.

"The Qdos pump has greatly improved reliability and simplified service for our application. Maintenance for this system has been reduced to keeping the chlorine tank full and adding salt to the softener.

"The softener runs continuously, 24-7, for our fuel gas treatment plant. Reliability is key to keeping the feed water to the softener treated biologically, which is what this pump provides - chlorine for that treatment.

"The original Qdos pumphead was installed in February of 2022 and ran roughly 15,600 hours [equivalent to 651 days, over 21 months]. The original outlasted anything else we tried in that application by

nearly triple. That is head and shoulders above the previously used diaphragm pump for service time."

Ergon's Energy & Specialty Solutions (ESS) segment transforms molecules that would otherwise be used as transportation fuels into non-combusted specialty naphthenic and paraffinic products for niche markets. Paraffinic process and base oils produced at Newell are used in a variety of applications, including automotive and industrial lubricants, grease, chemical process industries, and rubber applications. Qdos CWT, one of six peristaltic pumps in the Qdos range which is designed to meet chemical metering and dosing requirements, delivers all the benefits of a peristaltic pump, but with significantly longer service life than traditional tube designs.

The longer CWT pumphead life, coupled with the recently enhanced 130 PSI (9 bar) pressure, enables Qdos CWT to meet requirements in more demanding applications.

Benefits of the Qdos CWT include:

- Accuracy of $\pm 1\%$ and repeatability of $\pm 0.5\%$ in dosing
- Flow rates to 31.7 USGPH (30 L/h) at pressures of up to 130 PSI (9 bar)

- Long service life at high pressure
- Reliable, low-maintenance metering

WHAT IS CONVEYING WAVE TECHNOLOGY?

Conveying Wave Technology (CWT) employs the peristaltic principle to operate a unique fluid contact element. To achieve the peristaltic pumping action, the pump incorporates a fluid contact element rather than a tube, which acts against a PEEK track. As a result, the fluid contact elements are subjected to very low stress levels. In use, this means a Qdos CWT pump will deliver significantly longer service life than a traditional pump.

ABOUT ERGON

Ergon is a group of privately held companies that operate under four primary business segments: Energy & Specialty Solutions, Pavement & Coating Resources, Integrated Services & Logistics, and Exploration & Production.

ABOUT WATSON-MARLOW FLUID TECHNOLOGY SOLUTIONS

Watson-Marlow Fluid Technology Solutions (WMFTS) is a world leader in manufacturing peristaltic pumps and associated fluid path technologies for the life sciences and process industries.

WMFTS is part of Spirax Group (formerly Spirax-Sarco Engineering plc), with 47 operating units worldwide (December 31, 2023).



Antarctica holds about 60% of the world's fresh water in the form of ice. If all the ice were to melt, global sea levels would rise significantly.



About the Author



Adeel Hassan
Product Manager,
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Solutions

As Product Manager for Watson-Marlow Fluid Technology Solutions, Adeel Hassan oversees the Qdos range of chemical metering pumps, widely used in water treatment plants globally. He is actively involved in understanding the challenges faced by customers and leads product development initiatives to drive efficiencies across the sector. In addition to extensive product management experience for several leading manufacturers, Adeel has spent time in the Middle East working on automation projects for the water treatment industry. He holds an MSc in Technology and Innovation Management from the University of Sussex, UK.




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URGENCY MEETS INNOVATION: TECH'S ROLE IN RESOLVING WATER CRISIS

Kanishka Chatterjee, Director, The/Nudge Prize

As you leaf through today's newspaper, the resounding message is crystal clear: we're facing a dire water crisis, and the urgency to address it is palpable as time ticks away.

India grew from merely 51 million tons (Mt) of food grain production in 1950/51 to over 314 Mt in 2022- a sixfold increase in production. What led to this remarkable outcome was the shift to science-led agricultural development, planner's vigour and the dedicated effort of millions of farmers. This transformed India from an acutely food-scarce and food shortage nation to a food surplus and food-exporting country.

However, these accomplishments came at a price- trading in water security, a resource even more essential for the survival of 1.3 billion people.

India has the highest demand for freshwater usage globally and extracts more groundwater each year than the US and China combined. 91% of this freshwater is used in the agricultural sector now, with groundwater contributing 62% of all irrigation water. Mismanagement, over-extraction, and inefficient irrigation practices have led to water scarcity in many regions. Moreover, climate change, growing population, and dependence on rain for replenishing these water reserves are not helping the case.

The issue operates in a dual manner: Inefficient

agricultural practices contribute to water wastage, exacerbating water scarcity. Consequently, this scarcity threatens the future of agriculture, ultimately jeopardizing the livelihoods of 58% of the nation's population that is currently dependent on it. This underscores the need for responsible water management.

But before this, we need to understand the science of agriculture:

Agriculture centers on the cultivation of soil, farming practices, and the nurturing of crops through irrigation. 'Irrigation' means supplying water to land to make it ready for agriculture.

Few crops require less amount of water for irrigation and few crops like rice, wheat, cotton, etc. require huge amounts of water for growth and are thus considered water-intensive crops.

Rice, wheat, cotton, and sugarcane represent 90 percent of India's domestic production and take up more than half of India's cultivable land. One of the key reasons for their higher production could be the most effective Minimum Support Prices (MSPs) support for these crops given by the government, leading to a disproportionate incentive structure favoring water-intensive crops.

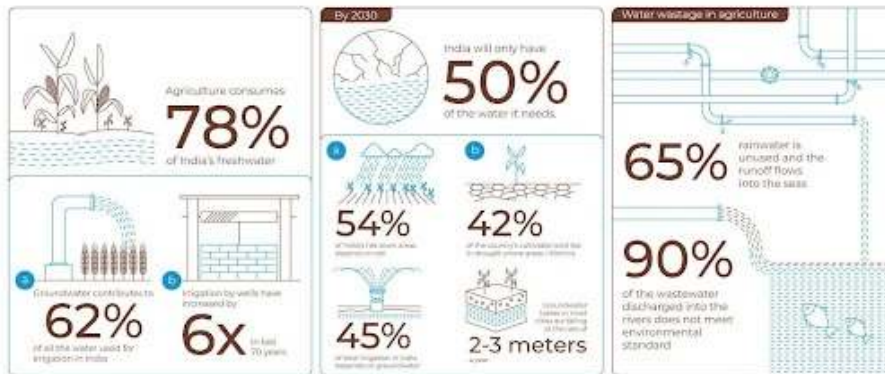
An in-depth analysis of crop distribution across states

highlights how suboptimal planting patterns exacerbate water stress. In Punjab, 117 out of a total 153 blocks are observed to have over-exploited groundwater- still the main cropping pattern is rice & wheat. Despite the significant water demand and shortage, Maharashtra contributes 22 percent of the nation's total sugarcane output.

A classic example is the Marathwada district in Maharashtra, where water scarcity has intensified due to three consecutive poor monsoons. The farming patterns in the semi-arid region have changed in the past few decades. Many farmers in the area have shifted from drought-resistant crops such as jowar (sorghum) and chana (chickpea) to water-intensive crops like sugarcane, lured by government incentives. Marathwada gets about 844 mm of average rain annually, whereas sugarcane ideally needs 2,100-2,500 mm. Traditional crops like moong and maize require 3.5-7 million liters of water per hectare, while sugarcane demands a significantly higher amount at 25 million liters per hectare. But sugarcane farming continues despite the drought and the area under sugarcane cultivation has gone up from 167,000 hectares in 1970-71 to 219,400 ha in 2014-15.

Thus, growing a water-intensive crop in already water-stressed areas is a recipe for water famine.

Why water is key



There are two perspectives to consider when examining the solution:

- Government policy and interventions need to shift to reset the revenue balance in favor of other less water-intensive crops. Currently, the government asks farmers to shift to less water-consuming crops, but it does little to support such a change. Fluctuating prices for vegetables, oilseeds, and pulses diminish the motivation for farmers to cultivate these crops.
- Technology & innovation to reduce water usage and wastage in water-intensive crops; and the ecosystem that is required to enable such innovation.

The nation has recognized that producing more from less is the key option to ensure sustainable development. Emerging technologies offer the ability to monitor, adjust, and promote more efficient use of water resources in agriculture. Further, these technologies should consider affordability by small-holder farmers since they make up 86% of India's farming households,

A perfect example of this is the Drip Pool Programme. This programme which was started in Gujarat, enables cotton farmers in India to use micro irrigation technology (drip irrigation) via community funding to provide interest-free loans to such farmers for adopting the technology. Programme farmers have reported using just 1,191 liters of water per kilogram of cotton, compared to the 5,923 liters consumed by non-programme farmers. They have also reported benefits such as uniformity in production, better yield

of seed cotton and increased fertilizer cost efficiency as well as reduced weeding and lower labour costs.

However, sparking new innovations requires a village.

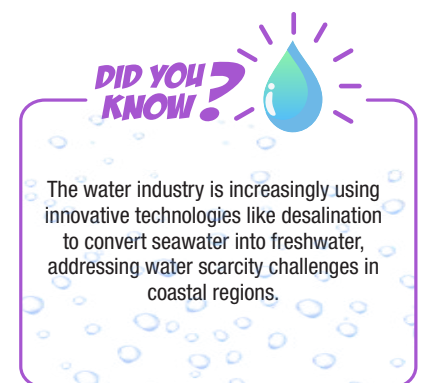
Just as water is required for nurturing soil and seeds, so too are the enablers and ecosystem vital for propelling the technological revolution. There are four major facilitators of technology seeding:

1. Landscape of Research & Development- Research and development within an industry, and learning by doing, can lead to technological change. The maturity of R&D centers and their collaborative synergy play crucial roles in this process.
2. Spillover from other industries - Drawing knowledge and expertise from related/ similar industries, along with the ability to integrate platforms from diverse use cases nationwide, fosters a culture of hypothesis testing and prioritization for commercial viability.
3. Information Technology Infrastructure- The effectiveness of existing technology infrastructure in swiftly and efficiently transferring data and decisions has accelerated the pace of technological shifts significantly.
4. Globalization- The increasing interconnectedness of the global economy and access to markets beyond local boundaries have transformed technology into a lever for scalability, thereby fostering innovation on a large scale.

Israel serves as an exemplary case of collaboration, transitioning from predominantly arid land to a global agricultural powerhouse. The key to this success lies at the combined role of government, market-orientation and an innovative system focused on problem-solving. Its robust innovation ecosystem addresses challenges across the value chain for farmers and private stakeholders. A dedicated government R&D agency collaborates closely with extension workers, farmers, and the private sector, emphasizing the identification of real problems, tailored solution design, and adaptive capabilities through local R&D centers. Substantial investments in education and research have propelled Israel into a prominent global R&D hub, marking a significant leap in scientific innovation.

More emphasis on these enablers and ecosystem is a pathway to have more innovation and a nudge to more social entrepreneurs to come up with innovative ideas and technology. A few solutions that can be looked at going forward are:

- Advisory & Information Services:** solutions that incorporate on-site data, precision agtech, and external information systems to improve decision-making
- Irrigation as a Service:** a model that provides access to irrigation to those who do not own irrigation equipment
- Irrigation Mechanisation/ Automation:** solutions that provide machineries and automation technologies for irrigation
- Agriculture Biotech:** solutions that offer biotech/materials such as inputs, alternative ingredients, etc. to improve productivity and efficiency



CONCLUSION

The water challenges currently confronting India are daunting, yet not insurmountable. There is an urgent need for sustainable and cost-effective technological innovations which addresses the water crisis. Equally important is the ecosystem and the enablers that nurtures and are the building blocks of such innovations. Coupled with meticulously executed government policies, this approach can undoubtedly assist India in overcoming its water challenges and also positively impact the livelihoods of the 58% of the nation's population who depend on agriculture for their sustenance.



About the Author



Kanishka Chatterjee
Director, The/Nudge Prize

Kanishka Chatterjee is the Director, The/Nudge Prize - A social innovation initiative that brings urgency & scale to stagnant livelihood issues, by inducing tech-first solutions through grand challenges.

Before joining The/Nudge Institute, he spent 16 years in consumer marketing & digital analytics as a consulting and commercial analytics leader. He has worked across Pharma, CPG & BFSI, focused on growth-hacking digital marketing strategy and driving differentiated research & social media insights practices for CXOs/enterprises. He's worked with Genpact, Clarivate, Axtia and led the marketing analytics portfolio and established new practices in digital transformations. Kanishka has a Bachelor's in Economics and PGDBM in Marketing from TAPMI, Manipal. He's also a postgraduate public policy student at the Takshashila Institute.



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Harnessing Artificial Intelligence for Enhanced Water Quality Monitoring

INTERVIEW WITH

Dr. Mayur J. Kapadia

Trainer, Writer, Editor & Former AGM, Quality Control Dept, GNFC Ltd

Q: Good afternoon, sir! EAW team has immense pleasure to extend you a warm welcome here to discuss about various facets of artificial intelligence (AI) in water quality monitoring.

A: A very good afternoon to you as well. I am excited to share my thoughts on the subject that deals with various aspects of artificial intelligence (AI) in the arena of Water Quality Monitoring. Please accept my compliments for having selected such a lively and most promising subject for the discussion.

Q: There is a lot of buzz about role of artificial intelligence in water quality monitoring. It will be interesting for our readers to know about your perception about revolution that AI can bring about towards water quality monitoring.

A: At the outset, I would like to describe Artificial intelligence (AI) as an area of computer science wherein human intelligence is imbibed in computers.



Due to AI's high-speed operation, accuracy and simplicity, it is applied effectively in water quality monitoring as it plays a pivotal role in revolutionizing water quality monitoring. AI enhances efficiency, accuracy, and proactive management of water resources. While traditional methods of water quality monitoring are labour-intensive, time-consuming, and lacking real-time insights; AI-powered systems offer innovative solutions to address these challenges.

AI enables the analysis of vast amounts of data collected from various sources such as sensors, satellites, and drones. Machine learning algorithms detect patterns, trends, and anomalies in water quality parameters, which facilitate early detection of contamination or pollution events. The real-time data processing provides timely alerts to stakeholders, enabling them to take prompt action to mitigate risks to water quality.

AI also integrates historical environmental data and predictive analytics to forecast water quality changes and identify potential hotspots for contamination. This proactive approach allows authorities to implement preventive measures and optimize resource allocation for water management.

Furthermore, AI contributes to the development of autonomous monitoring systems, reducing the need for human intervention in data collection and analysis. This makes it possible to monitor water bodies remotely by collection of high-resolution data with greater frequency and precision than traditional methods. This reduces operational costs and enhances scalability.



Additionally, AI-powered decision support systems can also empower policymakers, water managers, and other stakeholders with actionable insights for sustainable water resource management. The stakeholders can make informed choices from among various recommendations provided by AI. This eases

the decision-making process to safeguard water quality, allocate resources effectively, and mitigate potential risks to public health and the environment.

Thus, AI's role in revolutionizing water quality monitoring is transformative. By harnessing the power of AI, one can achieve more efficient, proactive, sustainable and safe management of water resources.

Q: What considerations should be taken into account when implementing AI-powered solutions for water quality monitoring at scale?

A: This point is quite important. Implementing AI-powered solutions for water quality monitoring at scale requires careful consideration of several key factors to ensure effectiveness, reliability, and sustainability.

Firstly, high-quality data and availability of enormous data are paramount to develop AI algorithms that can accurately detect patterns and anomalies in water quality parameters. At the same time, the data collection methods should be robust and consistent. Also, it is important that a wide range of environmental conditions data are covered.

Secondly, algorithms should be transparent and interpretable for winning stakeholders' trust over AI-driven insights. The selected AI techniques should be easily explainable to ensure that the reasoning behind algorithmic decisions is clear.

Thirdly, scalability and adaptability are essential for deploying AI-powered solutions across diverse water systems. Users should design flexible architectures that can accommodate varying data volumes, sensor types, and monitoring requirements, allowing for seamless integration and expansion as and when needed.

Fourthly, AI-powered solutions should adhere to relevant standards and guidelines. The users should prioritize data privacy, security, and fairness in algorithmic decision-making processes, mitigating potential biases and risks to vulnerable communities.

Additionally, the user industry should work closely with government agencies, research institutions, and local communities to co-design monitoring programs, share data, and gather feedback to improve AI algorithms' performance and relevance.

Lastly, these solutions should be sustainable over long-term as well as cost-effective. The AI-powered solutions will remain viable over time by virtue of these two crucial factors.

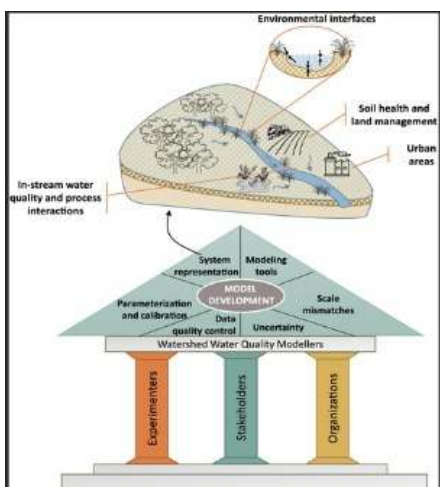
Q: Accuracy of water quality monitoring data and efficiency of the systems collecting data is crucial. In what ways AI can impact the efficiency and accuracy of water quality monitoring?

A: Artificial intelligence (AI) is significantly able to enhance the efficiency and accuracy of water quality monitoring data through various mechanisms:

Autonomous Monitoring: As I said earlier, AI enables the development of autonomous monitoring systems, such as drones or unmanned underwater vehicles, equipped with sensors and cameras. These systems can collect high-resolution data from remote or inaccessible locations, providing comprehensive coverage and reducing the need for manual sampling.

Speed of Data Processing: AI algorithms can process large volumes of data from diverse sources like sensors, satellites, and manual measurements, at a much faster rate than manual methods. This rapid processing capability allows for real-time analysis or very close to real-time analysis, which, in turn, enables quicker detection of anomalies or trends in water quality parameters.

Predictive Modelling: AI-powered predictive models can forecast future changes in water quality based on historical data, environmental factors, and other relevant parameters. Such predictions help to anticipate potential risks to water quality, allowing implementation of proactive management strategies.



Study of Patterns: AI excels at detecting complex patterns within water quality data that may not be immediately apparent to human analysts. The correlations of diverse data are quickly established by AI. This way AI can identify subtle changes or anomalies in water quality parameters for quicker remedial and proactive measures.

Decision Making Process: AI-driven decision support systems provide stakeholders with actionable insights and recommendations based on water quality data analysis. These support systems can also prioritize the monitoring efforts. In addition, they can also assist in allocating resources efficiently. They also facilitate evidence-based decision-making.

Overall, I would say, the AI can substantially improve the efficiency and accuracy of water quality monitoring.

Q: How can one ensure reliability and validity of AI-generated insights in water quality assessment?

A: This is a fantastic question. The reliability and validity of the insights generated by AI is very crucial. Several strategies must be employed to achieve reliability.

First and the foremost, the data provided to AI must be of high-quality. The accuracy, consistency and representativeness of data could be established through rigorous data collection and their validation. In this sense, cleaning processes adopted for sensors is of paramount importance. Further, regular monitoring and maintenance of sensor networks and data sources will help in preventing data drift and degradation over time.

Secondly, AI algorithms should be transparent and explainable to facilitate understanding and validation of their outputs. Users should be able to interpret the machine learning models and techniques. Rule-based systems should be employed so that the users can understand the reasoning behind AI-generated insights and verify their validity. At occasions, AI-generated insights should undergo validation and verification checks by comparing AI predictions with ground-truth data collected from independent sources. Field validation studies should also be conducted to confirm the consistency and relevance of the insights. By comparing AI-generated insights with results obtained from conventional monitoring techniques or expert assessments, one can ensure consistency and reliability across different approaches.

Additionally, probability models should be used to not only recognize the uncertainty but also to quantify the level of uncertainty of AI-generated insights. Different models and simulations are available to estimate uncertainty levels and provide confidence intervals for AI predictions.

Finally, it is important to implement a true feedback loop mechanism and provide due weightage to each and every feedback. On the basis of unbiased feedback and new data inputs, continuous improvement could be brought about for the AI models. Regular updates and refinements to algorithms will further strengthen AI-generated insights with respect to accuracy and relevance in dynamic water quality monitoring scenarios.

Q: In your opinion, what are the key challenges an industry faces in water quality monitoring? How does AI help address them?

A: Well, to begin with, industries often deal with large volumes of complex data from various sources like sensors, satellites, and manual measurements. To integrate and analyse these heterogeneous datasets is highly challenging. AI algorithms can help in a giant manner. AI can integrate multiple data sources, can harmonize discrete datasets, and provide a holistic view of water quality parameters. All these features overcome the challenge of comprehensive monitoring and analysis.



Also, the manual way of interpreting water quality data is time consuming. AI algorithms automate data interpretation quickly. Not only interpretation, they can also identify patterns, trends, and anomalies. This way, AI enhances the efficiency and accuracy of the decision-making processes.

Real-time Monitoring is another challenge for most industries. The traditional methods of water quality monitoring followed by industries, many a times, lack real-time capabilities. This leads to delays in detecting and responding to pollution events or changes in water quality. AI-powered systems enable real-time monitoring

by processing data rapidly and providing timely alerts for prompt actions to mitigate risks.

Conventional ways of anticipating future changes in water quality pose a great limitation. AI can generate predictive models to anticipate the future changes in quality and assess potential impacts of various environmental and human factors, such as climate change or land use practices. Through predictive modelling, it is possible for industries to work out proactive management strategies, which was not possible with conventional means of monitoring.

Cost incurred towards water quality monitoring is a big hurdle for industries to generate plenty of data. The traditional methods are expensive and resource-intensive. Therefore, they limit the scalability and accessibility of monitoring. AI-powered solutions can greatly overcome this challenge, as they automate data collection, analysis, and interpretation processes, which reduce the need for manual intervention and thereby lower the operational costs.

Q: How do you envision the future integration of AI with IoT devices and sensors for real-time water quality monitoring?

A: I strongly believe that future IoT devices will feature more advanced sensor technologies capable of measuring broader range of parameters with higher precision and sensitivity, which will make it possible to measure emerging contaminants, microbial pathogens, and microplastics etc. However, mere use of advanced IoT devices cannot guarantee improved quality monitoring. Here comes the role of Machine Learning (ML) algorithms for improved water quality monitoring. In future, the ML algorithms will be deployed directly on IoT devices, thereby the IoT devices will get integrated with autonomous systems such as drones, unmanned surface vessels, and underwater robots etc. These platforms will carry IoT sensors, collect water samples, and conduct in-situ measurements. It will also be possible that smart phone-based sensors and IoT-enabled water quality testing kits will be used by individuals to contribute data and report observations.

The 4 main types of ML techniques viz. Supervised, Unsupervised, Semi-supervised and Reinforcement ML will have definitive role in conjugating AI with IoT devices. While Supervised learning will classify water quality data based on specific parameters to detect

anomalies or changes, the Unsupervised learning will identify patterns or clusters within data to detect unusual quality events or identify new patterns. Further, the Reinforcement learning will assist optimization of treatment processes by providing feedback to control systems.



This way, the integration of ML into intelligent water networks will significantly enhance water distribution efficiency, detect leaks, optimize pressure levels, identify abnormal consumption patterns, improve overall system performance and ensure a reliable and sustainable water supply. ML powered emerging trends in water quality monitoring hold immense promise for ensuring the availability of clean and safe water for future generations.

Q: Finally, how do you measure the return on investment (ROI) or the overall impact of AI implementation in water quality management strategies?

A: The implementation of AI in water quality management strategies will have significant impact on both the efficiency and effectiveness of monitoring, assessment, and remediation processes.

Firstly, AI-powered systems will analyse a large volume of data from various sources such as remote sensing, IoT sensors, and historical records. The data analysis will detect anomalies in water quality parameters quite early. This early detection will allow implementation of proactive management strategies before water quality issues escalate.

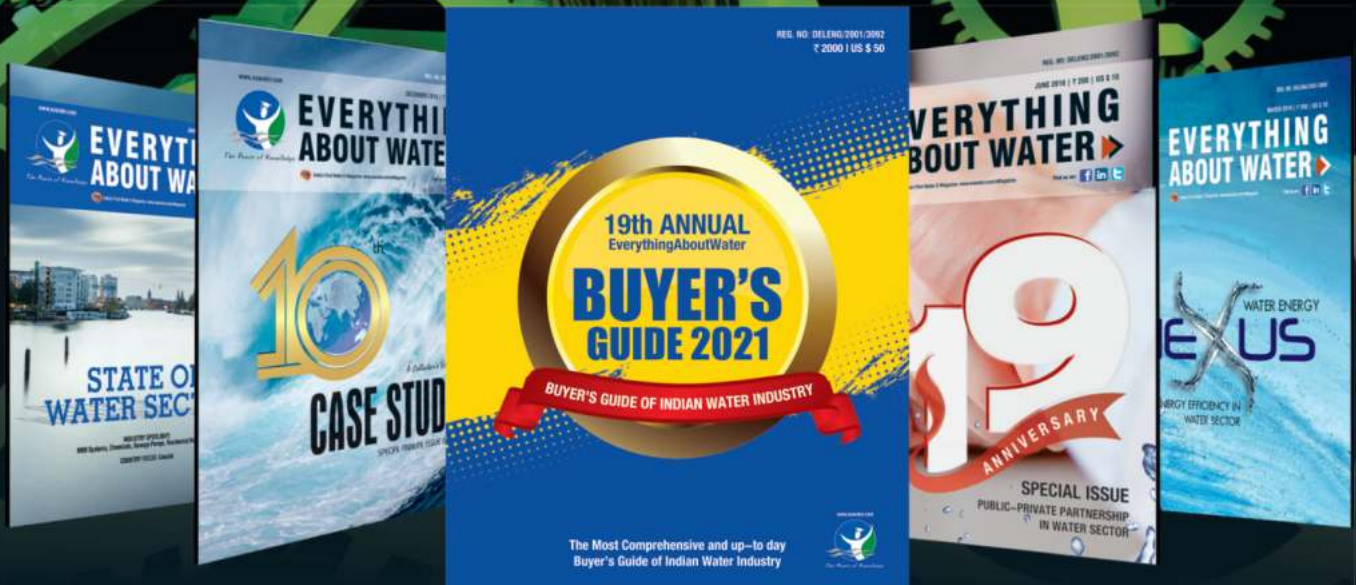
Secondly, AI will develop predictive models that forecast potential water quality issues based on historical data, weather patterns, and other relevant variables. These models can enable decision-makers to anticipate and prepare for future challenges.

processes by analyzing real-time data and automatically adjust the treatment parameters. The foremost impact of AI is on Cost Reduction. The automation of repetitive tasks to optimize processes will help reduce operational costs. The predictive maintenance driven by AI will minimize equipment downtime and prolong asset lifespan, which will lead to cost savings in the long run.

Overall, the integration of AI technologies in water quality management strategies will fetch many intangible benefits like enhanced efficiency, improved decision-making, and safeguarded human health and the environment. Additionally, tangible benefits like increased equipment life, cost saving in operation of treatment processes etc will also be visible.



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INTERVIEW WITH Dhrubo Banerjee

Managing Director of Wex
Technologies (Subsidiary of Aquatech)

Q: How do you perceive the role of artificial intelligence in revolutionising water quality monitoring?

A: Artificial Intelligence (AI) is revolutionizing the monitoring of water quality by improving efficiency and accuracy through anomaly detection, predictive modelling, and fast data analysis. It gathers and examines massive amounts of manual and sensor data in order to pinpoint the sources of contamination and forecast patterns. When AI is combined with automated sensor networks, it allows for real-time monitoring, which quickly identifies abnormalities and triggers quick action. We can now predict future water states, which facilitates proactive responses to support environmental sustainability. This all-encompassing strategy guarantees prompt, accurate, and effective solutions—essential for protecting water resources.

Q: How does your company integrate AI with traditional monitoring methods for enhanced water quality analysis?

A: Our artificial intelligence technique enhances and revolutionizes current techniques, especially by incorporating real-time data analysis. Effective pattern recognition and early contamination alerts are made possible by combining AI with conventional monitoring via smart sensor networks. This synergy facilitates prompt decision-making and is displayed in dashboards that are easy to use. Continuous AI interaction improves existing techniques by producing deeper insights. We ensure comprehensive water quality analysis by fusing AI's advantages with tradition, encouraging proactive resource management for sustainability and safety.

Q: What considerations should be taken into account when implementing AI-powered solutions for water quality monitoring at scale?

A: For projects to be successful, timely and high-quality data access is essential. Deploying sensors that can provide this kind of data calls for extra attention. It is crucial to prioritize data quality, algorithm transparency, and ethical AI use when scaling AI-powered water quality monitoring systems. Because AI frequently operates as a black box, it requires explainable technology recommendations for trust build up. Reliable sources, validation against ground truth, and transparency in decision-making are vital. Addressing biases, privacy concerns, and regulations is essential. Stakeholder cooperation and continuous monitoring are essential for successful implementation at scale. Broader data access is made possible by cloud-based systems, which also guarantee complete data security and privacy.

Q: In what ways has AI impacted the efficiency and accuracy of your water quality monitoring processes?

A: AI has the potential to significantly increase the accuracy and efficiency of our water quality monitoring procedures. Large datasets can be processed quickly and accurately with AI-driven data analysis, which also helps to spot anomalies and patterns. We are currently in the deployment phase, and once full functionality is achieved, we expect several benefits, including improved monitoring accuracy, resource optimization through prompt decision-making, cost savings through automated compliance reporting, methodological improvements overall, and predictive modelling capabilities. To summarize, artificial intelligence (AI) improves water quality monitoring effectiveness by streamlining processes, increasing

accuracy, and enabling proactive measures..

Q: How does your company ensure the reliability and validity of AI-generated insights in water quality assessment?

A: First and foremost, we have strong expert oversight over AI-generated recommendations, and our company ensures the reliability and validity of AI-generated insights through rigorous validation processes. We use high-quality data sources and ground truth validation to train AI models accurately. This means we are constantly improving AI accuracy through human feedback. At the same time, many of our dashboards display multiple KPIs, which allows us to quickly identify reporting anomalies. Regular performance evaluations and validation against established standards demonstrate the efficacy of AI-generated insights. Also, keeping AI explainable enables end users to verify recommendations and act only if they agree with them. Furthermore, transparency in algorithmic decision-making and collaboration with domain experts help to validate the relevance and reliability of AI-generated assessments, resulting in trustworthy water quality assessments.

Q: What data sources does your company rely on for AI-driven water quality analysis, and how do you ensure data quality and integrity?

A: Our company utilizes a broad range of data sources, including in-situ sensors and historical records, to conduct AI-driven water quality analyses. To ensure data quality and integrity, we use stringent validation processes such as sensor calibration, database cross-referencing, and regular maintenance. We are currently integrating sensor and lab report data and adjusting for seasonal variations. Employing data fusion techniques improves accuracy by combining multiple sources. Continuous monitoring and validation protocols reduce errors, resulting in reliable insights for effective water quality analyses.

Q: Could you elaborate on any collaborations or partnerships your company has engaged in to further develop AI solutions for water quality monitoring?

A: We've formed a partnership with a leading AI and data science firm, bolstering our venture with skilled professionals and drawing on the collective AI community's wealth of experience. We benefit from

these strategic collaborations by leveraging expertise in AI algorithms, sensor technology, and environmental science. This collaboration improves access to cutting-edge research, method validation, and solution innovation. We advance AI-driven water quality monitoring by encouraging interdisciplinary collaboration, resulting in effective and long-term environmental stewardship strategies.

Q: What are some of the key challenges your company faces in water quality monitoring, and how does AI help address them?

A: One of the most common concerns expressed by people is data security and privacy. Also, data residency. Other challenges include large, distributed data environments with data diversity and scale, complexity, real-time processing and efficient adoption to reduce costs. Promoting a technology-first mindset to improve traditional methods is another hurdle.

AI addresses these challenges by automating data analysis, allowing for faster processing, and prioritizing

monitoring efforts. Machine learning detects patterns and anomalies, which aids in early contamination detection. Overall, AI improves efficiency, accuracy, and proactive responses to water quality monitoring challenges.

Q: How do you envision the future integration of AI with IoT devices and sensors for real-time water quality monitoring?

A: IoT is essential for AI and real-time monitoring through sensors. Without it, digitalisation cannot take off. The future integration of AI with IoT devices and sensors promises to transform real-time water quality monitoring. Deeper insights into water quality will emerge as technology advances and a variety of sensors become available. AI algorithms will analyse sensor data in real time, resulting in unprecedented accuracy in anomaly detection and trend prediction. This integration will enable proactive measures to protect industrial assets and the environment. Customized monitoring models tailored to specific industries or clients will emerge, resulting in comprehensive, timely insights that

transform water resource management.

Q: Finally, how do you measure the return on investment (ROI) or the overall impact of AI implementation in your water quality management strategies?

A: We evaluate the ROI and overall impact of AI implementation in water quality management by examining a variety of factors. Cost savings from increased efficiency, shorter response times to contamination events, and improved accuracy in predicting water quality trends are among the primary drivers. These include operational efficiencies achieved through better resource utilization. Furthermore, we can evaluate AI's effectiveness in reducing risks to industrial utility systems, public health, and the environment. We quantify the tangible and intangible returns of implementing AI in our strategies by weighing these benefits against investment costs. ROI will be determined by how the customer and individual users perceive the value proposition.



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World Water Day

22 March 2024



Pradip Kumar Sengupta

India is currently facing a severe water crisis, exacerbated by a combination of factors including population growth, urbanization, industrialization, and climate change. With approximately 17% of the world's population but only 4% of its freshwater resources, India's water situation is becoming increasingly precarious.

Population growth is a significant factor contributing to the water crisis in India. As the population increases, the demand for water also rises, putting immense pressure on the available water resources. Per capita water availability refers to the average amount of water available per person in a given region or country. In India, per capita water availability has been declining steadily due to population growth and increasing water demand. According to recent data, India's per capita water availability stands at around 1,545 cubic meters per year, which is well below the global average of approximately 6,000 cubic meters per year.

Addressing the challenge of declining per capita water availability requires comprehensive and sustainable water management strategies, including water conservation, efficient use of water resources and investment in infrastructure. Collaboration among governments, communities, industries, and other stakeholders is essential to ensure equitable access to water resources and mitigate the adverse effects of water scarcity in India.



Dr Mayur J Kapadia
former AGM-QC, GNFC Ltd

It is needless to say that scarce and polluted water, that too, with unequal access has raised tensions among countries and communities. So, water can be a critical factor for stability of the world. Aptly chosen theme for World Water Day 2024 - 'Water for Peace' – can be supported by appropriate actions of all major stake holders of water - Agriculture, Industry and Domestic consumers.

Though there are varying estimates (8-14%), it is clear that industrial use of water is not negligible, which will continue to grow further. It is known to industries that though no one of them owns water, they all rely upon it heavily! Water is a shared resource, so water risks are also shared risks!

To begin with the stewardship, industries need to disclose their water use to bring about a culture of decision making that is based on environmental costs. Use of water risk mapping tools can help in finding solutions for water risks. In collaboration of other stake holders, industries should develop long term water security plans by analysing available water resources, usage pattern, future demand and community expectations. Industries should strength collective efforts and ensure water availability in culturally and socially equitable manner, which are also environmentally sustainable and economically achievable. To begin with the stewardship, industries need to disclose their water use to bring about a culture of decision making that is based on environmental costs. Use of water risk mapping tools can help in finding solutions for water risks. In collaboration of other stake holders, industries should develop long term water security plans by analysing available water resources, usage pattern, future demand and community expectations. Industries should strength collective efforts and ensure water availability in culturally and socially equitable manner, which are also environmentally sustainable and economically achievable.



Abdul Rahman Mohammed,
CEO, Sahara Industry

The theme for this year's World Water Day underscores the imperative that no one should be left behind when it comes to access to water and sanitation on a global scale. Water scarcity is a pressing issue, impacting even the largest economies, while the situation in the poorest nations are particularly terrible.

Instead of resorting to power struggles or seeking to dominate shared water resources, the focus should be on promoting cooperation, transparency, and mutual understanding among all stakeholders. This includes riparian nations, local communities, and marginalized groups, ensuring that their perspectives and needs are taken into account in decision-making processes. By prioritizing collaboration and inclusivity, we can work towards sustainable solutions that address the challenges of water scarcity and promote equitable access for all.

Water is essential to our existence, serving crucial functions from hydration to cooking to personal hygiene. It also holds significance for commercial endeavors, contributing to the development and economic advancement of nations.

India, with its vast population, is grappling with a difficult challenge – water scarcity. This critical issue has far-reaching implications, as nearly half of the country's population is routinely suffering from acute water shortages. The severity of this crisis is posing a significant threat to the well-being of millions and the nation's overall development. The root causes of this water crisis are multifaceted, stemming from a combination of factors such as rapid population growth, urbanization, industrialization, and the adverse effects of climate change. The growing demand for water across various sectors, including agriculture, industry, and domestic use, has outpaced the available resources, leading to an unsustainable strain on existing water supplies.

THE WATER CRISIS IN INDIA POSES A SIGNIFICANT THREAT TO THE WELL-BEING OF MILLIONS OF PEOPLE AND THE COUNTRY'S OVERALL DEVELOPMENT EFFORTS.

Moreover, the uneven distribution of water resources across the region further aggravates the problem. While some regions experience abundant rainfall and have access to permanent rivers, others face prolonged droughts and rely heavily on groundwater, which is being depleted at an alarming rate due to overexploitation.

For a large population in India, groundwater is the primary source of water supply for daily activities, highlighting the critical role of natural resources in maintaining a stable and healthy lifestyle. However, with the escalating population, groundwater usage is on the rise while water availability is shrinking. India holds the distinction of being the world's largest groundwater user, utilizing an estimated 251 billion cubic meters per year, which accounts for over a quarter of the total global extraction. Given that over 60% of irrigated agriculture and 85% of drinking water supplies rely on it, coupled with increasing industrial and urban demand, groundwater stands as a crucial resource. It is imperative that we focus our efforts to conserve groundwater and safeguard one of our most vital natural resources for future generations.

Water pollution represents a significant environmental concern in India, with untreated sewage being the primary source of contamination.

It's estimated that around 70% of surface water in India is unfit for consumption. Every day, almost 50 billion litres of wastewater enters rivers and other water bodies untreated. The drinking water quality is worsening every day.

The World Economic Forum has estimated that cost of environmental degradation in India is valued to be INR 3.75 trillion (\$45 billion) a year. The health costs relating to water pollution are alone estimated at about INR 470-610 billion (\$5.6-7.3 billion per year) – most associated with diarrheal mortality and morbidity of children under five. Apart from the economic cost, lack of water, sanitation and hygiene results in the loss of 400,000 lives per year in India.

WATER POLLUTION IN INDIA EXACTS A STAGGERING ECONOMIC TOLL, WITH THE ASSOCIATED HEALTH COSTS ESTIMATED TO RANGE BETWEEN A STARTLING INR 470 BILLION AND INR 610 BILLION ANNUALLY.

This gives the rise to water treatment industry, which is estimated to be \$3.03 billion (INR 252.7 billion) in 2023, expected to reach \$6.95 billion (INR 579.6 billion) by 2033, at a CAGR of 8.67%. As urban populations rise, there's a growing need for water treatment systems to fulfill city water supply and sanitation needs. Implementing point-of-use water treatment systems can mitigate waterborne illnesses and enhance daily water quality. With increasing awareness of waterborne diseases, the demand for such systems in India is also on the rise.

Sahara Industry has been at the forefront of addressing water challenges for the past two decades, employing advanced technologies to ensure access to clean water for both drinking and industrial production purposes. With a deep understanding of the critical role water plays in sustaining life and driving economic activities, Sahara Industry has been relentless in its pursuit of innovative solutions to tackle water-related issues.

Leveraging cutting-edge technologies, Sahara Industry has developed a comprehensive range of water treatment systems tailored to meet the diverse needs of communities, industries, and municipalities. Their advanced water purification processes are designed to remove harmful contaminants, such as heavy metals, chemicals, and microorganisms, ensuring that the treated water meets the highest quality standards for human consumption and industrial applications.

As the world continues to face increasing water stress due to factors such as population growth, urbanization, and climate change, Sahara Industry's role in providing sustainable water solutions becomes even more critical. It is our collective responsibility to ensure that no one is left behind in the pursuit of clean water. Every drop counts, and every action, no matter how small, can contribute to a ripple effect that transforms lives and communities.



Dr. Siddappa S. Bhusnoor,
Professor, Department of
Mechanical Engineering
K J Somaiya College of Engineering

Water quality and quantity are diminishing due to human activities and the impacts of climate change. Water is at the core of sustainable development and is critical for socio-economic development, healthy ecosystems and for human survival itself. However, with the global population increasing, the demand for clean and accessible water is also rising. This demand, coupled with climate change and environmental degradation, presents significant challenges in water resource management. It is imperative to adopt sustainable practices to secure a viable future for our planet.

Sustainable water management ensures meeting current needs without jeopardizing the ability of future generations to meet their own. SDG # 6 (Sustainable Development Goal 6) focuses on not only providing drinking water, sanitation, and hygiene but also enhancing water quality and sustainability. Apart from traditional practices like rainwater harvesting, sustainable water management includes wastewater treatment, desalination, drip irrigation, water pricing, river basin management, and raising public awareness about water conservation. Several challenges must be addressed in sustainable water management, including population growth, water pollution, scarcity, and political and social issues. By prioritizing sustainable practices and addressing these challenges, we can work towards a future where water resources are managed wisely for the benefit of all.



Anil Sethi,
Chairman,
Pump Academy Private Limited

Water plays a critical role in sustaining life, fostering economic development, maintaining ecological balance, and promoting peace and well-being. It can also trigger conflicts as the disputes over water have crossed national boundaries affecting countries globally. The growing water scarcity, driven by factors such as population growth, commercial activities, expanding cities, climate change, and inadequate water resource management, is increasing tensions both local and global scales.

Access to clean and safe water is vital for human health and survival, serving crucial roles in drinking, sanitation, and hygiene. Lack of clean water or its contamination can result in diseases, malnutrition, and fatalities. Key economic sectors such as agriculture, industry, energy production, and construction rely heavily on sufficient fresh water. Adequate water resources are necessary for sustaining economic growth, creating employment opportunities, and ensuring food security.

This year, World Water Day 2024 is dedicated to promoting cooperation to balance the needs of all, with a commitment to ensuring inclusivity and leveraging water as a catalyst for a more peaceful world under the theme "Water for Peace."

WATER PLAYS A DUAL ROLE IN PROMOTING PEACE AND TRIGGERING CONFLICT ACROSS THE GLOBE.

Historically, the scarcity of water resources has fuelled conflicts between communities, regions, and nations. India, currently grappling with the challenge of meeting the drinking water needs of its large population, with over 40% facing severe scarcity, is alarming. Competition for water access can escalate existing tensions, potentially resulting in violent conflicts and threatening peace and stability. Inefficient water resource management, including wasteful usage, lack of infrastructure, high water losses, poor management of water supply network and inadequate policies, can contribute to water scarcity and conflicts between states and cities as we can witness such emerging situations. Effective governance and sustainable water management practices are essential for mitigating water-related tensions.

To address the challenges posed by water scarcity and water-related conflicts, a comprehensive and collaborative approach is necessary. This involves investing in water infrastructure development and technology intervention, promoting sustainable water resource management, reducing water loss, fostering international cooperation, attending energy efficiency and carbon emission issues, addressing the impacts of climate change, and ensuring equitable access to water resources for all.

WORLD WATER DAY 2024 ADVOCATES FOR COOPERATION TO HARMONIZE THE NEEDS OF EVERY INDIVIDUAL, WITH A COMMITMENT TO ENSURE THAT NO ONE IS LEFT BEHIND.

According to the United Nations report, over 3 billion people worldwide depend on water that crosses national borders; however, only 24 countries have cooperation agreements for all shared water resources. When water is scarce or polluted, or when people have unequal or no access, tensions can rise between communities and countries.

The goal is to ensure that no individual or community is left behind in accessing clean water and adequate sanitation facilities. This objective necessitates a shift away from the traditional mindset of asserting dominance and control over water resources, particularly in the context of trans-boundary river systems. Instead of prioritizing dominance and the diversion of attention from pressing regional issues, the focus should be on addressing the root causes of water scarcity and promoting equitable and justifiable water resource management.

At Pump Academy Private Limited, we recognize the crucial role that pumping systems play as vital water infrastructure, and the challenges they face. To address these challenges, we have introduced an IIoT (Industrial Internet of Things) based optimization solution called iPUMPNET. This innovative solution holds the promise of making pumping systems operationally smart and responsive, enabling better resource management and contributing to improved water sustainability.

On the eve of World Water Day, we reiterate our commitment to driving innovation and providing cutting-edge solutions that address the challenges faced by the water industry. iPUMPNET is a testament to our dedication to promoting water sustainability through intelligent and responsive water infrastructure.



Kamalakanan Thiruvadi
Regional Executive for South Asia,
Bentley Systems

This World Water Day 2024, under the theme 'Water for Peace', Bentley Systems India emphasizes the vital role that water plays in the stability and prosperity of the world. Water, our most precious resource, is at the heart of human survival, environmental sustainability, and economic development. The significance of water conservation has never been more crucial, as it is instrumental in fostering peace, security, and harmony among communities and nations.

Industries have a pivotal role in water stewardship, underscoring the importance of adopting sustainable water management practices to mitigate conflicts, promote cooperation, and ensure equitable access to clean water. By integrating innovative technologies and efficient water use, industries can lead the way in preserving this invaluable resource, supporting not just economic growth but also contributing to a peaceful and prosperous world.

The journey towards water sustainability is a collective endeavour, requiring the engagement of governments, businesses, communities, and individuals alike. It is our responsibility to optimize our water usage, advocate for policies that protect and conserve our water resources, and adopt practices that respect our planet's delicate water cycle.

As Bentley Systems India, we are dedicated to advancing the principles of water stewardship and sustainable management through our expertise in infrastructure and technology. This World Water Day, let us reaffirm our commitment to preserving this invaluable resource for present and future generations, ensuring that every drop counts. Together, we can forge a path to a water-secure world, a legacy that will define our stewardship of the planet for centuries to come.



Hiroaki Kobayashi
CMD,
Toshiba Water Solutions Pvt. Ltd.

World Water Day is a global reminder of the importance of preserving our planet's most precious resource. At Toshiba Water, we are committed to advancing sustainable solutions for water management. From bringing new technology like large-scale Ozone Treatment System that were delivered at one of the largest-scale ozonation systems for a water treatment plant in India, to an active contributor to the government's 'Clean Ganga' initiative. We are supporting India's quest to build sustainable water and wastewater infrastructure contributing to the Clean Ganga initiative and so far, we have constructed a total of 10 sewage treatment plants across 3 states (Uttar Pradesh, Bihar & Jharkhand), with a total installed capacity of 181 million litres per day (MLD).

By leveraging our water treatment solutions and technologies cultivated through years of development and extensive experience in overseas EPC and O&M projects, Toshiba Water is committed to contribute to sustainable water recycling systems in India, to turn on the promise of a new day. We are leveraging our cutting-edge solutions to address water scarcity, improve sanitation, and promote conservation in India. Together, let's make every drop count!



Bhaskar Sharma
CEO, BPC India

On this World Water Day, let's unite in leveraging water for peace. At BPC, we're committed to sustainable wastewater treatment to conserve water resources, while helping corporations achieve their compliance discharge norms. Let's work together to ensure access to clean water for all, fostering peace and prosperity worldwide.



Kritee Jhavar,
Associate Vice President,
Avalon Consulting

When India's IT Capital, a mammoth like Bengaluru is buckling under severe water crisis and affecting every aspect of our daily lives, we have no choice but to open our eyes to the significance of water conservation. Why are we in this predicament? The answer is quite simple and something we have all learnt as part of our environmental studies courses – climate change, unsustainable urbanization and inadequate water management practices. Now that the theory has affected our practical lives, its high time we present a united front. Each entity as an important role to play – Government, Industries and Citizens.

The government is at the helm by creating policies like Jal Shakti Abhiyaan that promote water conservation and public-private partnerships for efficient use. Additionally, river rejuvenation projects like Namami Gange aim to restore polluted waterways.

Industries are major water consumers. Implementing water-efficient technologies, treating wastewater, and adopting rainwater harvesting in factories are essential. Citizens play a crucial role in adopting water-saving practices at home. Rainwater harvesting, using low-flow fixtures, and fixing leaks are small steps with big impacts. Raising awareness through community initiatives can further encourage conservation.

Charity begins at home, and water conservation is the biggest charity for mankind.



Jitender Thirwani,
COO SmarterHomes

As industry leaders, we stand at the forefront of innovation and progress. Our responsibility extends beyond mere profitability; it encompasses the preservation of our planet's most precious resource: water. In our pursuit of excellence, let us champion best practices in water management, weaving sustainability into the fabric of our operations. Through efficient technologies, responsible consumption, and holistic conservation strategies, including meticulous water measurement and monitoring, we can not only mitigate risks but also cultivate a legacy of environmental stewardship. Remember, in the vast stream of progress, it's our collective commitment to sustainable practices that ensures a flourishing future for generations to come.



Dr. F.L. Hooimeijer (Fransje),

In a world that diversifies and recognised diversity as a quality also water needs to be recognised in its capability to manifest itself in diverse conditions. It is all connected, water can connect us.



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Where the Water Community Comes Together



PRESERVING OUR LIFELINE: THE IMPORTANCE OF WORLD WATER DAY

Dinesh Chandra Rai, Vice- Chancellor, BRA Bihar University

On March 22nd every year, World Water Day is observed as a way to raise awareness about the importance of water and advocate for the sustainable management of water resources. This year, the theme for World Water Day is "Valuing Water" and it highlights the essential role that water plays in our daily lives and the need to protect and conserve this valuable resource. At the same time the water crisis surfaced in Bangalore serves as a sobering reminder of the importance of sustainable water management practices.

Water is essential for all living beings and is crucial for human health, agriculture, industry, and the environment. However, many people around the world still do not have access to clean and safe drinking water. According to the United Nations, 2.2 billion people worldwide do not have access to safely managed drinking water services, and 4.2 billion people lack safely managed sanitation services.

The COVID-19 pandemic has also highlighted the importance of water in the fight against infectious diseases. Proper handwashing with clean water and soap is one of the most effective ways to prevent the spread of the virus. However, millions of people around the world still do not have access to clean water and sanitation facilities, making it difficult for them to practice good hygiene and protect themselves from diseases.

Climate change is also exacerbating water scarcity issues around the world, with more frequent droughts, floods, and extreme weather events affecting water availability and quality. It is crucial for countries to work together to address these challenges and

ensure that water resources are managed sustainably for the benefit of current and future generations.

As individuals, we can also do our part to conserve water by reducing our water consumption, fixing leaks, and using water-saving technologies in our homes. By valuing water and understanding its importance, we can work towards a more sustainable and water-secure future for all.

The water conditions in Bihar are quite poor, with many areas facing issues such as contamination, scarcity, and lack of access to clean drinking water. The groundwater in the state is often contaminated with high levels of arsenic and fluoride, leading to serious health problems for those who consume it. In addition, the state faces seasonal waterlogging during the monsoon season, causing further issues with water quality and access.

The government and various organizations have been working to improve water conditions in Bihar through initiatives such as water purification systems, borewell construction, and awareness campaigns. However, more efforts are needed to ensure that all residents have access to clean and safe drinking water.

The Jal Jeevan Hariyali Scheme is a flagship programme launched by the Government of Bihar to increase green cover along the banks of the rivers in the state. The objective of the scheme is to promote afforestation, tree plantation, and the conservation of natural resources to tackle issues like climate change, soil erosion, and water scarcity.

Key features of the scheme include:

1. Target areas: The scheme focuses on the banks of rivers, canals, and other water bodies in the state to improve water conservation and increase biodiversity.
 2. Plantation drive: Under the scheme, extensive tree plantation drives are carried out along the riverbanks to increase green cover and reduce soil erosion.
 3. Soil conservation: The scheme also includes measures to prevent soil erosion and improve soil quality through the use of natural resources like organic fertilizers.
 4. Water conservation: Water conservation measures such as building check dams, farm ponds, and rainwater harvesting structures are implemented to improve water availability in the region.
 5. Community involvement: The scheme encourages community participation in the implementation and monitoring of the project to ensure sustainability and long-term success.
- Overall, the Jal Jeevan Hariyali Scheme in Bihar aims to enhance the ecological balance, improve the environment, and create a sustainable ecosystem for future generations.

BRA Bihar University is also keen to contribute its part in addressing water issue. Apart from regular awareness sessions in collaboration with NSS and other bodies various measures are being taken.

1. Establishing research programs to develop innovative solutions for water scarcity, such as new

water treatment technologies and efficient water management strategies.

2. Implementing water conservation programs on campus, such as installing water-saving fixtures and promoting water conservation practices among students, faculty, and staff.

3. Partnering with local water utilities and municipalities to develop sustainable water management plans for the campus and surrounding community.

4. Offering educational programs and workshops on water conservation, sustainability, and the importance of water stewardship.

5. Investing in infrastructure improvements to reduce water waste and improve water efficiency, such as upgrading irrigation systems and implementing rainwater harvesting systems.

6. Supporting student-led initiatives and projects focused on addressing the water crisis, such as water quality testing programs and community outreach campaigns.

7. Collaborating with industry partners and other stakeholders to identify and implement best practices for water conservation and management.

8. Engaging in advocacy efforts to raise awareness about the global water crisis and the need for

sustainable water management practices.

9. Incorporating water sustainability into the university's curriculum and research agenda, to ensure that future generations of students are equipped to address the water crisis.

10. Establishing partnerships with other universities, research institutions, and organizations to share knowledge and resources for addressing the water crisis on a larger scale.

Overall, the Bangalore water crisis underscores the urgent need for proactive measures to address water scarcity and ensure water security for current and future generations. By learning from past mistakes and taking decisive action, we can work towards building a more resilient and sustainable water supply system.

This World Water Day, let us reflect on the critical role that water plays in our lives and commit to taking action to protect and conserve this precious resource. Together, we can ensure that everyone has access to clean and safe drinking water. Together, we can make a difference and help create a more sustainable world for all. Let's pledge to take action and make a positive impact on world water day and every day. Let's clean and safe water and build a more sustainable future for our planet.



About the Author



Prof. Dinesh Chandra Rai
Vice- Chancellor,
BRA Bihar University

He is the Vice- Chancellor of BRA Bihar University Muzaffarpur, Bihar and the Former Founding Head of the Department of Dairy Science and Food Technology, Institute of Agricultural Science at Banaras Hindu University, Varanasi, UP



The concept of virtual water refers to the hidden water embedded in the production and transportation of goods. For example, it takes about 2,000 liters of water to produce one kilogram of rice.

EverythingAboutWater

Annual

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HOW TO EVALUATE AND SELECT AN OZONE GENERATOR

PART-3

CONTINUING FROM LAST MONTH

It is a known fact that metals can accumulate dust because of electrostatic conditions. In air sanitization where plate type generators are mostly used, even with the best of filters, if one examines the air conditioning duct after months of operation, heavy dust build-up could be observed. This dust build-up attracts moisture on the corona plate. The dust also accumulates. This will result in failure of the cell if they are not cleaned regularly. The maintenance of the plate is very cumbersome and risky.

The plate types of generators allow air to pass between two or more parallel plates with alternating negative and positive charges. The corona between the plates will generate the Ozone. Where the application uses air as feed gas the pre treatment of the feed gas becomes very vital. Air quality must be at least Minus 60 degrees Dew Point to prevent formation of Nitrous oxides due to ozone reactions with moisture and Nitrogen present in the air. This may not be a problem in very small-scale applications but becomes a very big factor large applications.

However this problem of Nitrous acid formation can be avoided in plate type systems by using oxygen as feed gas. So for applications where air feed is sufficient, plate type technologies are found to be expensive.

There have been some improvements in plate type Ozone generators recently that has resulted in improved performance, but the technology is still largely considered as inferior to tube type generation for large commercial applications.

THE TUBE TYPE CORONA DISCHARGE OZONE GENERATION

This is by far the most common and the most widely used method. This is the latest and the most reliable technology. The technology consists of a di-electric that could be glass /SS combination or Ceramic. Air /Oxygen as feed gas is passed through the minute gap between the dielectric and a high voltage applied. The ionization of oxygen takes place within this gap and ozone is formed.

The quantity of ozone formed with is Technology depends on the Technology used to generate high voltage. Ozone can be formed at concentrations between 6-16 % using this Technology. Most of the large ozone companies around the



A tube type Ozone generator shell

world use this technology and have continuing research to improve and make the technology more economical and better efficiency. For very large applications this technology provides the most economical way to produce ozone. Ozone produced by this method can be anywhere up to 40% more economical when compared to the plate type Corona ozone Systems.

ELECTROLYTIC OZONE GENERATION

Electrolytic ozone generators offer a consistent, cost-effective solution for continuous or discrete disinfection of cold storage and distribution systems for ultrapure water (systemic protection). The key advantage of this mechanism is that it is a straightforward and simple process of water electrolysis, that is the ozone is generated directly from the water. The design that allows reliable and fully automatic operations along with low maintenance. The applications it serves span across – PW (Purified water), HPW (High purified water), and WFI (Water for injection). Only a small amount of Ozone is generated using this technology, and the efficiency depends largely on the conductivity of the water and thus its application is limited to pure water only.



continued Next month

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ETERNAL ENIGMA: LAKE BAIKAL'S MYSTICAL DEPTHS



Nestled in the heart of Siberia, Lake Baikal stands as a symbol of awe-inspiring natural beauty and enigmatic mysteries waiting to be unraveled. Beyond its crystalline waters lies a world of wonder, where secrets whisper in the wind and legends come to life.

As the sun sets behind the Siberian horizon, Lake Baikal becomes a theater for the inexplicable phenomena that have intrigued both locals and scientists for generations. Among its vast expanse, tales of spectral apparitions and unexplained phenomena weave a tapestry of intrigue and fascination. At the heart of Lake Baikal's mysteries lies its unparalleled depth, plunging to unfathomable depths that have yet to be fully explored. Within these murky waters, whispers of ancient civilizations and undiscovered creatures echo, tantalizing the imagination and beckoning explorers to delve into the unknown.

For decades, scientists have endeavored to uncover the secrets hidden beneath Lake Baikal's surface, from its unique ecosystem to its geological marvels. Yet, with each discovery comes new questions, fueling the insatiable curiosity surrounding this majestic body of water.

One of the most captivating mysteries of Lake Baikal is the phenomenon known as "Baikal's own Loch Ness Monster" – tales of a legendary creature lurking in the depths, evading capture and defying explanation. While skeptics dismiss these accounts as mere folklore, the allure of the unknown continues to draw adventurers and researchers to the shores of Lake Baikal in search of the truth. As night falls over Lake Baikal, the shimmering surface becomes a canvas for celestial displays that rival the brilliance of the stars above. From ghostly lights dancing on the water's edge to unexplained phenomena illuminating

the night sky, the mysteries of Lake Baikal unfold in a mesmerizing spectacle that defies rational explanation.

Whether you're a water scientist probing the depths of knowledge or a wanderer seeking the thrill of discovery, Lake Baikal offers an invitation to explore the unknown and embrace the mysteries that lie within. As the pages of history turn, the enigma of Lake Baikal continues to captivate the imagination, leaving an indelible mark on those who dare to venture into its mystical depths.



T E N D E R

Installation, Commissioning And Testing Of Effluent Treatment Plant 50 Kld & Associated Sewer Line Works At Fatehpur Station Under Sr. Asstt. Divisional Engineer/ North Central Railway/Fatehpur.

Category	Miscellaneous tenders		
Location	Uttar Pradesh, Prayagraj		
Bid Open Date	18 Apr 2024	Tender Value	1.58 Cr
Doc Collection Date	18 Apr 2024	FTID	24031421420

Providing Consultancy For Effluent Treatment Plant At 4 Th Ctu Depot Cum Workshop At Raipur Kalan, U.T. Chandigarh. (Ch To 5055 C.O. (P) Expansion And Development Of Workshop

Category	Construction, Infrastructure, Civil Work tenders		
Location	Chandigarh , Chandigarh		
Bid Open Date	20 Mar 2024	Tender Value	1.18 Lac
Doc Collection Date	20 Mar 2024	FTID	240214443740

Supply, installation & commissioning of distilled water plant

Category	Engineering, Plants and Machinery tenders		
Location	Tamil Nadu , Arakkonam		
Bid Open Date	20 May 2024	Tender Value	86.72 Lac
Doc Collection Date	20 May 2024	FTID	240214459940

water proof treatment and repair works to the roof of department of management studies main building and annex building

Category	Construction, Infrastructure, Civil Work tenders		
Location	Karnataka , Bangalore		
Bid Open Date	21 Apr 2024	Tender Value	14.20 Lac
Doc Collection Date	19 Apr 2024	FTID	240314425820

Providing ugss to mannaragudi municipality in thiruvavur district -design, engineering, build, operate and commissioning of 10.05 mld capacity sewage treatment plant

Category	Miscellaneous tenders		
Location	Tamil Nadu , Thanjavur		
Bid Open Date	17 Apr 2024	Tender Value	20.10 Crores
Doc Collection Date	16 Apr 2024	FTID	240413479660

Running And Maintenance Of Swtp At Jatanbari/Sh 1.20 Mgd Surface Water Treatment Plant At Jatanbari Nutan Bazar Repairing And Rewinding Of Vt Pump-Motor Under The Jurisdiction Of Dws Sub-Division, Kar

Category	Miscellaneous tenders		
Location	Tripura , Jatanbari		
Bid Open Date	10 April 2024	Tender Value	9.24 Lac
Doc Collection Date	10 April 2024	FTID	240314440160

T E N D E R

Renovation And Painting Of Old Water Treatment Plant 6.80 MI At Lambaline Section Under Phed Apwd, Prothrapur. Sw Renovation Of Internal Electrical Installation.

Category	Electrical and Electrical Equipment tenders		
Location	Andaman & Nicobar , Port Blair		
Bid Open Date	4 Mar 2024	Tender Value	3.68 Lac
Doc Collection Date	14 Feb 2024	FTID	240214481850
Interception and diversion for tapping nallah and setup of sewage treatment plant for used water management of harpalpur town			
Category	Miscellaneous tenders		
Location	Madhya Pradesh , Nowgong		
Bid Open Date	22 Apr 2024	Tender Value	2.67 Crore
Doc Collection Date	20 Apr 2024	FTID	240413485770



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LET'S CONNECT DIGITALLY VIA WEBINAR

EVENT CALENDAR



March 2024

Roorkee Water Conclave

03 - 06 Mar 2024
Indian Institute of Technology Roorkee,
Roorkee, India
www.iitr.ac.in/rwc

New England Water Well Expo

07 - 09 Mar 2024
Best Western Royal Plaza Hotel & Trade
center, Marlborough, USA
www.newwassociation.org

WaterReuse Research Conference

10 - 13 Mar 2024
Hilton Denver City Center, Denver, USA
www.watereuse.org/event/2024-watereuse-symposium

Water Policy Conference

18 - 20 Mar 2024
Washington Hilton, Washington DC, USA
www.10times.com/e1zk-rr53-h02x

Rural Water Conference

18 - 21 Mar 2024
Penn Stater Conference Center Hotel, State
College, USA
www.prwa.com/annual-conference

Aqua Netherlands

19 - 21 Mar 2024
Evenementenhal Gorinchem, Gorinchem,
Netherlands
www.aquanederland.nl/en/

KRWA Conference & Exhibition

26 - 28 Mar 2024
Century II Performing Arts & Convention
Center, Wichita, USA
www.krwa.net/TRAINING/Conference

April 2024

Florida Water Resource Conference

02 - 05 Apr 2024
Gaylord Palms Resort & Convention Center,
Kissimmee, USA
<https://www.fwrc.org/>

Texas Water

09 - 12 Apr 2024
Fort Worth Convention Center, Fort Worth,
USA
www.txwater.org

AZ Water Conference & Exhibition

10 - 12 Apr 2024

Phoenix Convention Center, Phoenix, USA
www.azwater.org/group/annualconference

Water Expo & Forum

16 - 18 Apr 2024
Abu Dhabi National Exhibition Centre -
ADNEC, Abu Dhabi, UAE
www.worldfutureenergysummit.com/en-gb/water.html#/

IE Expo China

18 - 20 Apr 2024
Shanghai New International Expo Centre
(SNIEC), Shanghai, China
www.ie-expo.com

Asia Water

23 - 25 Apr 2024
Kuala Lumpur Convention Centre, Kuala
Lumpur, Malaysia
<https://www.asiawater.org/>

SDARWS Rural Water Expo

24 - 25 Apr 2024
Best Western Ramkota Hotel, Rapid City, USA
<https://www.sdarws.com/>

International Green Energy Expo

24 - 26 Apr 2024
EXCO, Daegu, South Korea
<https://www.greenenergyexpo.co.kr/eng/>

Water Expo Bangladesh

25 - 27 Apr 2024
International Convention City Bashundhara
(ICCB), Dhaka, Bangladesh
<https://www.limraexpo.com/water/index.php>

Green Vision Summit & Expo

30 Apr - 02 May 2024
MFCC - Malta Fairs & Conventions Centre,
Malta
<https://10times.com/e15k-f3dd-4fx4>

May 2024

Maryland Rural Water Association Conference

06 - 09 May 2024
Roland E. Powell Convention Center, Ocean,
USA
<https://10times.com/mrwa-ocean>

Power of Water Canada Technical Conference & Trade Show

08 - 10 May 2024
Niagara-on-the-Lake, Canada
<https://www.owa.ca/conference/>

IFAT Munich

13 - 17 May 2024
Exhibition Munich, Munich, Germany
<https://ifat.de/en/trade-fair/>

Renewable Energy Show

16 - 18 May 2024
International Convention City Bashundhara
(ICCB), Dhaka, Bangladesh
<https://10times.com/renewable-energy-show>

Water Management Show

16 - 18 May 2024
International Convention City Bashundhara
(ICCB), Dhaka, Bangladesh
<https://10times.com/water-management-show>

West Africa Water Expo

21 - 23 May 2024
Landmark Centre, Lagos, Nigeria
<https://elanexpo.net/waweexpo/>

June 2024

SIEE Pollutec

02 - 05 Jun 2024
Add Safex - Foire d'Alger, Mohammadia,
Algeria
<https://siee-pollutec.com>

International Exhibition on Environmental Technology & Green Energy

03 - 05 Jun 2024
COEX Convention Center, Seoul, South Korea
<https://www.envex.or.kr/eng/main/index.asp>

Watertech Africa

05 - 07 Jun 2024
Kenyatta International Convention Centre,
Nairobi, Kenya
<https://www.expogr.com/watertech/>

GreenTech Amsterdam

11 - 13 Jun 2024
RAI Amsterdam, Amsterdam, Netherlands
<https://www.greentech.nl/>

China (Guangzhou) International High-end Drinking Water Industry Expo

14 - 16 Jun 2024
China Import and Export Fair (Canton Fair
Complex), Guangzhou, China
<http://www.ihe-china.com/cn/Invitation/40.IWE/>

Singapore International Water Week

16 - 20 Jun 2024
Singapore

EVENT CALENDAR



<https://www.siww.com.sg/>

Egypt Infrastructure & Water Expo

25 - 27 Jun 2024

Egypt International Exhibition Center, Cairo, Egypt

<https://www.egyptinfrastructureexpo.com/>

July 2024

European Wastewater Management Conference & Exhibition

02-03 July 2024

The Point at Emirates Old Trafford, Manchester, UK/Online
ewwmconference.com/

Thai Water Expo 2024

03 - 05 Jul 2024

Queen Sirikit National Convention Center, Bangkok, Thailand
www.thai-water.com

12th Annual International Forum on Water

15-18 July 2024

Athens, Greece
www.atiner.gr/water

Water and Aqueous Solutions Gordon Research Conference

20 - 21 Jul 2024

Holderness School, Holderness, USA
<https://www.grc.org/water-and-aqueous-solutions-conference/2024/>

August 2024

The Water Expo 2024

20 - 22 Aug 2024

Miami Airport Convention Center, Miami, USA
www.thewaterexpo.com/

AgriTech India 2024

22 - 24 Aug 2024

BIEC Bengaluru International Exhibition Centre, Bengaluru, India
agritechindia.com

September 2024

The Water Expo 2024

20 - 22 Aug 2024

Miami Airport Convention Center, Miami, USA
www.thewaterexpo.com/

AgriTech India 2024

22 - 24 Aug 2024

BIEC Bengaluru International Exhibition Centre, Bengaluru, India
agritechindia.com

EcwaTech 2024

10 - 12 Sep 2024

Crocus Expo, Moscow, Russia
en.ecwatech.ru

CamWater 2024

11 - 13 Sep 2024

Diamond Island Convention and Exhibition Center, Phnom Penh, Cambodia
www.camwaterexpo.com

Taiwan International Water Week 2024

11 - 13 Sep 2024

Taipei World Trade Center, Taipei, Taiwan
www.taiwanintlwaterweek.com

Water & Wastewater Management Expo 2024

11 - 12 Sep 2024

The Emergency Services Show, Birmingham, UK
www.ess-expo.co.uk

Indo Water Expo & Forum 2024

18 - 20 September 2024

Grand City Mall & Convex Surabaya, Surabaya, Indonesia
indowater.com/

Water and Wastewater Fair 2024

24 - 26 Sep 2024

Elmia, Jönköping, Sweden
www.elmia.se/en/va-massan/

October 2024

Aqua Ukraine

15-17 Oct 2024

Ukraine, Kyiv | International Exhibition Centre
www.iec-expo.com.ua/en/aquaen-2024

WWEM - Water, Wastewater and Environmental Monitoring Conference

09-10 Oct 2024

NEC, Birmingham, UK
www.ilmexhibitions.com/wwem/

WETEX 2024

01-03 Oct 2024

Dubai World Trade Centre (DWTC)
www.wetex.ae

IFAT India

16-18 Oct 2024

Bombay Exhibition Centre, NESCO, Mumbai
www.ifat-india.com

Cairo Water Week 2024

13 - 17 Oct 2024

The Nile Ritz-Carlton Cairo, Cairo, Egypt
www.cairowaterweek.eg

November 2024

Produced Water Management, Treatment & Reinjection 2024

28 Oct - 01 Nov 2024

Dubai, UAE
10times.com/e1x5-z5p1-f9sp

Deepwater Operations Conference & Exhibition 2024

05 - 07 Nov 2024

Moody Gardens Hotel Spa and Convention Center, Galveston, USA
www.offshore-event.com/2024home/home

Vietwater 2024

06 - 08 Nov 2024

Saigon Exhibition and Convention Center, Ho Chi Minh, Vietnam
vietwater.com

SADC Groundwater Conference 2024

13 - 15 Nov 2024

Maseru, Lesotho
www.sadc.int

Annual WMAO Conference 2024

19 - 20 Nov 2024

Crowne Plaza Columbus North - Worthington, Columbus, USA
wmao.org

Clean India Show 2024

21 - 23 Nov 2024

Bombay Exhibition Centre (BEC), Mumbai, India
ctwindia.com/clean-india-show/

Floodex 2024

27 - 28 Nov 2024

ExCeL London, London, UK
floodex.co.uk

National Drainage Show 2024

27 - 28 Nov 2024

ExCeL London, London, UK
drainageshow.com

BAYWATCH



Date: 23 - 25 April 2024

Venue: Kuala Lumpur Convention Centre, Malaysia

Website: www.asiawater.org

Get ready for ASIAWATER 2024! It's back in the heart of vibrant Kuala Lumpur, Malaysia, at the Kuala Lumpur Convention Centre from April 23 to 25, 2024. This time, the spotlight is on "Water and Climate Change: Innovation for Resilience".

In its 13th edition, ASIAWATER will host over 20,000 top-notch trade attendees, including key players and enthusiasts from the water and wastewater industry across Asia and beyond. It's where industry leaders gather to explore cutting-edge solutions, technology, and products. With over 1,000 brands and companies under one roof, ASIAWATER 2024 promises to be the ultimate platform for driving transformation in the water and wastewater service industry. Expect insightful discussions led by industry experts at our flagship Conferences & Seminars, charting the course for effective solutions to current challenges.



Date: 24-26 April 2024

Venue: São Paulo Expo, Brazil

Website: ifatbrasil.com.br

Since its inception in 1966 in Munich, Germany, IFAT has evolved into the premier global platform for environmental technologies. With over 8 events worldwide and a diverse portfolio of 11 leading initiatives, IFAT attracts visitors from 155 countries and exhibitors representing 59 nationalities. In 2024, IFAT further expanded its reach by launching IFAT Brasil, aiming to leverage the environmental technology market in Latin America and foster sustainability initiatives across the region.

IFAT's expansion into Latin America underscores its commitment to driving environmental innovation on a global scale. By establishing a presence in Brazil, IFAT seeks to catalyze positive change and promote sustainable practices in a burgeoning market. With IFAT Brasil, the world's largest environmental technology network continues to make strides towards a more sustainable future, uniting stakeholders from around the world in the pursuit of environmental excellence.

BAYWATCH



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19th EVERYTHING ABOUT WATER EXPO SOUTH ASIA'S LARGEST WATER EXHIBITION AND CONFERENCE 2024

Where the Water Community Comes Together

The 19th EverythingAboutWater Expo 2024 stands as a remarkable and all-encompassing annual event in India, spotlighting cutting-edge technologies and solutions within the water sector. This event serves as an exceptional gateway for stakeholders worldwide to immerse themselves in the expansive and dynamic realm of the Indian Water management Industry, facilitating the exchange of business opportunities, networking, and the exploration of innovative Water solutions.

Date: 10 - 12 September 2024

Venue: IICC, New Delhi

Website: [//www.eawaterexpo.com](http://www.eawaterexpo.com)

India is currently on a trajectory towards severe water stress, with projections indicating a critical situation by 2025. The rapid pace of Industrialization and the burgeoning population have significantly widened the gap between water supply and demand, a matter of deep concern for both the Central and State Governments. Within the framework of the 19th Everything About Water Expo 2024, unparalleled business prospects will emerge for both domestic and international players in the Water Industry. Attendees will have the opportunity to gain valuable insights, discover future trends, and navigate the evolving landscape of the Indian Water market.

Water Expo Bangladesh

Water Expo Bangladesh offers a unique platform for establishing new distribution channels not only in Bangladesh but also in neighboring countries. It's the ultimate meeting ground for engaging with public and private sector investors, policymakers, and various stakeholders deeply invested in the water sector.

This event brings together a diverse array of participants from across the globe, representing countries and regions such as Belgium, China, France, Finland, Japan, Korea, Singapore, Hungary, the EU, and many more. The sheer magnitude of advanced innovations, cutting-edge technologies, high-quality products, top-notch equipment, and comprehensive services from all industrial segments will be showcased under one roof. It's an unparalleled opportunity to explore the latest trends and developments in the water industry while networking with industry leaders and experts. Join us at Water Expo Bangladesh and dive into a world of possibilities for growth and collaboration in the water sector.



Date: 25-27 April 2024

Venue: ICCB, Kuril, Dhaka, Bangladesh

Website: www.waterexpobd.com

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118	International Port & Marine Development Conference	21	+971 52 969 7209	partnerships@gmevent.ae	www.portdevelopmentconference.com
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FAST TRACK YOUR GROWTH

CONFERENCE

The conference program will include internationally renowned keynote speakers encompassing experiences, challenges and solutions from around the world. The conference is structured into 4 sessions and 2 days training programs, spread over two days, focusing on specific theme, besides the inaugural and valedictory session.

- **GLOBAL FORUM: BEST PRACTICES**
- **INDUSTRIAL WATER FORUM**
- **MUNICIPAL FORUM**
- **THE INDUSTRY DISCUSSION FORUMS**

TRAINING

EA Water Master Class on Water Treatment & Recycling

EverythingAboutWater training program equips participants with the special expertise, technical knowledge and skills they need to tackle complex Waste Water Treatment & Recycling challenges, these trainings has been attended by over 25,000 + delegates.

- **INTRODUCTION OF WASTEWATER TREATMENT**
- **WATER RECYCLING**
- **CASE STUDIES: MULTIPLE FROM DIFFERENT INDUSTRIES**
- **PRACTICE EXAMPLE: SETTING UP 1000 M³/DAY WATER RECYCLING SYSTEM (WRS)**

and many more...

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