Pey Jal Survekshan

Ministry of Housing and Urban Affairs
Government of India

अमृत 2.0
Atal Mission for Rejuvenation and Urban Transformation

INNOVATIONS
Leading Practices

INDIA - AMRUT 2.0 - STARTUP CHALLENGE

Knowledge Partner

asci
Leadership through Learning

Message from the Secretary, MoHUA

मनोज जोशी
सचिव
Manoj Joshi
Secretary

भारत सरकार
आवासन और शहरी कार्य मंत्रालय
निर्माण भवन, नई दिल्ली–110011
Government of India
Ministry of Housing and Urban Affairs
Nirman Bhawan, New Delhi-110011

MESSAGE

The India Water Pitch-Pilot-Scale Startup Challenge, initiated by the Ministry of Housing and Urban Affairs (MoHUA) under the aegis of Atal Mission for Rejuvenation and Urban Transformation 2.0 (AMRUT 2.0), marks a significant stride towards addressing water and sanitation challenges in urban areas. By harnessing the potential of youth, startups, and technology, this initiative aims to accelerate the adoption of innovative solutions to ensure safe water supply and sanitation practices across India.

Through a meticulous selection process, 105startup innovations have been chosen to pilot their solutions in 67 cities. These innovations offer practical and scalable technology and business solutions tailored to urban water and wastewater management challenges.

The significant progress in deployment of solutions in 36 cities by 74startups, selected in the first phase of the challenge, is encouraging for increasing use of technology in water sector. 31 innovations from the second phase of the challenge are currently undergoing deployment, further bolstering the initiative's impact.

To sustain and amplify this momentum, the Ministry continues to accept applications, providing each startup with a grant of upto₹20 lakhs in three instalments and mentoring support to facilitate the scaling up of their solutions. Partnerships between startups and urban local bodies have been fostered to enhance the visibility and adoption of these innovative solutions.

The compendium highlighting these promising innovations serves as a testament to the transformative power of collaborative efforts in addressing complex urban water challenges. It is anticipated that these ideas will inspire stakeholders from cities, development agencies, and research organizations to champion innovation-driven approaches for widespread implementation.

I want to acknowledge the continuous support of Administrative Staff College of India (ASCI) as the knowledge and technical partner for the challenge and putting together this compendium. Their expertise and guidance have played a crucial role in achieving the envisioned goal of addressing the challenges in the urban water sector.

Manoj Joshi

(Manoj Joshi)

New Delhi
February 29, 2024

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'India Water Pitch-Pilot-Scale Start-up Challenge' under AMRUT 2.0

AMRUT 2.0 was launched by the Hon'ble Prime Minister on 1st October 2021 to provide central assistance for universal coverage in water supply in all statutory towns, upscaling sewerage and septage management in 500 AMRUT cities, rejuvenation of water bodies (including urban wetland) and creation of green spaces. AMRUT 2.0 also aims to encourage innovative solutions under Technology Sub-Mission.

The Ministry of Housing and Urban Affairs (MoH&UA), Government of India (GoI) launched the AMRUT 2.0 India Water Pitch-Pilot-Scale Start-up Challenge on 12th March 2022. It aims to encourage start-ups to provide innovative, workable, and scalable technology and business solutions to address challenges in urban water management.

Administrative Staff College of India (ASCI) is the Technical Partner to facilitate this challenge. The compendium features 107 disruptive innovations shortlisted under the challenge, spread across eight key thematic areas: freshwater systems, hydro informatics, used water management, urban water management, agricultural water management, urban sewerage management, water governance and innovation in conventional taps and plumbing systems.

The challenge has successfully provided handholding support to 107 start-ups and has helped them pilot their solutions in 67 AMRUT cities. The applications for "India Water Pitch Pilot Scale Start-up Challenge" are open throughout the year and further cohorts of the challenge will be rolled out periodically. The document also provides contact details of start-ups for quick reference. Cities are encouraged to reach out to them to promote innovations in urban water management.

City-Startup Partnership Summit for Water Security

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Start-ups and their Innovations

1. Fresh Water System

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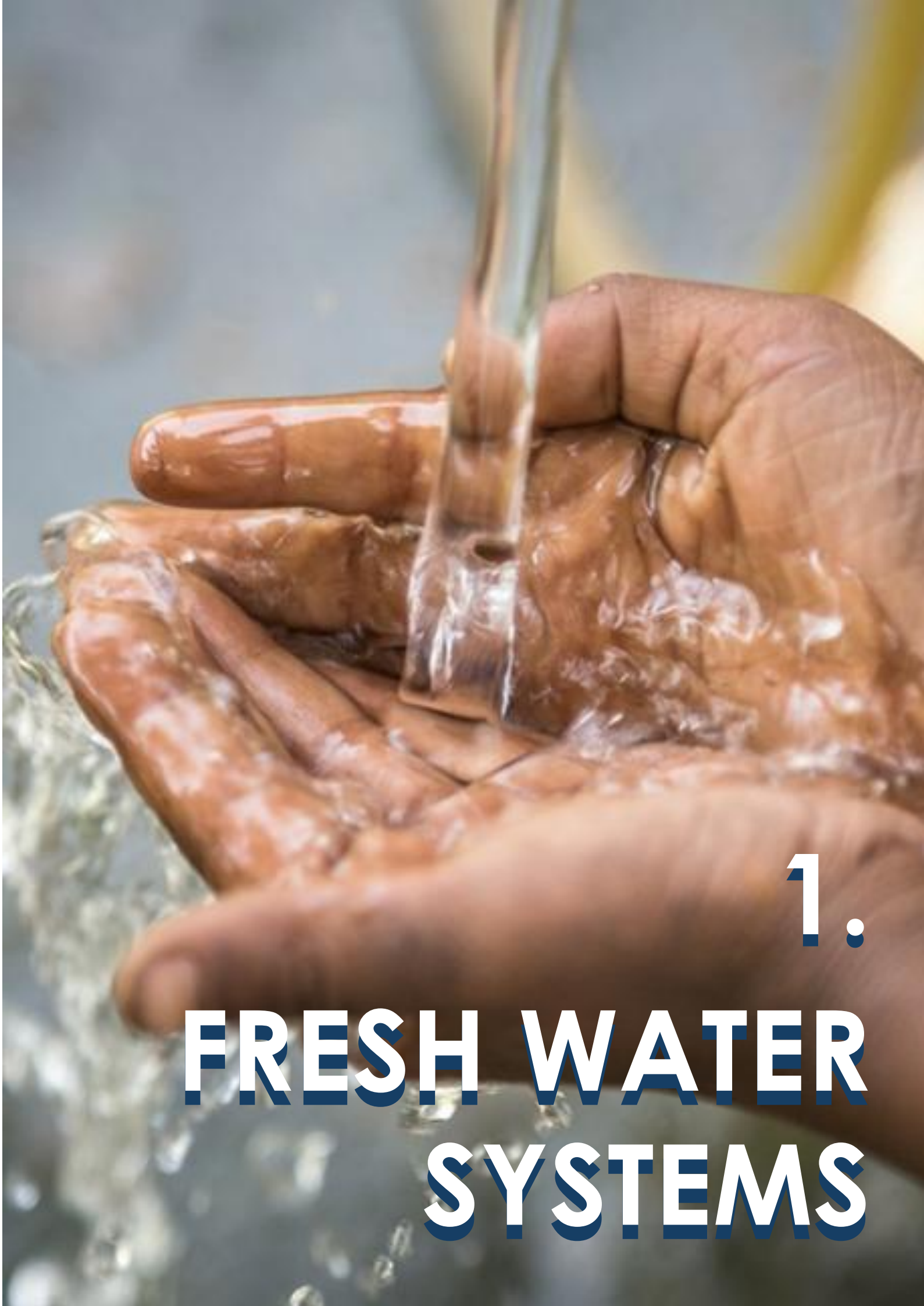


1. FRESH WATER SYSTEMS

START-UP 1

Adva Enviro Solutions

Founder

Kalpana Ramesh

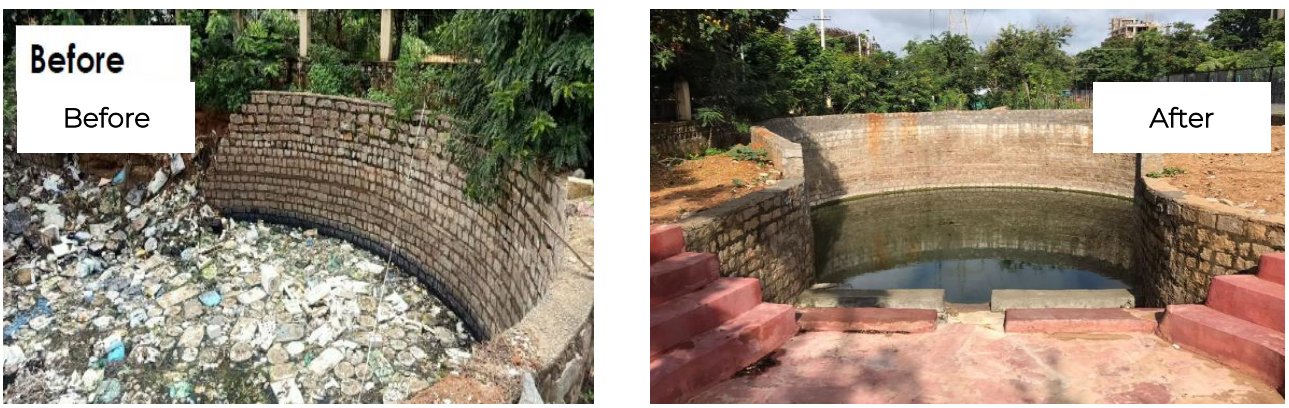
Challenge

India is the largest extractor of groundwater in the world. As one of the largest populated countries in the world we need to be concerned about improving ground water, conserving rainwater and creating source sustainability to cater to the generation ahead.

Solution

The organization uses a citywide approach for water resilience and source sustainability with rainwater harvesting. It offers end-to-end, site-specific solutions from design to execution for rainwater harvesting, wastewater reuse and integrated water management solutions.

Rainwater sump at household



Well restoration project, before (left) and after (right)

Implementation and Impact

They work with stakeholders, government and communities across the city to make sure the public and government takes the ownership of the respective traditional structures or a waterbody. They deploy different teams as per the service requirements. Some of their key projects in Hyderabad include the HDFC 2020 Pilot for increasing rainwater through common area recharge pits, Well restoration at Gachibowli, Zero Discharge Schools Grant (*saved 12 lakh liters from leakages*, shallow aquifer management in Hyderabad, well restoration in Gopinagar and across the districts with the support of government stakeholders.

Their unique feature involves activation of local communities to create action driven plans that help in recharging ground water, creating an enabling environment for the city's water management strategy and conservation of heritage.

Citizen engagement

Community gathering at a stepwell

START-UP 2

Arms 4 AI

Founder

Jagriti Dabas

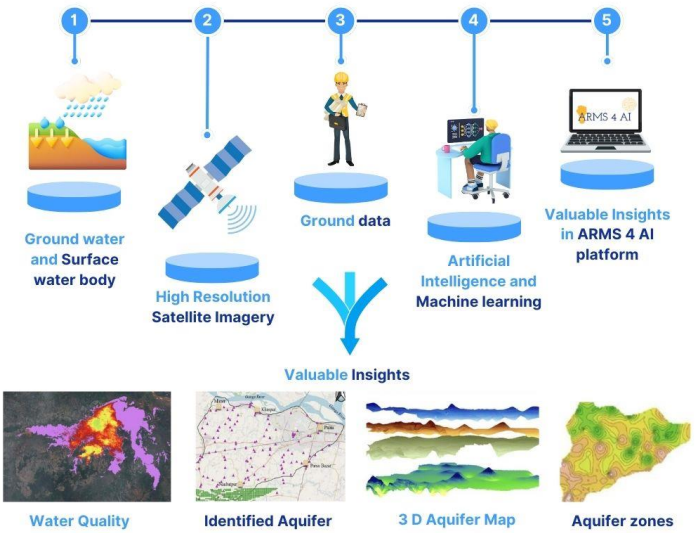
Challenge

Escalating global demand for clean water, exacerbated by strain on urban groundwater and surface water bodies, poses multifaceted challenges. Rapid urbanization intensifies pressure on limited water resources, fostering competition for access. Overexploitation leads to groundwater depletion, land subsidence, and saltwater intrusion. Contamination from industrial and agricultural sources heightens health risks. Addressing these challenges is vital for sustainable water management and ensuring safe urban water access.

Solution

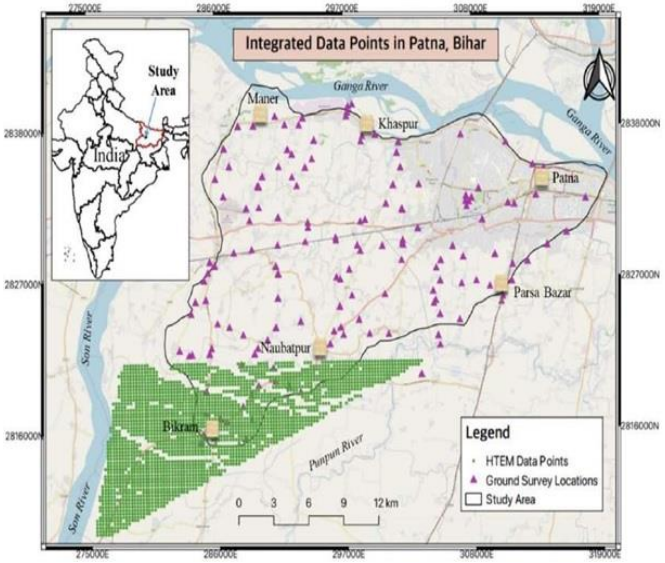
ARMS 4 AI introduces One-Click Geo AI, a cutting-edge web-based monitoring platform tailored to tackle the intricate challenge of monitoring and assessing both groundwater and surface water. Leveraging multiple high-resolution satellite data sources, seamlessly integrated with advanced AI and ML models, our technology delivers real-time monitoring and assessment capabilities, offering invaluable insights.

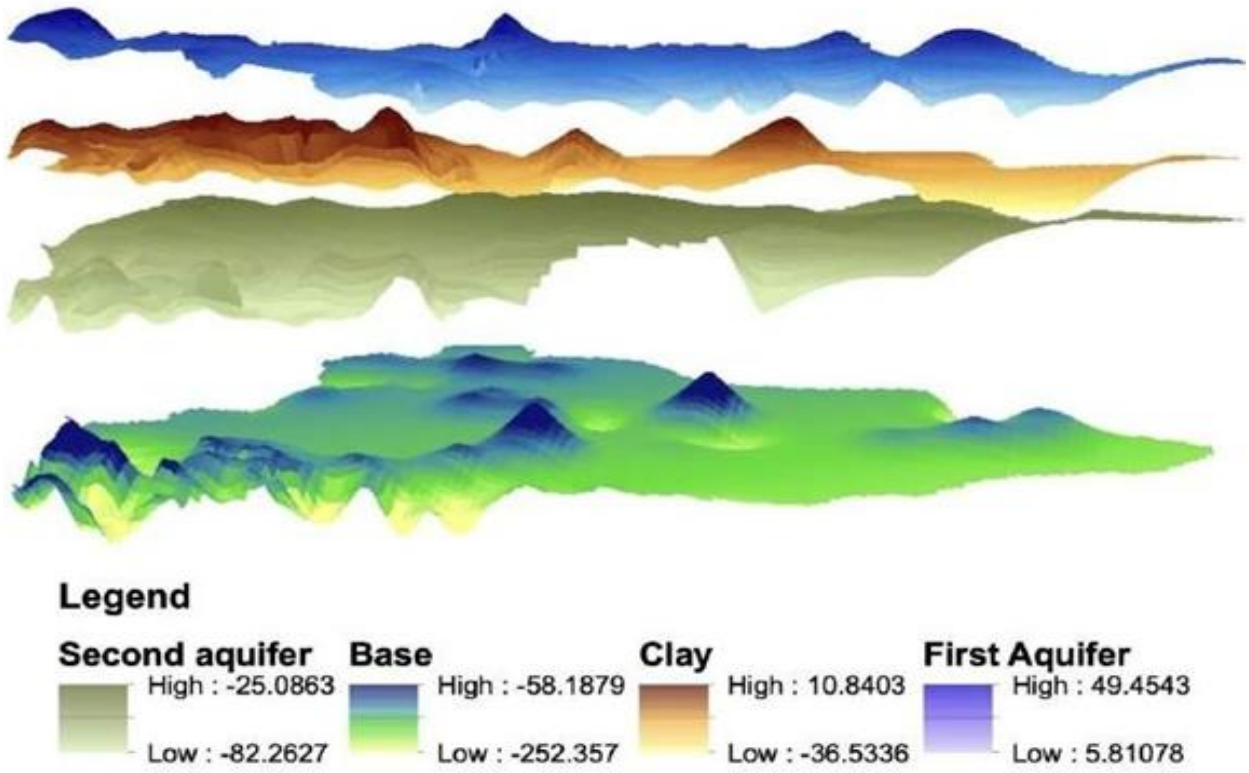
These insights empower city administrations to make informed, data-backed decisions, presented in visually intuitive map formats, facilitating targeted interventions in areas grappling with water-related issues. Remarkably, our technology operates without the need for physical hardware in the field, ensuring continuous insights year-round. With near-real-time accuracy of 90%, it significantly reduces reliance on field manpower by an impressive 70%, revolutionizing water management practices.



Implementation and Impact

The technology has been used to identify and map groundwater in Patna, Bihar. The project involved the use of Heliborne transient electromagnetic (HTEM) survey, integrating it with satellite data, and applying AI and ML. As a result, the technology successfully mapped the aquifers in high resolution in 3D, and the depth up to the second aquifer was accurately mapped. The project played a crucial role in identifying aquifers without manual interventions and field boring, which typically consumes a significant amount of time and cost.





3D map of below-ground aquifer layers

START-UP 3

Aryav Eco-Friendly Resource

Founder

Sanjay Kumar Garg

Challenge

Pollution of water bodies and climate change exacerbate water scarcity. Therefore, water treatment to improve the quality of drinking water is critical. RO is the most common technology, apart from desalination and others. But these technologies have limitations concerning the requirement of Input water and plumbing infrastructure, significant water wastage (around 70% water wastage) and poor water output quality. Moreover, many countries ban RO technology if the TDS exceeds 500.

Solution

Aryav AWG is an innovative and patented technology to generate pure, clean, alkaline and mineral-rich drinking water from air without any water wastage. The technology does not require input water. The innovators manufacture 100LPD to 10000LPD machines to cater the B2B market. The basic requirement for the machine is humidity and temperature. The capacity is defined at the standard 80% RH and 25 Degree C temperature. It is a membrane-less machine to get the desired result. No heavy metals are used, and there is no dependency on groundwater or monsoons. It is a plug-and-play system.

The water generated from the air is being tested at Delhi and Kolkata NABL Laboratory, which confirms that the water meets the drinking water specifications (IS- 10500:2012) and the protocol of IS:15815. The product also received CE Certification.

Aryav air to water generator

Implementation and Impact

Aryav Eco-friendly Resources supplied a 30LPD machine to IIM Kashipur for the FIED department staff. Upon the successful implementation and satisfactory performance of the product, they received a product validation certificate. Similarly, SIDBI purchased a 100LPD machine under their CSR programme and installed it at their Industrial Community Centre, Kolkata for their labour and staff. This machine is being widely used at one of the most polluted locations in Kolkata and users are happy to use this machine, and more unit orders are in the pipeline.

Products of Aryav - Air to Water generators

START-UP 4

Aumsat Technologies

Founder

Riddhish Soni

Challenge

India faces huge challenges in mitigating NRW losses, this not only increases the stress on freshwater systems but also results in additional burden on municipalities for ensuring equitable and adequate supply of water. In most cases utilities find it challenging to identify the leakages as the supply pipes are underground and span huge distances. Aumsat provides SaaS based approcah to detect leakages through satellite based thermal imagery. The company also provides solutions for precise detection of groundwater.

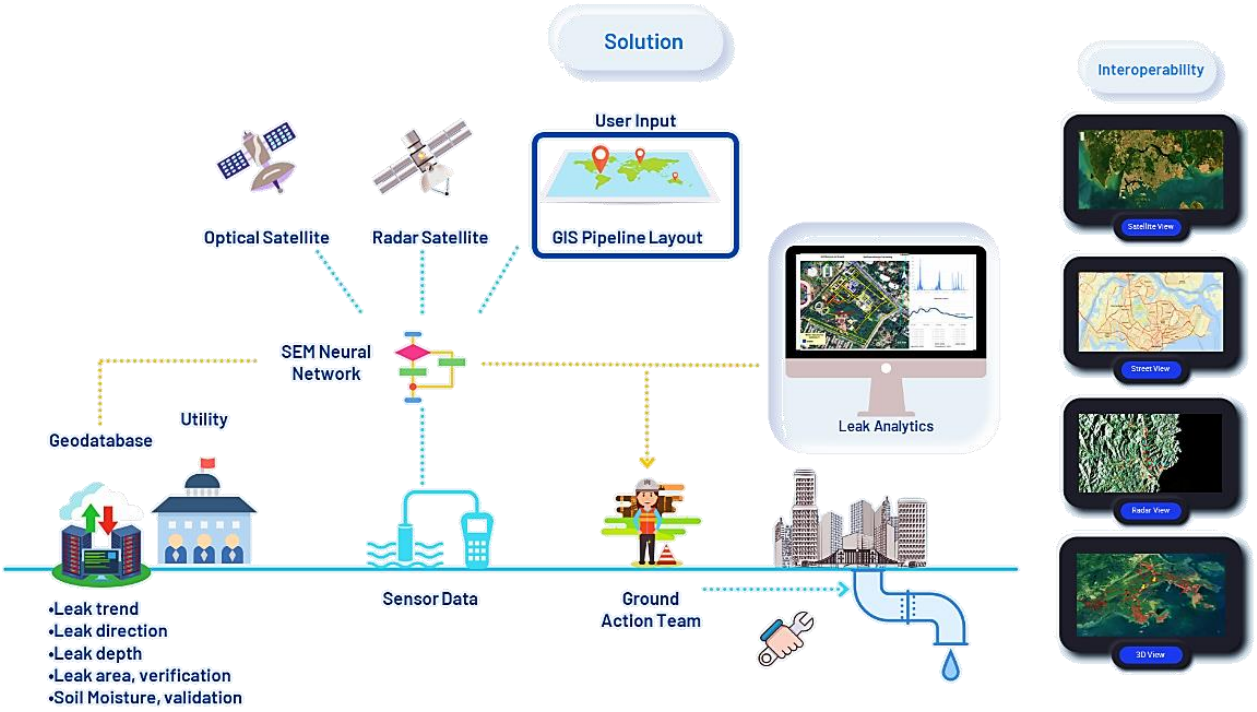
Solution

Empowered with deep knowledge of the pipeline networks, multi-phase flows, hydro-informatics, Satellite Earth Observation (EO), terrestrial and 'in-situ' devices, AUMSAT provides a multi sensor technology combined with Advanced Artificial Intelligence (AI) using UAV-mounted radar and ground penetrating radar to detect groundwater resources. Their aim is to use radar technology for groundwater exploration to improve the water resources due to more accurate groundwater forecast and precise assessment of crop damage due to disease, natural disasters such as drought and flood, etc.

Implementation and Impact

The Quota based distribution in a village near Bhubaneswar, Odisha, which impacted 38 households, is a notable project which ensured equitable distribution and achieved leakage detection in underground pipelines and eliminated potential non-revenue water losses.

The project on Sewer Line Monitoring system, Beawar, Rajasthan is ongoing and uses solar-powered sensors, to monitor 45 manholes by detecting the debris accumulation which obstructs the sewage flow and alerts the authorities in time, thereby preventing potential flood hazard in case of heavy rains.



Procedure followed by Aumsat for precision driven analytics

START-UP 5

Aumsat Technologies

Founder

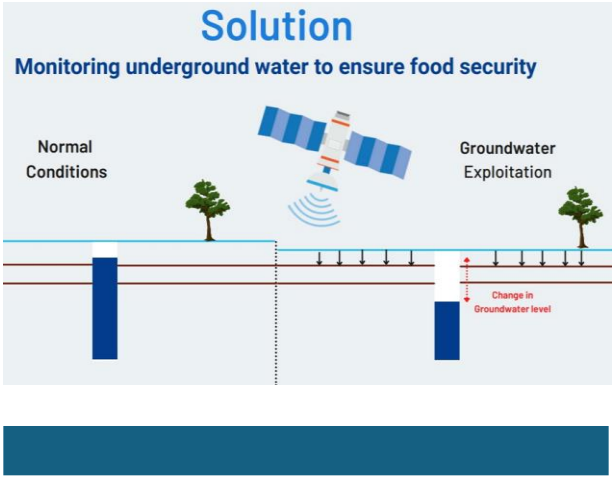
Riddhish Soni

Challenge

In the domain of water conservation, Public Health Engineering Departments (PHED) and municipalities encounter hurdles in pinpointing dependable groundwater reservoirs. Our solution harnesses radar satellites for exploration, prospecting, and recharge planning, boasting a remarkable 90% precision rate and slashing costs by 75%. This pioneering approach holds the potential to transform groundwater sustainability for urban areas and agriculture within India's Smart Cities framework. Integrated groundwater management is paramount for safeguarding pristine water sources, nurturing resilience, and upholding a sustainable water supply across diverse sectors.

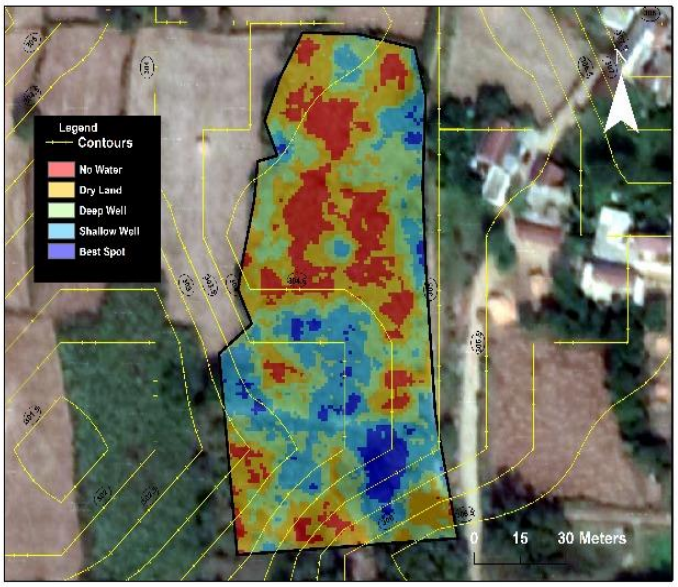
Solution

Leveraging advanced earth imaging techniques, we continuously monitor fluctuations in groundwater levels, offering insights into overexploitation of underground water resources. This data facilitates judicious and sustainable water management for utilities. Our diverse product range encompasses solutions for groundwater conservation, exploitation monitoring, exploration, and recharge structure site suitability assessment, providing a holistic approach to address the energy-water nexus.



Implementation and Impact

To date, Aumsat has proficiently executed ten projects within the domain of groundwater source targeting. Notably, our endeavors have encompassed the provision of solutions to esteemed entities such as PHED Udaipur, Nandurbar Nagarpalika, PUB Singapore, SETOM France, HMWSSB, and BWSSB. The hydrological data generated from these projects has played a pivotal role in facilitating evidence-based decision-making concerning water resource management. Aumsat's interventions have had a substantial impact, positively affecting the lives of 800,000 residents residing in the states of Maharashtra, Telangana, Karnataka, and Rajasthan. Additionally, we have meticulously scanned 44,000 hectares of land, identifying and creating 3,800 water points as part of our comprehensive efforts



Advanced earth Imaginary techniques

START-UP 6

Bhungru

Founder

Raja Bagchi

Challenge

Unregulated use of bore wells has resulted in groundwater depletion in many parts of the country, resulting in drying springs and aquifers. As a result, an increasing number of aquifers have reached unsustainable levels of exploitation. Overexploitation of the groundwater affects the sustainability of agriculture, long-term food security, livelihoods, and economic growth. Over a quarter of the country's harvest is at risk, and many cities may have to face a severe water crisis.

Solution

Bhungru (पानी की खेती) is a unique technology which augments the groundwater by storing large amounts of rainwater or farm water into the subsurface zones of the earth and returns the same water in lean periods for domestic, agricultural and industrial uses.

Installation of Bhungru which augments the groundwater

Implementation and Impact

The whole process of Bhungru technology implementation consists of three phases. Firstly, the walk-through survey. Secondly, the technical audit of subsoil formation and water augmentation opportunity assessment, and thirdly the creation of filtration, Injection & storing systems for Bhungru. Finally, based on the survey report, dowsing and technical detail, filtration, Injection & storing systems are created to augment groundwater in a particular area.

BHUNGRU is well-tested environment-friendly disaster alleviation technology that purifies, injects, and reserves rainwater or excess farm water or storm water below the earth's surface for lean or dry periods. Various districts of Jharkhand like Ranchi, Dumka, Godda, Ramgarh and Khunti have implemented the Bhungru technology, and a few projects are in the pipeline in Madhya Pradesh and Assam.

Bhungru Water Augmentation project

START-UP 7

Dynamit Innovations

Founder

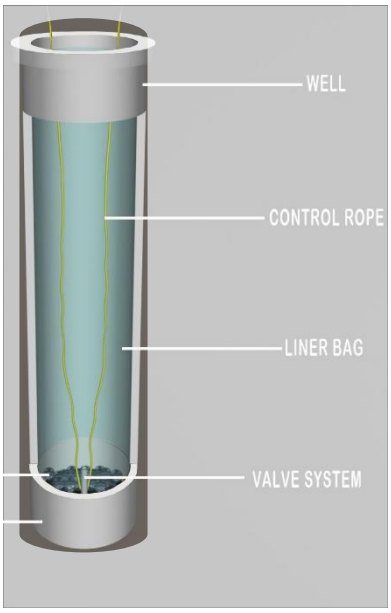
M C David

Challenge

The water tankers form the main source of drinking water for marginalized urban dwellers in many cities and towns. Often, each house gets only a few pots or buckets, for which they spend hours waiting in long queues collecting drinking water from these water tankers. On the other side, the rain water is being wasted and there are no mechanisms to recharge or conserve this water which is abundant during the season. The economic costs due to water loss and waiting hours are enormous and country line India must address this issue.

Solution

Dynamit team believed that storing the rainwater could resolve the water scarcity. Therefore, the team developed two innovative and cost-effective products for storing rainwater / potable water. The first is a Well Cum Tank. A typical well with sufficient depth is prepared with a HDPE/MDPE liner tube system, and rainwater or water from other sources is stored. The bottom end of the liner tube is tied securely by nylon rope to the valve system. The bottom area of the well inside the liner is configured with small nylon net bag filled with charcoal, river sand, stone etc. which act as filters for the water entering the valve system. The system is operable as a regular well when the valve is opened and converted to a water container when the valve is closed. If the water quality in the well is not good enough, by extending the length of the pipe, pure water from another water level could be drawn. To clean water in the Well-cum-tank, the valve needs to be opened, and the water in the well goes downwards to the groundwater level.

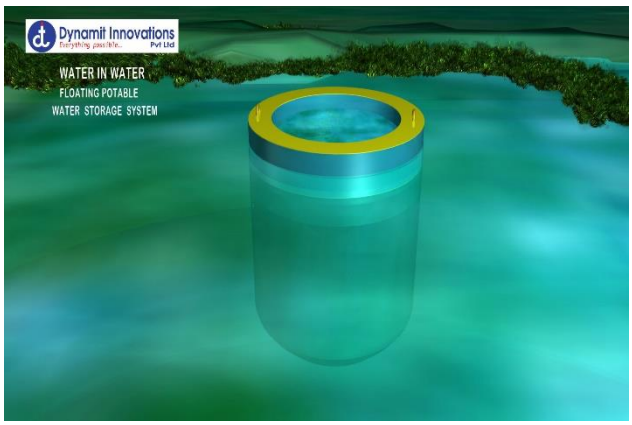


Well Cum Tank

Water storage system with control valve

The second concept - Water In Water, is a floating water container system which can be placed in a wider water body such as lakes, canals, pools or ponds. The system comprises several inflatable/ buoyant units, nylon rope, polyethene (HDPE/MDPE) bag, rainwater collection PVC corrugated sheets, mosquito net, anchor weight etc.

The cost of converting the well to a Well Cum Tank and constructing a Water In Water is much less than any present harvesting system.



Water in Water – Floating potable water storage system

Implementation and Impact

Kerala needed clean drinking water post-2018 floods. The Dynamit team prepared the prototype of the floating water chamber of the Water in Water concept. The size of the water chamber was 2M in diameter and 3M in depth, with the floating segments prepared using blocks of thermocol and the chamber bag prepared using a polythene sheet. The weight of the water chamber was only 15 kg, and it was carried out using a motor or manually.

Water storage in a separate compartment inside a well would solve the space constraints in water storage. Furthermore, such an arrangement not only serves as an efficient way of rainwater harvesting but also provides the consumers with an additional choice to use harvested rainwater and groundwater.

START-UP 8

Eunoia Innovations

Founders

Aashish Sharma, Deepak Cheran, Anjali Verma, Alankar Achadian (From left to right)

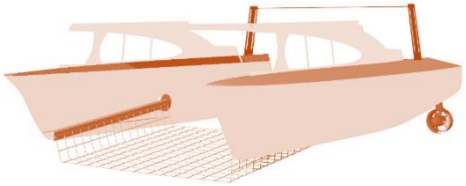
Challenge

Around 43% of the plastics consumed and disposed in India are Single-Use Plastics (SUPs). The Covid-19 outbreak has exacerbated the situation with the use and unscientific disposal of personal protective equipment like suits, gloves, masks etc. Most of these SUPs end up in the rivers and marine ecosystem. India is the twelfth largest source of marine litter and is projected to become the fifth largest by 2025. River Ganga is one of the top five rivers dumping plastics into oceans.

Solution

Aqua Skimmer is a water robot with great potential to clean water bodies. It skims on the water surface and cleans the floating trash, including plastics, cans, organic waste etc. Aqua Skimmer is made on a Catamaran Hull form and operates on two different platforms, i.e. Radio Controlled & Artificial Intelligence Operated platforms. This device can be a game changer in cleaning and maintaining the water bodies in urban areas, tourist places, private lakes, hotels, resorts etc. Aqua Skimmer is easy to set up, user friendly and can be run on most water bodies like lakes, ponds, and rivers, capable of cleaning and removing all the superficial trash.

The device has a split hull design to achieve higher performance. The device's inlet is equipped with a mechanical arm that captures and collects trash. The camera onboard assists in detecting the waste and maneuvering the device toward collecting trash in the collecting wastebasket attached between twin hulls. It is powered by solar energy, which provides a renewable energy source while extending the device's run time.



Implementation and Impact

Aqua Skimmer has completed all the prototyping iterations and is ready with the Minimum Viable Product (MVP) after vigorous testing by Quality Assurance Team. The device will be available in the market by the 4th Quarter of 2022. The device will be available in two variants tentatively ranging from Rs. 3,60,000/- to Rs.9,50,000 based on the client's requirements. Supported by the Commissioner and Directorate of Municipal Administration, Telangana and Greater Hyderabad Municipal Corporation, the implementation of the skimmers has been initiated at Kapra Lake in Hyderabad, Telangana. The whole focus of the pilot is to clean the entire lake of floating trash and get the database of its pollution potential.

Aqua skimmer

START-UP 9

EyeNetAqua Solutions

Founder

Kamalesh Chaudhari

Challenge

Arsenic contamination is a significant groundwater issue in several Indian states, including West Bengal, Punjab, Assam, Bihar, Uttar Pradesh, and Rajasthan. Exposure to arsenic levels exceeding 10 ppb in drinking water can lead to severe health issues such as arsenicosis, cancer, skin ailments, and even fatalities, affecting over 100 million people. Monitoring arsenic concentration in drinking water is crucial for effective water management. Current methods often involve expensive laboratory-based instruments, necessitating sample transportation. Field test kits, though common, utilize environmentally harmful acid-based reagents and require skilled personnel. Consequently, there's a pressing need for alternative technology: one that's reagent-free, cost-effective, and doesn't demand specialized training, particularly in regions like West Bengal and Punjab grappling with arsenic contamination.

Solution

To solve the aforementioned challenge, Eyenetaqua plan to deploy IIT Madras patented arsenic sensing technology. The sensing device is similar to glucose monitors available in the market. The device is used with test strips which allow "drop and sense" testing of arsenic in water. Unlike glucose test strips, these test strips are reusable (>50 tests/strip) and made with environment friendly carbon-based material. A freshly collected water sample can be tested without a treatment with any chemical reagents. Due to the similarity with routinely adapted glucose testing devices in the market, this arsenic testing device can also be easily handled by any untrained personnel. This innovative device can be deployed with a smartphone app for the testing of arsenic samples with geotagging. The information obtained from the water quality testing will be used to alert consumers about the presence of arsenic and the data can also be provided to the concerned authorities for remedial actions.

Implementation and Impact

The arsenic sensing technology being deployed by Eyenetaqua is robust, low cost and easy to use. Considering the vast population being chronically exposed to arsenic contamination, the device is scalable such that it can be made available at household level for communities to enable regular monitoring of their local water sources. The technology assessment has been conducted with the arsenic contaminated water samples from South 24 Parganas, West Bengal. Eyenetaqua will conduct continuous assessment of water sources and treatment plants in arsenic affected areas at various locations in Punjab and West Bengal. The data will be accessible through online dashboard. The device is upgradable as a solution for pay per use water quality testing facility for people in the arsenic affected areas. Eyenetaqua has piloted their real time water quality monitoring units in Haryana and Telangana.

A handheld device for the testing of arsenic using “drop-and-sense” test strips (inset)

Eyenetaqua’s real-time water quality monitoring unit →

START-UP 10

Fount Lab Solutions

Founder

Neeraj Magnani

Challenge

The challenge in urban water management revolves around the escalating pollution threats to health and the environment. This necessitates real-time monitoring of water quality parameters and swift responses to pollution incidents. Ensuring the sustainability of water resources across diverse urban water bodies, including rivers, lakes, ponds, reservoirs, and treatment plants, is imperative. This challenge underscores the crucial need for comprehensive strategies to effectively manage urban water resources, mitigate pollution risks, and safeguard the health and well-being of urban populations and the surrounding environment.

Solution

FL-SWQM revolutionizes water quality management, combatting pollution's threats to health and the environment. With 24/7 monitoring of crucial parameters like pH and COD, it empowers real-time decision-making. Cloud connectivity ensures secure data storage and accessibility, while customizable alerts prompt swift pollution responses.

Versatile and easy to install, its solar-powered, low-maintenance design makes it ideal for diverse water bodies. FL-SWQM: A cutting-edge solution for safeguarding water quality and promoting sustainable resource management.

Implementation and Impact

Implementation ensures the provision of clean, safe water for drinking, bathing, and household use, mitigating the risk of waterborne diseases and enhancing overall health. Additionally, it supports economic development by facilitating sustainable usage in agriculture, industry, and aquaculture, fostering growth and prosperity. Moreover, monitoring aids in protecting aquatic ecosystems by identifying and addressing threats like pollution and habitat destruction, thereby preserving biodiversity and ecosystem services. Lastly, it enables informed decision-making by providing valuable data on water quality and availability, aiding in effective water management strategies and policy formulation. Through these multifaceted benefits.

Fount lab water monitoring system emerges as a crucial tool for promoting human well-being and environmental sustainability.

Sites

Labeling Factory STP
Navi-Mumbai
FL-WQMS

IT Park STP
Hinjewadi, Pune
FL-WQMS

Aquaculture Pond
Goa
FL-WQMS

IT Park STP
Pune
DO Monitoring and
Controlling

START-UP 11

GEO CLIMATE RISK SOLUTIONS PVT LTD
....for sustainability

Geo Climate Risk Solutions

Founder

G. Prasad Babu

Challenge

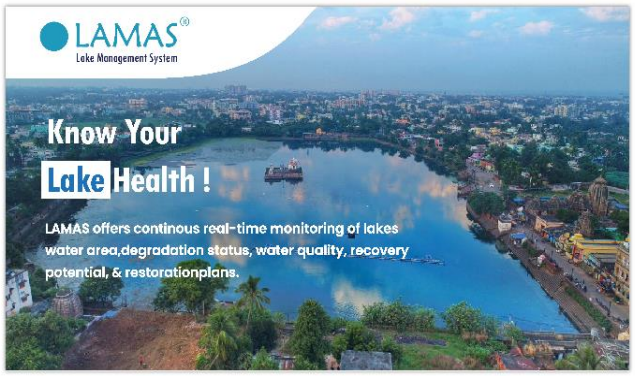
One significant challenge related to urban water management related to increasing degradation and pollution of urban lakes and wetlands. Urbanization often leads to encroachment, pollution from runoff and industrial activities, and alteration of natural hydrological processes, resulting in deteriorating water quality and habitat loss. Therefore, implementing effective management strategies to address these issues is crucial.

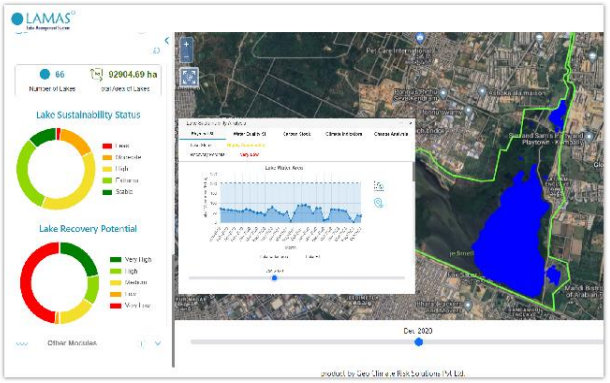
Solution

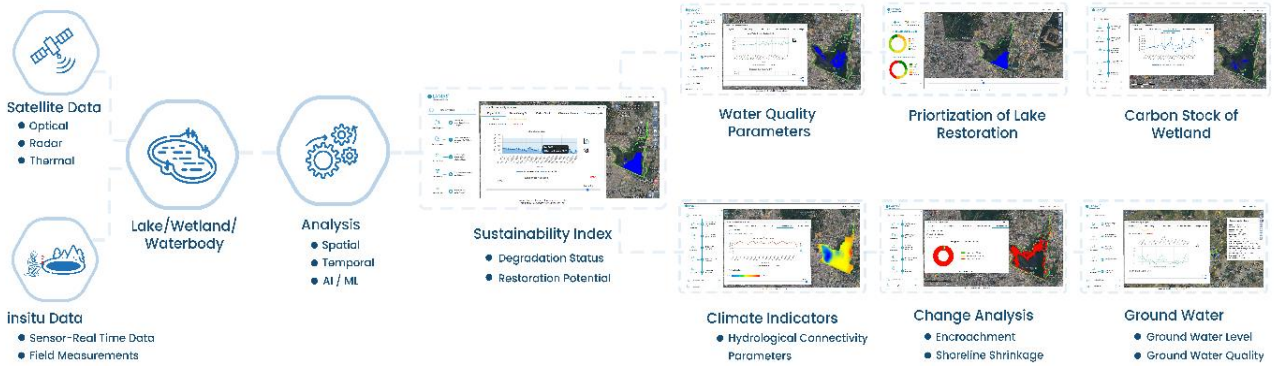
LAMAS, an innovative AI & ML-based web GIS tool, revolutionizes urban lake and wetland management with continuous monitoring and health diagnosis. Employing advanced predictive analytics and water quality assessment, it accurately identifies water spread areas, encroachments, and climate impact parameters. This capability empowers authorities to precisely pinpoint pollution sources, monitor changes in water quantity and quality, and assess the overall health of water bodies. LAMAS integrates diverse data sources seamlessly, enabling real-time monitoring and informed decision-making. By providing comprehensive insights into lake and wetland health, it facilitates the implementation of sustainable management practices. Through proactive measures guided by LAMAS, urban water managers can effectively mitigate pollution and degradation, ensuring the preservation of these vital ecosystems for the benefit of urban populations and the environment..

Implementation and Impact

The implementation of the Lake Management System (LAMAS) by Geo Climate Risk Solutions has shown notable impacts in urban water management and restoration. Key projects include the lake degradation and recovery assessment, and prioritization of degraded lakes for restoration for the Hyderabad Metropolitan Authority, contributing significantly to sustainable lake management in the region. In Rajasthan, LAMAS was instrumental in analysing shorelines & hydrological connectivity of Sambhar Lake, aiding in the development of effective conservation strategies. For corporates like Aditya Birla Group and Dr. Reddy's LAMAS helped to analyse historical trends of water bodies and to estimate water availability. Additionally, LAMAS is empanelment by the Chhattisgarh State Wetland Authority for comprehensive wetland management underscores its effectiveness in ecological health improvement, enhancing water quality, and fostering sustainable water use. These deployments collectively demonstrate the substantial role of LAMAS in advancing environmental conservation and effective urban lake, water bodies and wetland management.







Lake Management System a product of Geo Climate Risk Solutions Pvt. Ltd.

https://lamas.co.in/ https://www.gcrs.co.in/ business@gcrs.co.in

Lamas dash board & tools

START-UP 12

Greenvironment Innovation and Marketing India

Founder

Bhagyashree Rath

Challenge

Cities face significant challenges concerning the non-availability of potable water for urban communities to meet their daily needs, increasing water supply costs, and lack of reliable data to make decisions on their water & energy infrastructure management. To overcome this challenge, the cities should be able to make decisions on water management which will help reduce freshwater usage, help maintain the quality of the recycled water & promote the use of the recycled water.

Solution

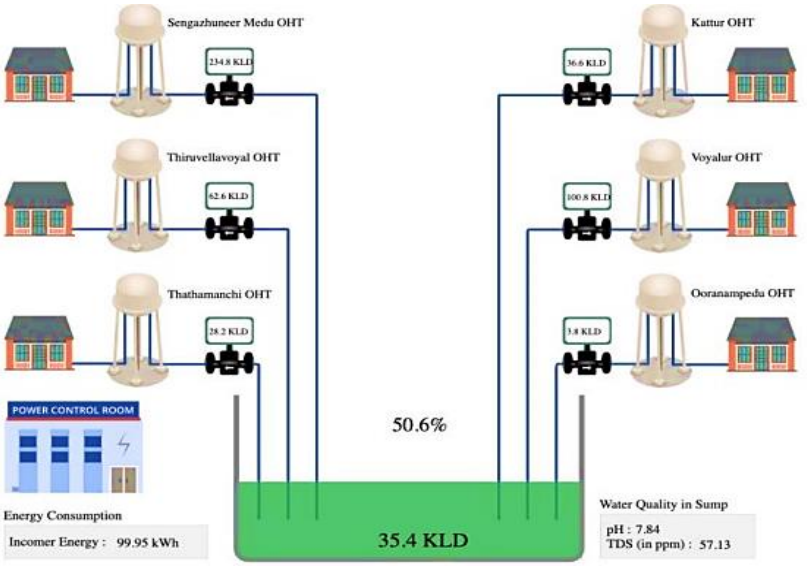
Greenvironment Innovation & Marketing India (P) Ltd is a smart environmental management company from IIT Madras incubation ecosystem, focused on providing technologies for the digitalization of water, energy and environmental infrastructure using IoT & Artificial Intelligence. Greenvironment has expertise in automation of the plant using RTM to take any decision on water management, reduce the dependency on human resources, save energy & improve the life cycle of the equipment. In addition, they provide real-time Monitoring (RTM) & troubleshooting support through innovative technologies for environmental management and help achieve regulatory compliance.

Greenvironment has two solutions. The first is based on digitizing water, energy and environmental infrastructure using IoT & AI and Real-Time Monitoring (RTM). This technology ensures water quality, promotes water reuse, and helps reduce water costs in industries, commercial and residential settings. It is a cost-effective, 100% indigenous, reliable, and scalable product in Indian conditions. It is a plug-and-play system which gives AI-based real-time alerts & notifications on your mobile 24/7. A single device can be connected to multiple water quality, flow, level, energy & pressure monitoring sensors. It also operates with Battery/ Solar power which is easy to deploy.

The second solution is a service that enables freshwater management, recycled water management, smart leak detection, river/lake/storm/flood water management, energy management, cooling tower management and indoor air quality management.

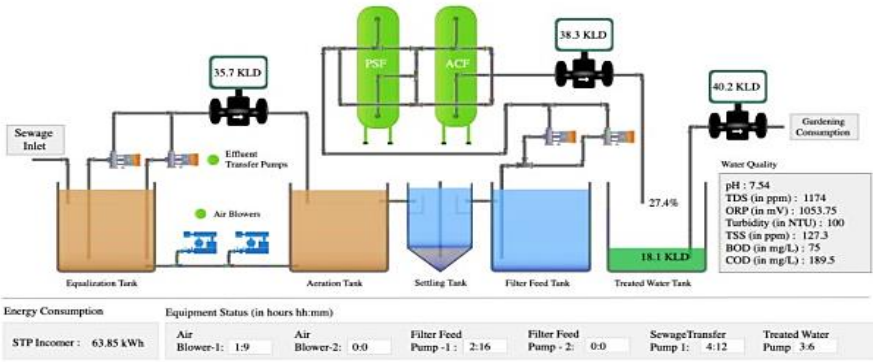
FWM – Digital Twin

Fresh Water Management Digital Twin is simulation of the assets from source to consumption with real-time sensor updates, historical performance data, machine learning/AI



RWM – Digital Twin

Recycled Water Management Digital Twin is simulation of the assets from Recycling to reuse with real-time sensor updates, historical performance data, machine learning/AI



Implementation and Impact

The green environment has demonstrated its solutions in many places across the country. Some services include STP monitoring at four locations in Bangalore under Bangalore Water Supply and Sewerage Board and in Aarakkonam, Tamil Nadu. In addition, they have deployed a smart water supply measurement and monitoring system under the National Jal Jeevan Mission in twenty-five villages of Karnataka, Gujarat and Ladakh. Other notable initiatives include river water and storm water management in Bangalore, Karnataka and STP monitoring in Tamil Nadu.

START-UP 13

Nature Dots

Founder

Snehal Verma

Challenge

Indian economy is at risk due to water-resource deficit and deterioration because of various factors like pollution, resource extraction, lack of scientific information and unavailability of real-time data. It becomes crucial to capture the pulse of Blue-Green-Grey water resources and map them in real-time to create a robust, resilient water network and de-risk our nature, people and business from the water-led crisis and climate risks. Due to the lack of robust data and real-time information modelled with ecological and climate variables targeting functional and practical use, diagnosing water health and managing water resources is very challenging.

Solution

AquaNurch combines "nature intelligence x artificial intelligence" to create a Digital Twin of all waterscapes of the world to design, de-risk, and decarbonize growth pathways and waterscapes. Each AquaNurch installation acts as a neural node for capturing the pulse of water ecosystems on an AI-powered real-time basis system. AquaNurch® hardware installation plus an AI-powered engine gathers and processes millions of data points on ecological stressors from natural and man-made water bodies.

The data points include fishes/biodiversity, hydrology system, climate variables and geospatial parameters. A proprietary AI engine loaded with advanced and sophisticated ecological-hydro models is used to assess current data and forecast climate risks and variability, enabling the user to take timely and effective measures to reduce vulnerability, compound resilience and enhance sustainable resource use.

The product provides a location-specific solution to address water deterioration, resource intelligence and enhance carbon storage. Ultimately, presenting the end user with a systemic model, the AquaNurch web and mobile platform enables stakeholders to easily access the insights, evidence, alerts, and advisories generated via its customized web application, water dashboards, and climate risks. Some of its key features include:

- Location-specific customization for mapping real-time water quality and quantity, monitoring up to 37 ecological, physical and chemical parameters
- Hassle-free and end-to-end water resource diagnostic support via web and mobile platform
- Onsite nature-based and nature-climate solution design and deployment
- Real-time alerts and advisories with actionable suggestions to address water, weather and climate risk
- AquaNurch interface is available in 13 Indian languages

Implementation and Impact

The solution is deployed across three states of Chhattisgarh, Maharashtra and Haryana, covering lakes, wetlands and rivers. They are working with fish farmers across 100 Ha of fishponds across India and have an ongoing engagement and pilot with 1000 small-scale fish farmers across central India. They also have a pilot on a coastal resilient and nature-based solution in Goa. Another project in Washington State, United States of America, involves the long-term monitoring of water health, climate risks and development of a resilient climate plan for the water bodies of the county.

The costing of AquaNurch System is based on local factors, objective-oriented customization and a location-specific AI model. This innovation can significantly reduce hardware requirements for measuring water quality and quantity on a real-time scale. Their fishing ponds and lake installations aim to tackle the pain points of 15 million inland freshwater fish farmers. In 10 years, they have targeted to map 2.5 million hectares of freshwater – wetlands and critical marine ecosystems – corals and mangroves.

Product - AquaNurch system

START-UP 14

NeeRain

NeeRain®
Water for you, free for life

Founder
Naishal Shah

Challenge

India has become a water-stressed nation due to rapid urbanization. India relies heavily on groundwater, a significant concern due to the dwindling groundwater withdrawal. Nearly 60 crores of Indians do not have access to water at their premise. Overexploitation of groundwater and intensive irrigation in major canals has posed serious problems for groundwater managers in India.

Solution

NeeRain rainwater filter is a rainwater harvesting filter designed for an ordinary person to become water secure in their habitat without any water loss. NeeRain is an economical and effective rainwater filter and has two stages of filtration with microfiltration up to 200 microns to remove large, small and micro impurities that come along with rainwater.

Rainwater Harvesting is a sustainable process that helps in preserving rainwater. The rainwater in this process is collected at the surface before it is lost as surface runoff. The groundwater is then recharged artificially through the process. NeeRain aims to enable and empower individual habitats with easy, effective and economical products to harvest rainwater from their premises. Their patent-forwarded technological innovations are accessible for a common man to implement with minimum cost, negligible labour and no recurring cost. NeeRain has come up with a do-it-yourself, plug-and-play RWH filter. The 1x1x1.5 foot device made from plastic fits on a house or building wall. It is attached to a pipe that receives rainwater from the rooftop and channelizes it to the ground. NeeRain fits between the pipe as a bypass arrangement and has a two-stage filtration process.

NeeRain works on the principle of Reverse Y filtration. Therefore, it does not need any electricity as it works on gravity, and there is no water loss and no stagnant impurities while harvesting rainwater.

Implementation and Impact

With 2500+ installations, NeeRain saved over 35 crore litres of water through more than 150 centers across India, Asia, Africa & America in two and half years. There are two models (NRE 140 & 220) available in the market, priced at 3,950 INR & 6,500 INR, with the former being a plastic device and the latter stainless steel. These products are about 40-60% cheaper than a traditional rainwater harvesting method costing between 8,000-10,000 INR. Moreover, the investment costs can be recovered from the water collected from the 1200-square feet roof over a year. This innovation ensures freshwater security, raises the water levels in borewells, reduces electricity bills, lowers the carbon footprint, mitigates climate change effects and brings social benefits.

Product – NeeRain (left) , Installation of NeeRain on site (right)

START-UP 15

Panthera Clean Tech

Founder

Prasham Mehta

Challenge

Hard water is water with an excessive amount of calcium and magnesium minerals present in the form of dissolved carbonates, sulphates or hydroxides. Scale is deposits of carbonates which is destructive and detrimental to household plumbing and prematurely ruins appliances like laundry machines and water geysers. Hard scale can also lower water pressure, restrict flow rates, and in dire cases, prevent water altogether from flowing through the pipelines. . Laundry washed in hard water comes out of the machine stiff with dingy colouration. Dishes washed in hard water are foggy and have soap spots after rinse. Soap and cleaning products build up in thick scum, as minerals prevent soap from lathering correctly, and hard water dries skin and hair after the shower. There have been conventional solutions to soften the water. However, all these are costly, difficult to maintain, or ineffective, necessitating a radical solution.

Solution

Aqua Scale is a salt-free water softener designed to tackle the hard water problems such as scaling inside the taps, basins, pipes, heaters, washing machines and bathroom fittings at homes/offices. It is a novel product which saves energy and prevents repairs and replacement of appliances and bathroom fittings at the user's property. Aqua Scale is a zero maintenance, zero service, and zero operating cost water softener with no salt or power consumption required to function. It has a quick and easy installation process. It is sustainable and safe for domestic use.

Aqua scale – salt free water softener

Implementation and Impact

Panthera Cleantech has sold over 700 products to individual houses/bungalows, societies, hotels, hospitals, and apartments. They garnered over 150 customers and 19 Lakh INR as pre-revenue on their minimum viable product. The community will benefit from improved water quality for domestic consumption. The treated water will prevent hair, skin damage, and kidney and gall bladder stones. Taps, pipes, tanks and bathroom fittings shall be protected against scaling, ensuring the lifespan of the appliances.

The Aqua Scale Water Softeners product range starts from 3000 INR onwards, depending on the variant and configuration. Panthera manufactures and markets water softeners through online, e-commerce, and offline channels.

Aqua scale water softener products

START-UP 16

Retas Enviro Solutions

Founder

Ankit Magan

Challenge

Around 54% of India faces acute water shortage, which will only aggravate shortly, considering the rapid urbanization. With this, our society today has multiple issues related to water. Some of the significant identifiable problems are:

- Depleting the groundwater table: Gradually, natural water resources are drying. In areas where the water table is receding, the general public has to resort to water tankers which do not provide clean and pure water.
- Water-borne diseases: Around 47% of illnesses are due to water. The availability of fresh and pure water helps in the reduction of diseases.
- Flooding: Insufficient provisions for adequate storage or retention of rainwater cause heavy flooding on roads and traffic networks.
- Plastic pollution: Indiscriminate dumping of plastic adversely impacts environmental health.

Solution

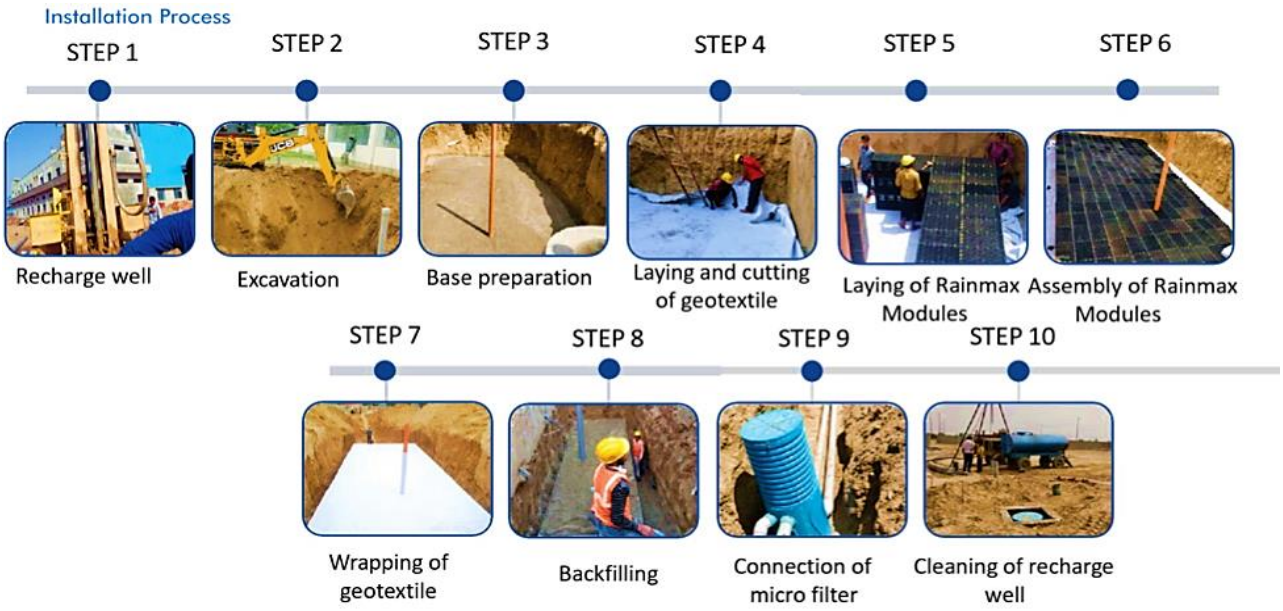
RETAS has developed the concept of modular rainwater harvesting (RWH) tanks called Rainmaxx. These tanks help in the artificial recharge of rainwater to the ground. Additionally, using these tanks, one can also store rainwater and use it for secondary activities. Rainmaxx also helps in flood mitigation. They also make ecological channels or bioswales using Rainmaxx, which can replace open stormwater drains. The Rainmaxx tank can be easily installed in places with less space, and the top surface of the tank can be used for parking, driveways, landscaping etc. The Rainmaxx modular tank is made of recycled plastic (polypropylene), so extra points can be bagged in the Green Building Ratings.

Implementation and Impact

The Rainmaxx tank was installed within six days at a property in Agra, wherein a total of 344 cubic metres (Cum) of recharge capacity was planned based on the area and details provided by the client. A total of 6 tanks were installed with one recharge well each. The capacity of each recharge tank was different depending on the area. Retas has provided a flood mitigation solution for the highway, where traffic jams were a significant concern during the rainy season. The client was previously using heavy pumps to divert the water. Retas designed a 500 Cubic metre Rainmaxx tank with ten recharge wells, a desilting chamber, oil pillows, and microfilters.

The product aims at water conservation, leading cities to become more water positive with a reduced flood problem. Further, the usage of recycled plastic helps tackle a significant waste stream. Since all their solutions are customized as per the location and site, the cost varies. However, Rainmaxx is approximately 10-50% economical compared to conventional RWH systems.

The Rainmaxx tank is widely recognized by all major government institutions, i.e., CPWD, PWD, NDMC, AAI, Railways, MES etc. Details of their products are also incorporated in CPWD 2019 Rainwater Harvesting & Conservation manual. They also get support from IGBC & CII.



Installation Process of Rainmaxx modules on site

START-UP 17

SAVTOA
SOFTWARE TECHNOLOGY

Founder

Barker Bhaskaran

Challenge

In the realm of India's freshwater systems, implementing real-time spatio-temporal mapping and monitoring via swarm unmanned boats faces a series of obstacles. These include inadequate infrastructure for deployment, technological limitations, vulnerability to harsh weather conditions, sluggish regulatory processes, data security concerns in cloud storage, community skepticism, financial limitations, and the necessity for specialized training.

Solution

Savtoa introduces the SAV1001, an unmanned surface vessel (USV) equipped with cutting-edge bathymetric sensors (sonars) and water quality sensors, revolutionizing real-time spatio-temporal mapping and monitoring of surface water bodies.

This innovative solution offers unparalleled advantages, including reduced costs, minimal risk to human life, and obviating the need for skilled labor. Leveraging 4G or RF private network connectivity, the USV seamlessly streams marine data to a cloud-based storage system, ensuring high-quality real-time data accessibility. Furthermore, its capability to survey remote locations and access historical time series data enhances its utility for comprehensive water resource management. Savtoa's integrated approach heralds a new era in efficient and effective water monitoring solutions.

Implementation and Impact

In collaboration with government departments, Savtoa is currently trialing its solution in Kerala State, aimed at utilizing unmanned boats for comprehensive surveys of quarries, dams, rivers, lakes, aquaculture farms, and seashores. The system's data processing and USV control application operate from a base station, remotely managing multiple USVs as they navigate predetermined GPS waypoints. Data collected from water quality sensors or bathymetric sensors are stored in files at the base station for post-processing. For water quality assessment, sensors from In-situ (such as aqua troll 500/600) or Hydrolab (HL series or Quanta) are employed, measuring parameters like dissolved oxygen, pH, temperature, chlorophyll, algae growth, turbidity, conductivity, and pressure. The SAV1001 USV features integrated sonar (Blue Robotics Ping Sonar) or external sonar, and RTK GPS (Trimble 5800), complemented by processing software like Hypack for efficient operation and data analysis. This comprehensive solution promises to revolutionize water resource monitoring and management in Kerala and beyond.

Hull Material	Hypalon, neoprene inflatable
Dimension	3m x 1.4m x 0.4m
Weight	25Kg
Draft	0.25m
Propulsion	Electric Outboard (9 Hp)
Obstacle avoidance	50m
Communication range	1.5 Km
Max speed	7 knots
Survey Speed	4 knots
Battery life	6Hr at survey speed
Monitoring item	temperature, dissolved oxygen, pH, conductivity, turbidity, blue green algae growth, chlorophyll

Lake Hydrographic Survey and specifications

START-UP 18

Solnce Technologies

Founder

Yash Tarwadi

Challenge

Potable water scarcity is the biggest problem that humankind is facing. The people living in coastal regions face this water crisis multifold as there are no freshwater bodies nearby. Although water is seen everywhere, this water can hardly be used for consumption or production.

Solution

Solnce Technologies has built a pilot plant that has successfully converted "Seawater (Any high TDS water) into potable water by solar energy" with their patented technology. The technology utilizes only natural resources like solar energy and seawater, and the process is fully decentralized, automated, and stand-alone. It provides safe, pure water with added minerals. In addition, the product matches the WHO clarity class, a drinking water parameter certifying that the water is safe to drink.

Pilot plant model using solar energy – Sea water into potable water

Implementation and Impact

Solnce Technologies has a pilot plant in Olpad, Surat, where they provide1500 litres of water to the people daily that costs less than 10 lakh and has 30 years of life. Through this technology, they have addressed the issue of water scarcity with a frugal innovation that utilizes only natural resources.

They are among the top 12 teams of India in Youth Co: Lab, an event by Atal Innovation Mission (AIM), NITI Aayog, and the United Nations Development Programme (UNDP) India, aiming to accelerate social entrepreneurship and innovation for young Indians.

Seawater to potable water

START-UP 19

Taraltec Solutions

Founder

Anjan Mukherjee

Challenge

The challenge of making polluted sewage water safe for further use is a universal issue. However, the affected population primarily includes the underprivileged and underserved in the rural and congested urban milieu, with limited access to sophisticated and cost-effective treatment systems. Further, the issue is aggravated due to ill health caused by unsafe water

Solution

Taraltec has devised a new reactor that can be easily retrofitted in existing sewage treatment plants with minimum space requirement and pipeline modification and without any interruption to the plant. The retrofitting makes the existing plant more efficient in terms of its effectiveness & capacity. Moreover, unlike current alternatives, namely chemicals, UV filters, membranes and aerobic/ anaerobic methods, etc., which require consumables, huge space/time and expert supervision, this solution is compact and environmentally friendly and works instantly.

Reactor for retrofitting in STP's

The working principle is based on the kinetic energy of water that is converted to cavitation bubbles. When the bubbles collapse, it creates shockwaves to kill microbes and break organic molecules instantly, thus reducing BOD.

The bubbles are created using a simple biomimicry-inspired physics principle which requires no behavioural change for its usage. The key features of the product are:

- Standardized, Standalone & Custom designed units
- ·Very low OPEX & CAPEX.
- Minimal maintenance Easily retrofitted into existing setups with minimum pipeline modification and without plant stoppage
- Minimum moving parts
- Can handle variable & pulsating flows
- No behavioural change required
- Environmentally compliant

Implementation and Impact

A modified version of the Maji: Taraltec Reactor, the new version is based on their patented technology. While the new version has not been implemented yet for sewage water treatment, the Maji: Taraltec Reactor has been used for the past five years.

Installation of Taraltec reactor

START-UP 20

Techxcl India

Saaf water™
Be uncontaminated...
A product of
TechXcl
TechXcl India Pvt. Ltd.

Founder

Hrishikesh Bhandari

Challenge

Almost 50% of the world's population depends on groundwater for consumption, the quality of which is rapidly deteriorating due to unchecked urbanization and climate change. The resultant physical, chemical and biological contamination leads to casualties, including deaths, infections and diseases. These issues can be avoided if a system forewarns the users in real time about the degradation of a water source. Unfortunately, existing solutions are essentially reactive, wherein the solution seeking begins only after the adverse effects of contaminated water consumption start setting in. Moreover, the results of the lab tests come in only after 5-7 working days, while adverse effects continue growing among consumers.

Solution

Saaf water solves this problem by forewarning about the quality of water before consumption in real-time and on multiple parameters to mitigate and prevent risks associated with unknowingly consuming contaminated water. Additionally, it also recommends purification processes to rectify the anomalies.

It is a compact yet robust IoT (Internet of Things) device that consists of water parameter sensors for total dissolved solids (TDS), turbidity, pH, and temperature. The system intelligently senses flowing water which triggers the further collection of water parameters. The system uses machine learning to estimate scores for the presence of physical and chemical contamination. It can use the previously estimated scores to forecast the water quality and the degradation of future water sources in the operating system. The system is co-powered by a defined classification model to provide purification recommendations according to the evaluated contamination. Water quality information, purification recommendation, and forecasts are then communicated to the users in real time.

Implementation and Impact

The technology is piloted in three locations:

Location 1 - A housing society in Taleigao where approximately 66 people from 22 flats use groundwater that passes through the Inline Installed Saaf water prototype. The dashboard access is given to the Society's Chairman, who can view it on any device.

Location 2 - Dr.K.B. Hedgewar School, Cujira-Bambolim, Goa. Over 2000 students and 150 school staff have used the Saaf-treated groundwater here. The data is collected every day in real-time.

Location 3 – Individual Bungalow in Panaji

The device provides real-time water quality inputs. It helps individuals prevent health complications due to the consumption of contaminated water. In addition, the agricultural sector would benefit by avoiding crop loss and pre-warning slow soil contamination and deterioration.

Device that consists of water parameter sensors

START-UP 21

Thales Clean Tech

Founder

Jennifer

Challenge

Water inequality is a pressing social challenge due to the iniquitous distribution of ownership of water resources. This situation often leads to exploitative relationships and becomes the source of conflict and tension

Solution

Thales is focused on providing environmentally responsible and economically attractive solutions for drinking water needs. In addition, they help achieve water security through our clean and sustainable Atmospheric Moisture Extraction (AME) technologies.

All existing Atmospheric Moisture Extraction systems work under the vapor compression principle, which is highly energy intensive with high operating cost, non-scalable, and thus economically unviable. Thales' proprietary STAME (Solar Thermal Atmospheric Moisture Extraction) technology involves fewer moving parts or components, ensuring a minimum of 20 years of life with negligible operating cost. They only use hot water to run the system, produced by solar thermal energy. Using unlimited and abundant resources (Air and Solar), this green technology offers a high-value product that is highly scalable from 1500 LPD to 1,00,000 LPD.

The water from air quality has been tested and certified by various governments and private and international labs and complies with drinking water norms set by GOI. The Central Testing Laboratory of the Public Health Engineering Department tested the water from AME and certified that the water is purer than RO water.

The life of the STAME system is over 20 years with a minimum capacity of 2000 litres per day, costing approximately 25 Lakh INR. The cost of making one litre of water is 30 paise.

Implementation and Impact

Thales Cleantech established the first 500 LPD AME community drinking water system at Krishnapuram Village in Tamil Nādu. It was found that the polluted drinking water caused throat cancer in the villagers. This model constitutes a template to cover more than 6000 arsenic-affected habitations in India. Indian Council of Medical Research (ICMR), Officer's mess at Chennai Coast Guard, the Rauli Railway Station at Bhubaneshwar and over 60 corporation schools and a gated community of 500 apartments in Chennai have also installed the AME systems.

Each litre from the atmosphere saves 3 litres of groundwater. The cost of making water through STAME technology is less than processing and filtering the groundwater. The process has no carbon footprints, effluents, refrigerant gas or grid electricity to run the system. It can potentially make 100 million LPD along both the east and west coast of India and positively impact health, especially thousands of arsenic-affected habitations in India.

Community drinking water systems (top), Thales cleantech team (bottom)

START-UP 22

Vaidic Srijan

Founder

Madhukar Swayambhu

Challenge

India is facing a water crunch because groundwater extraction is higher than its recharge. So, the need of the hour is to find innovative and sustainable ways for intelligent water usage and recycling.

Solution

Vaidic Srijan has developed 'Cownomics® Technology' as an in-situ approach to the rejuvenation & restoration of waterbodies & wetlands. This technology is a sustainable, nature-based indigenous technology focused on consuming and digesting' the contamination in the aquatic food chain instead of the traditional segregate & collect' approach. Every water body provides a plethora of ecosystem services. Cownomics® Technology restores the waterbodies and all the ecosystem services in-situ, without any construction/chemicals or biologically active organisms' invasion into the limnology.

Edudi Lake, as on 15th December, 2019

Edudi Lake, as on 30th December, 2019

Implementation and Impact

Vaidic Srijan carries out a study on the water body on various parameters. Based on it, they prepare a herbal medicine, mix it with fresh water from the same agro-climatic zone as the waterbody, and pour it into the waterbody at sunrise. The treatment is divided into three phases (3+3+6 months), and at the end of phase three, the water body is restored to its original condition, restoring all the ecosystem services.

Cownomics® Technology has been used so far for rejuvenating billions of litres of water and sewage daily in 10 states. Vaidic Srijan has been awarded the Water Hero Award by the Ministry of Jal Shakti and has received other international and national recognitions.

START-UP 23

Vayujal Technologies

Founder

Ramesh Kumar Soni

Challenge

The water crisis is an impending reality and calls for an urgent need to consider alternative renewable water sources. Earth's atmosphere has approximately 1.4 x 10^16 litres of water, replenishing daily. Harnessing this water source efficiently can solve the water crisis caused due to rapid urbanization. However, atmospheric water harvesting (AWG) requires a heavy real-estate footprint to generate water.

Solution

VayuJal minimizes the power required to make a litre of drinking water by 5-20%, using bio-inspired surfaces for condensation. The Cacti plant has a specific morphology that enables it to capture water at night in the desert and provides for its uses. The exact morphology is replicated on the surface, kept below dew points for water condensation. Additionally, the VayuJal system uses an air filter and a seven-stage water filtration system to ensure continuous water generation and consistent water quality at 0.27 kWh/litres, which can be used for drinking and other purposes. VayuJal units take in the ambient air through air filters for harvesting the water content of air on a bio-mimic surface kept below the dew point. The collected water is further processed through a seven-stage water treatment process to ensure consistent drinking water quality in all installation locations.

Vayujal units of different capacities

Implementation and Impact

Vayujal prevents water wastage and exploitation of the groundwater table. 62 VayuJal products rated for 70 %RH and 30 'C ambient conditions are installed in 18 cities of India. Machines have performed at par or higher than rated capacity for the ambient conditions of the installation location. It does not require a raw water source; the water generated is mineralized and free from plastic micro-particulates. The output drinking water complies with BIS:10500-2012 drinking water standards. VayuJal provides quality water to school children and students of primary school with AWGs and prevents water-borne diseases. Vayujal has been awarded the Water Warrior Award at the Waterthon hosted by CNN News-18.

Vayujal product

START-UP 24

Vertox Labs

Founder

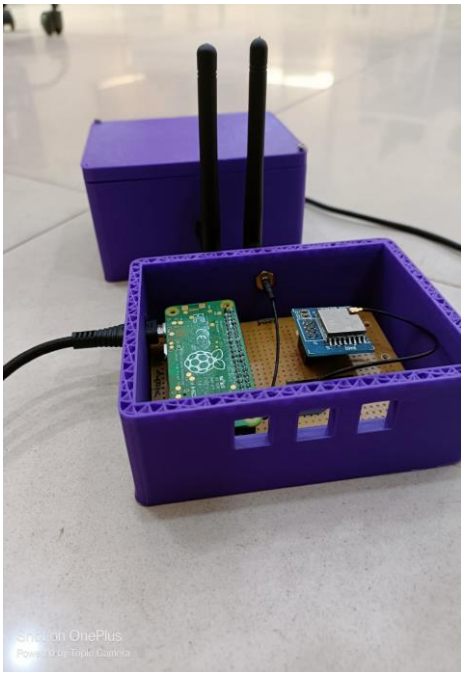
Salomi Dabral

Challenge

Urban water management faces a critical challenge due to the escalating strain on sewage treatment plants (STPs) caused by rapid urbanization. Conventional methods struggle to cope with the increasing demands for maintenance and skilled manpower necessary for monitoring treatment processes and discharge quality. This strain compromises the efficiency of treatment processes and poses risks to water quality. Aging infrastructure exacerbates the issue, requiring costly upgrades. Addressing these challenges is paramount for sustainable urban water management and ensuring the health of communities and the environment.

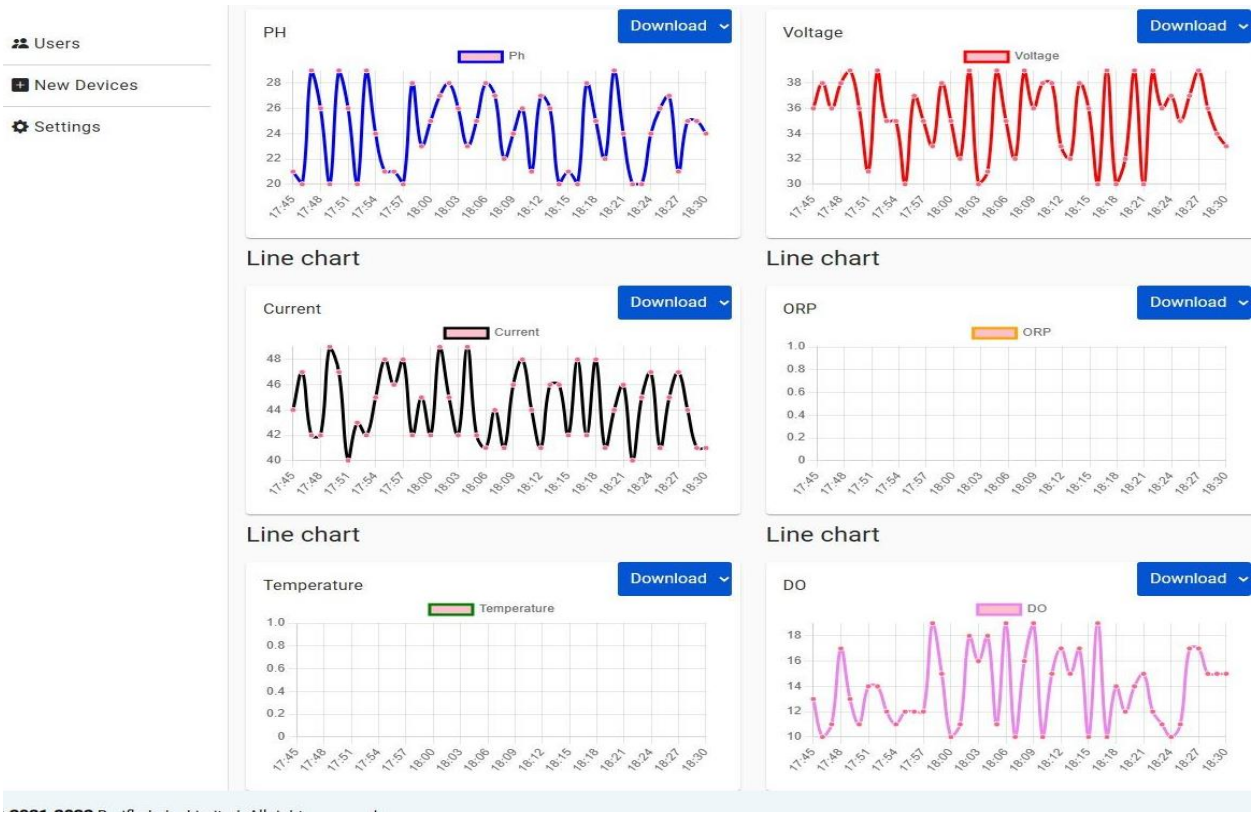
Solution

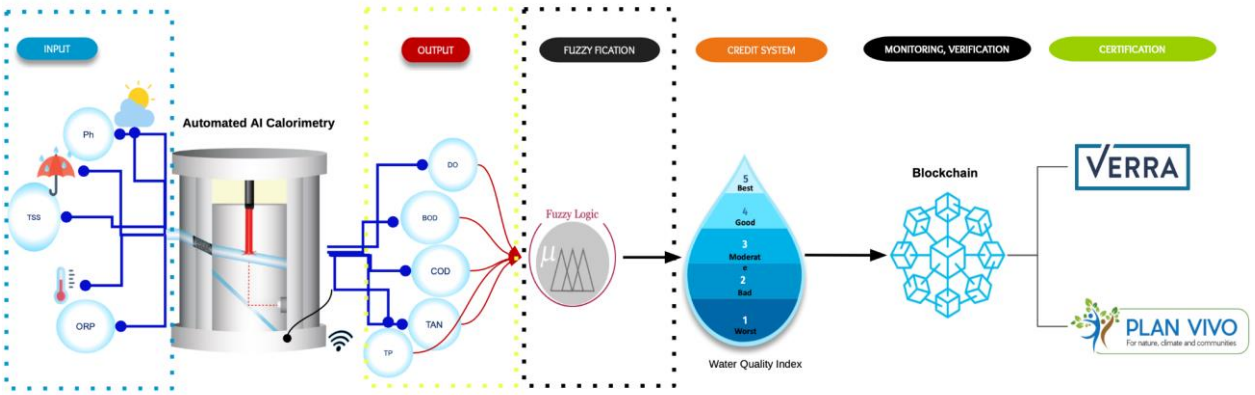
Vertox Labs addresses the maintenance-intensive nature of conventional sewage treatment plants (STPs) by offering a comprehensive robotic solution. This includes bioremediation methods like bioflocculation and biocoagulation for on-site deployment within existing treatment ponds, slashing secondary treatment costs by 50%. Additionally, the solution features multiple sensors for real-time water quality data reporting and a LoRA-blockchain hardware framework for water quality credit formulation. To make this technology accessible, VertoX Labs introduces an Intelligent and secure LoRaWAN-blockchain-driven meshnet (LWBDM) integrated with proprietary water quality monitoring sensors. This innovative approach not only enhances data-driven decision-making for urban water management but also addresses affordability and usability concerns, ensuring seamless adoption by public and private stakeholders.



Implementation and Impact

There are approximately 235 municipal corporations in India which are involved in management and upkeep of more than 10,00,000 water bodies. As mentioned previously, this technology is scalable across several water bodies allowing for remote monitoring of the water quality - enabling accurate reporting and prediction of key standardized water quality parameters such as dissolved oxygen, ammonia, BOD and phosphorus. They are implementing their first AMRUTH pilot at the Brahmapur municipality in Odisha in 2024.





Sensor-driven data , Block chain-based MRV & credit system

START-UP 25

Waterlab Solutions

Founder

Vijay Gawade

Challenge

In India, nearly 65% of water for irrigation and 85% of potable water is sourced from groundwater, primarily abstracted using borewells. However, situations of overuse and exploitation of groundwater to meet irrigation and domestic water requirements, together with drought and erratic monsoons, have led to the depletion of groundwater levels in several parts of the country. Moreover, with no demand-side tools available to understand groundwater levels and better management of the borewells, water is often being abstracted relentlessly with continuous pumping until the borewells go dry.

Solution

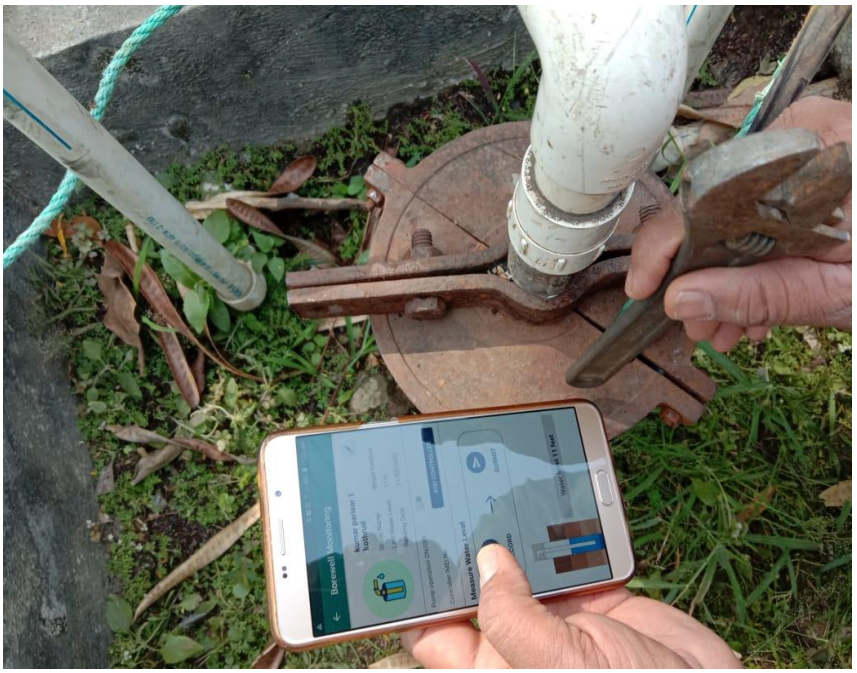
Waterlab addresses the issue of inefficient groundwater management through its Borewell Monitoring App 'Bhujal'. It is the first-of-its-kind multilingual app developed exclusively for monitoring water levels in borewells/boreholes. The app works on sonar technology and is non-invasive. The app has geotagging and geofencing facilities to generate useful data for specific borewells. It provides reports on borewell operations and performance, including a borewell life report for predicting the water availability in borewells. The observed accuracy of the app is ± 0.5 Feet.

Installation of borewell monitoring app

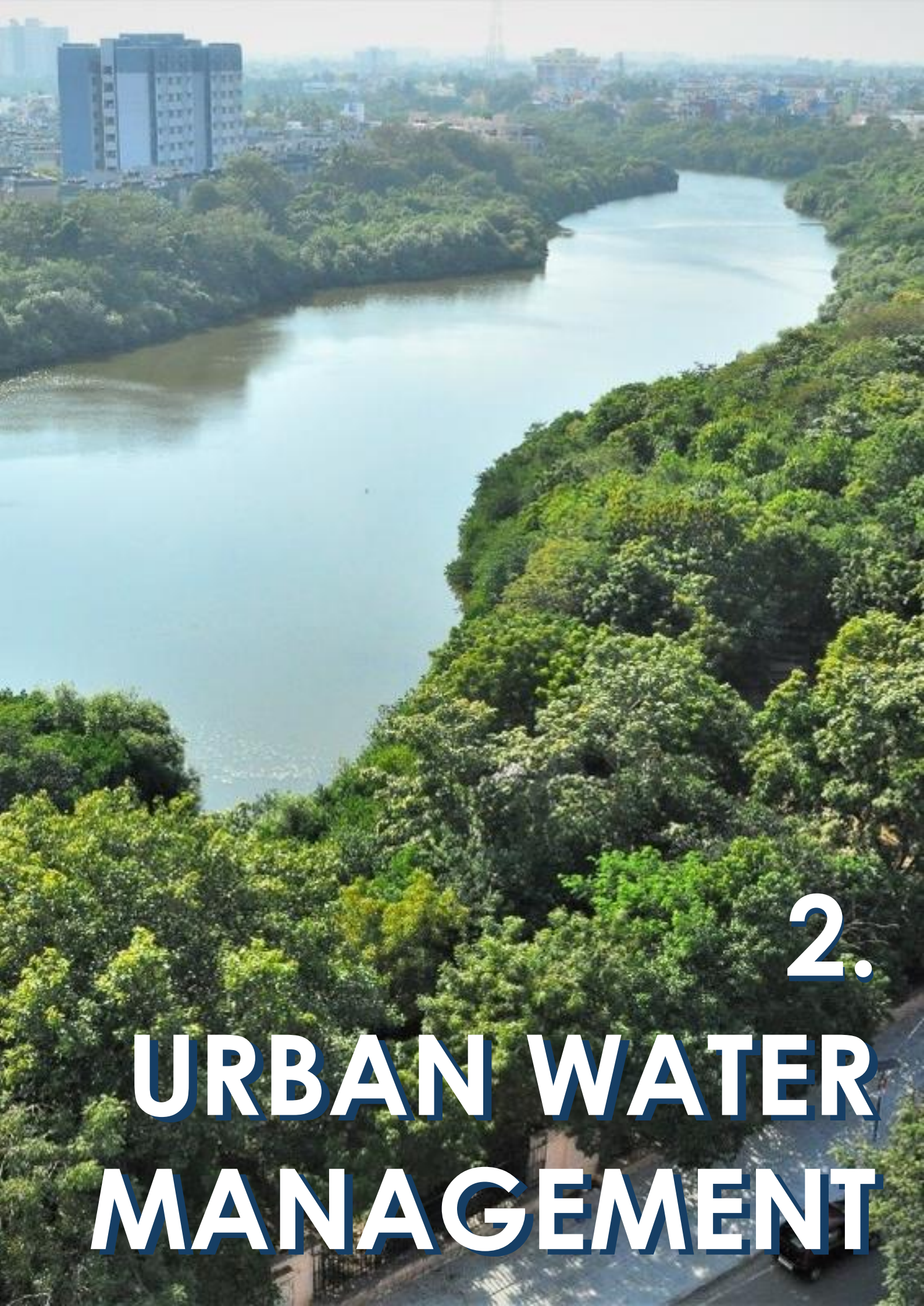
Implementation and Impact

The Central Ground Water Board has tested Bhujal, IIT Mumbai, State Ground Water Agencies in Maharashtra and Karnataka, and organizations like PAANI Foundation. It is currently being tested and validated for accuracy by the Central Water Resources Development and Management, Government of Kerala.

The Bhujal app is undergoing a pilot with the Swayam Shikshan Prayog (SSP) and Syngenta Foundation in Latur, Osmanabad, Nasik and Ahmednagar districts, with nearly 300 farmers. The app will also be piloted by Aga Khan Rural Support Programme for select gram panchayats in Bihar for monitoring borewells. In addition, Waterlab has been incubated at the National Institute of Agricultural Marketing (NIAM), Jaipur and has received a grant from the Ministry of Agriculture and Farmers Welfare.



Bhujal app – pilot with Swayam Shikshan Prayog and Syngenta Foundation



2. URBAN WATER MANAGEMENT

START-UP 26

Absolute Water

Founder

Smita Singhal

Challenge

In most villages and small towns in India, sewage flows untreated, either into the ponds and rivers or percolates into the groundwater. This leads to various waterborne diseases, agricultural contamination and environmental degradation.

Solution

AWPL addresses this major problem by providing 100% organic Water Recovery Decentralized System, which is simple, effective, affordable and can be operated by unskilled labour They have installed the country's first 100% Organic Sewage Treatment Plant that treats domestic sewage and converts it into clean water without the use of any chemicals and is non RO in nature in order to maintain the natural vitamins and minerals of water.

Decentralized water recovery system by Absolute water unit

Implementation and Impact

The AWPL Vermi-filter works on the principle of vermi-filtration where specially bred worm species and a mix of bacteria act on the suspended and dissolved solids in the raw sewage that leads to its biological degradation in an environmentally safe manner. Vermi-filtration and advance ozonation treatment are the two levels involved. While the former leads to the formation of clear and odourless water, the latter acts as an advanced disinfection treatment. They have three different variants designed and customized as per the availability of space and installation size.

Variant -1 Civil Based Plant – Capacity of 100 KLD – 2 MLD and a smaller footprint; meets space constraint issues.

Variant 2 – Modular Plant – Capacity of 20 – 50 KLD and powered by solar energy; suitable to cater to small villages, housing colonies and localised treatment plants.

Variant 3 – India's First Ever Compact & Mobile STP- Requires minimal site preparation and no civil work; ideal for construction works, remote sites and villages.

AWPL currently treats 4.2 million litres of wastewater per day and produces 115 tons of high-quality organic fertilizer every year. The treated water has multiple applications including horticulture, construction and flushing of toilets. These plants help mitigate leaching of the water pollutants thus containing disease and death by contaminated water. They provide access to clean and safe water for a population of 1 lakh people daily and contribute to significant increase in the water table across the country.

Absolute water – Turning sewage into drinking tap water

START-UP 27

AgroMorph

Founder

Dr. Akanksha Agarwal

Challenge

Most wastewater treatment systems are designed as centralised systems, which incur huge transportation and processing cost. Partial treatment of wastewater is common which can have implications for the ecology and public health. Hence, the need of the hour is to develop and adopt solutions that solve the problem at source, i.e. clean the wastewater at the source to an extent that it can be recycled back into the community for either domestic use or agriculture.

Solution

AgroMorph is a turnkey solution provider for wastewater management by developing a prototype to treat wastewater at the source using algae. They collaborated with the local residents and other start-ups in the ecosystem to set up a unit which controls the reactor design, reactor fabrication, algae cell bank management, unit installation and unit commissioning for better results.

Their technology can provide running tap water 24/7 to a community at less than Rs. 25 per KL for domestic applications. The quality of water from this technology is useful for the agricultural sector and, therefore, beneficial to farmers.

Key features of the innovation are low cost, odourless process, zero waste, chemical-free treatment, utilizing nutrients from wastewaters, carbon negative process allowing for CO2 sequestration and O2 release.

Treatment plant (top), Treated shrimp farm effluent (Bottom)

Implementation and Impact

Projects, Pilots/ Demonstration – Agromorph has piloted its solution with the Vadgaon Nagar panchayat in April 2022 with the support of ICCW (International Centre of Clean Water, IIT Madras) and the CSR grant from Akamai technologies. Through this pilot, ~2KL of domestic wastewater was redirected for gardening purposes using their zero chemical treatment method. The algal biomass thus generated has been assessed for utilization as a liquid fertilizer and for solvent extraction of bio-pigments.

Pilot demonstration of AgroMorph

START-UP 28

Agua Wireless Systems

Founder

Kanish Aggarwal

Challenge

Water infrastructure across Indian cities has multiple problems across the distribution network. These include non-revenue water losses, uneven distribution of water, outdated technology, high operation and maintenance costs, inefficient data collection mechanisms, and poor real-time water quality monitoring. Moreover, waste water frequently mixes with fresh water sources which poses health risks.

Solution

Agua wireless solutions designed and developed IoT solutions enabling Smart Water Management in urban, rural and industrial areas. The innovation enables automated water distribution, usage-based billing, water quality tracking and leakage detection in underground pipelines and tanks. In the households, the innovation enables water metering, quality monitoring, pressure monitoring, and distribution automation.

The hardware devices communicate wirelessly over RF and GSM modules and enable an extensive range of features like end-to-end monitoring and control of the water distribution infrastructure, real-time leakage detection, slab-based billing for individual consumers, and an alert system to notify the user when they are about to breach slab threshold. It also alerts the water utility in case of unpaid bills, meter tampering, leakage detections and sensor failures. Bills are generated, and collection is enabled from an easy-to-use Mobile app/SMS service, which ensures that the supply is based on actual demand, and the pipeline pressure is maintained.

The AI-based system helps create user water profiles and predicts demand at a street, locality, or city level. Their wireless SCADA system enables remote monitoring, device control, analytics and geotagging of water assets.

Implementation and Impact

The Quota based distribution in a village near Bhubaneswar, Odisha, which impacted 38 households, is a notable project which ensured equitable distribution and achieved leakage detection in underground pipelines and eliminated potential non-revenue water losses.

The project on Sewer Line Monitoring system, Beawar, Rajasthan is ongoing and uses solar-powered sensors, to monitor 45 manholes by detecting the debris accumulation which obstructs the sewage flow and alerts the authorities in time, thereby preventing potential flood hazard in case of heavy rains.

START-UP 29

Arion Techso

Founder

Devan Kumar Chheda

Challenge

Urban areas in India are plagued by significant challenges related to water leaks, exacerbating existing demand-supply imbalances in water resources. The lack of real-time monitoring of water parameters hinders the detection of leaks, leading to substantial water losses and compromising conservation efforts, especially in regions already facing water stress. Furthermore, the inability to accurately forecast demand for water exacerbates the problem, impeding the development of necessary infrastructure to address growing urban populations. Additionally, the absence of live data on electricity parameters further complicates the issue.

Solution

Arion Techsol Pvt Ltd offers IoT-based smart monitoring solutions for live and wireless monitoring of water levels in tanks/ESRs/GSRs, water quality parameters, total water flow, and electricity units consumption, alongside current and voltage levels. This initiative provides decision-makers in urban local bodies, nagarpalikas, gated communities, industrial units, institutional bulk users, and bulk suppliers of water and electricity with live data on these parameters. By offering comprehensive visibility into the entire water supply chain and electricity usage, this solution enables decision-makers to make informed and effective decisions regarding water and electricity management.

Implementation and Impact

Arion's solution has not only been successfully implemented in Nagarpalikas and Municipal Corporations but has also extended its benefits to a cluster of textile units. This implementation empowers the water department to conduct comprehensive audits of water infrastructure, assessing both water and electricity usage. Beyond ULBs, the solution provides live data and reports on critical parameters essential for optimizing water usage, minimizing non-revenue water (NRW), monitoring water quality parameters, water budgeting, and forecasting water demand. Additionally, it aids in monitoring electricity units consumption and preventing pump/motor failure due to current/voltage fluctuations. This holistic approach enhances operational efficiency, promotes resource conservation, and ensures sustainable management of water and electricity resources..

START-UP 30

Avan Tech Innovation

Founder

Boyina Anusha

Challenge

Recent statistics reveal a concerning trend of rapidly declining underground water levels across India. This alarming phenomenon highlights a looming crisis in water resource management. The depletion of underground water reserves poses severe threats to agricultural productivity, industrial operations, and overall socio-economic stability. Furthermore, the diminishing groundwater levels exacerbate the risk of drought, particularly in regions reliant on groundwater for irrigation and domestic water supply. Urgent measures are imperative to address this critical issue, including sustainable water conservation practices, efficient irrigation techniques, and strict regulations on groundwater extraction. Failure to mitigate this trend could lead to dire consequences for India's food security, economic development, and environmental sustainability.

Solution

Avan Tech Innovation’s flagship, an Automatic Water Level Control Unit, merges a starter and Automatic Water controller controls motor based on the Water levels in the Water tank, So no Water overflowing problems which results conserving lakhs of litres and power per household. Even though from the last two decades these type of products available in the market but it was not reached to the people in respective of time because of its failure since they are Electronic and imported material which has no spare parts available in India and so many other reasons for not promoting in India. So we developed this product such a way to resolve all above problems and other than the water saving it has many unique features. For this reason our Technology was Patent granted in India and having one design patent grant, it's a game-changer in under water conservation. We have developed another Patent granted product i.e Compact Electromagnetic Push switch assembly which conserves 50% of Plastic. Our product showcases Avan Tech's commitment to innovation and environmental impact.

Implementation and Impact

Avan Tech's journey is punctuated by pivotal milestones, from developing the patented Automatic Water Level Control Unit to its successful commercialization. Collaborating with Aic-Sku for incubation, gaining guidance from Kalam Dream Labs, and securing patent filing support from NRDC showcase the company's comprehensive approach. Avan Tech's impactful strides in water conservation have earned five National wide awards and one international accolade from esteemed organizations like Action for India, JagrithiYatra, Aic-Sku, HDFC, and IFIA (International Federation of Inventors, Geneva), validating the technology's effectiveness and societal impact. Looking forward, Avan Tech Innovarion focuses on R&D-IPR-Commercialization, envisioning an expanded product line to address diverse global water conservation challenges. Having saved 9 billion litres through the sale of 1800 units till now, Avan Tech Innovation is poised to lead in environmental technology, making a lasting impact on global water sustainability.

Product images: Jalraksha Automatic Starter for Submersible and monoblock Motors

START-UP 31

Bariflo Labs

Founder

Mrutyunjaya Sahu

Challenge

Contamination of the surface water bodies and overexploitation of groundwater due to domestic, agricultural, and industrial activities have led to severe water stress in urban and rural areas. Climate change has exacerbated the issues. In addition, a lack of scientific understanding of the degradation of the water bodies, and poor adoption of intervening technologies by farmers, have led to an increase in the operational and capital maintenance expenditure of farmers and contractors who depend on agriculture for their livelihood.

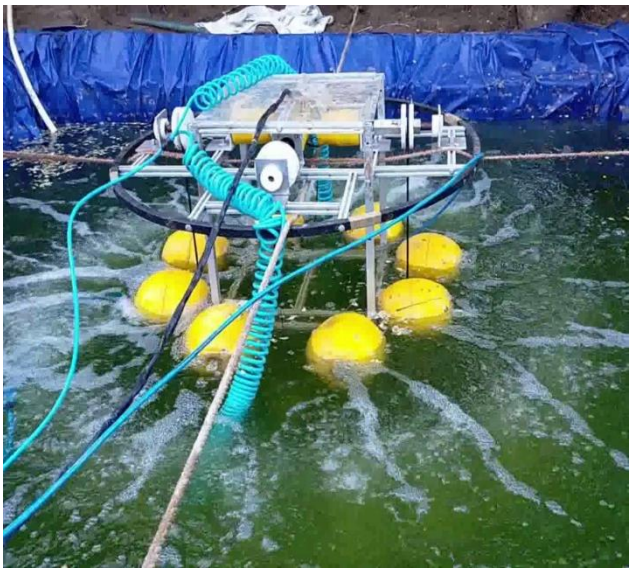
Solution

Bariflo Labs has developed a patented solution called the Diffused Flapping Sediment Aeration Device. The device diffuses air at the sediment level where most waste and aquatic species shelter and helps maintain dissolved oxygen at the sediment oxygen boundary layer. In addition, the intelligent mobile monitoring device provides data across the waterbody along the water column and sediment-water interface to identify practical problems. It can predict critical water quality parameters for the aeration, feeding and nutrient control process. Their mobile feeding/nutrient control system feeds the carp or controls nutrients based on the need. Further, the data gathered by these systems are provided to stakeholders as an alert so they can manage the farm at their fingertips. The application also has an automated weed cleaning device that manoeuvres and collects garbage and water weeds.

Diffused Flapping Sediment Aeration Device

Implementation and Impact

Bariflo labs have implemented the solution at Badbil, Keonjhar Odisha and in the mining-affected water bodies at Angul District, Odisha. In addition, during the harvesting process, carbon and water security credits are generated. The marginal farmers are incentivized through their block chain data framework by selling them to the carbon-rich industry. The impact is that this innovation recreates the biodiversity and creates employment for at least ten per water body. It sequesters carbon and also helps in the reversal of climate change.



Integrated water body management system

START-UP 32

BAYESIAN WAYS

Founder

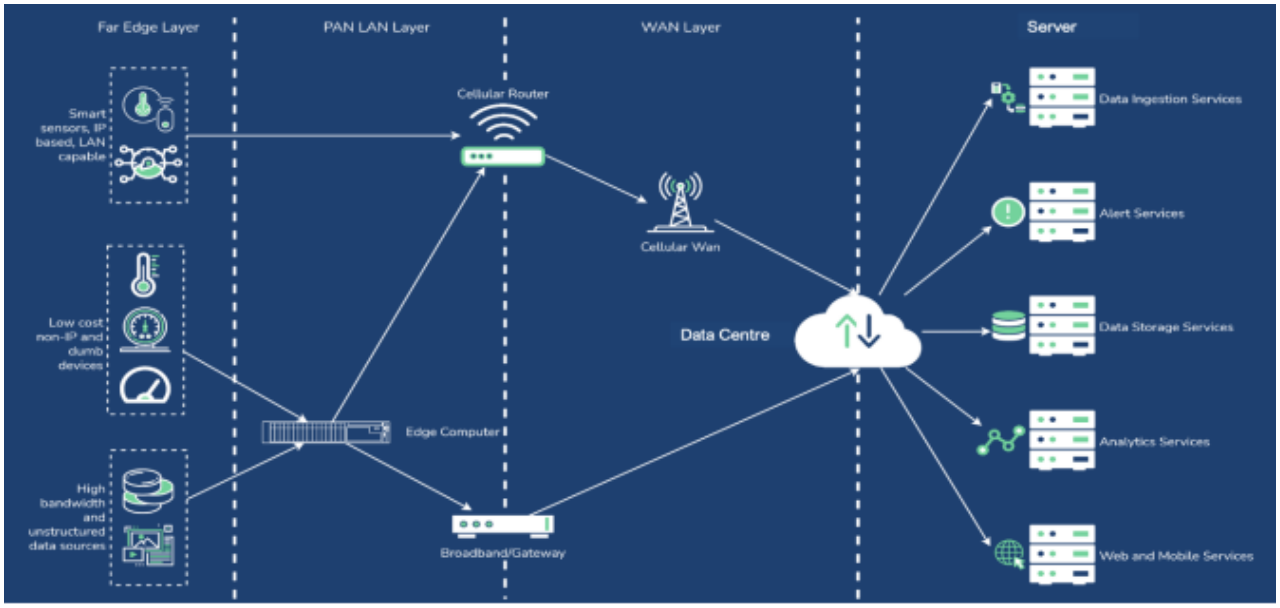
Rajesh Pillai

Challenge

Optimizing energy use in water management systems, particularly in pumping stations and water treatment plants, presents a significant challenge due to the high energy demands associated with these facilities. Pumping stations require large amounts of energy to move water through pipelines, especially when overcoming elevation differences or long distances. Similarly, water treatment plants consume substantial energy for processes such as filtration, disinfection, and chemical treatment. The need for continuous operation further exacerbates energy consumption, leading to significant operational costs and environmental impact. Additionally, outdated infrastructure and equipment may lack energy-efficient technologies, making it difficult to achieve substantial energy savings without costly upgrades or retrofits.

Solution

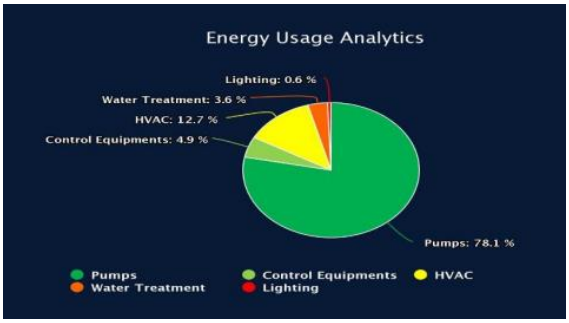
Bayesian Ways introduces the Anumana platform, leveraging data analysis and machine learning to enhance water treatment and distribution management systems' efficiency. By harnessing data collected through Water SCADA systems, the platform focuses on improving operational efficiency, leading to better fund utilization, increased productivity, and proactive equipment maintenance to reduce unexpected downtimes. The solution features an interactive dashboard, offering a user-friendly interface that consolidates key information for comprehensive system understanding. With five key steps including data collection, equipment monitoring, data storage, analytical engine, and dashboard presentation, the platform enables water accounting through data analytics. This approach optimizes operations, identifies problems, and facilitates informed decision-making in water management.

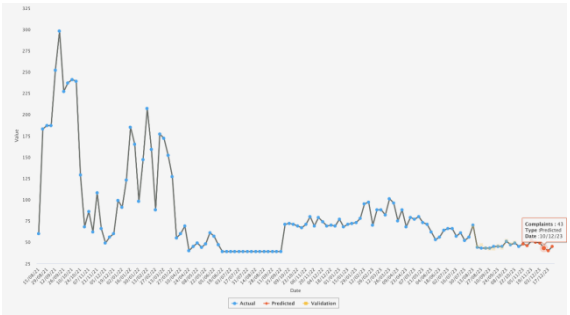


High level solution diagram

Implementation and Impact

The implementation of IoT devices, equipment monitoring systems, data storage, and analytical engines promises enhanced efficiency in water management, with easy replicability across Indian cities. The pilot program, situated at the 73 MLD water treatment plant in Kerala, aims to achieve several benefits. These include improved fund utilization, anomaly detection to preempt operational issues, attainment of sustainability goals through optimized energy consumption, scalability across regions, and automated reporting for informed decision-making. This comprehensive approach ensures better performance, reduced downtime, and cost savings while advancing sustainability objectives.





Sample chat showing water demand

START-UP 33

DBD Water Systems

Founder

Santosh Bendkhale

Challenge

Water is a depleting but essential resource. Therefore, it must be conserved and managed efficiently for a sustainable future. Informed water consumption is significant for conserving and managing water resources. However, tracking water usage at a granular level and using the data for the planning process is currently weak. An easy cloud-based solution that measures water usage and provides timely alerts is the need of the hour.

Solution

DropbyDrop Water Systems built and established a cloud-based platform named DropByDrop (DBD) in Feb 2018 to address the burgeoning need for an efficient water management system.

DropByDrop (DBD) is a Hardware, vendor-neutral, multi-protocol compatible, cloud-based Smart Water Management Internet of Things (IoT) Platform. The platform allows the water management system to acquire, store, bill and analyse water-meter data to enable system control and consumer satisfaction. Water management control is executed by providing the users with protocol-independent metering, detailed billing, multiple payment options and a dynamic analytic view.

DropByDrop platform can be easily integrated with existing and new smart water management systems in municipalities, smart cities, industrial & commercial buildings, residential apartments, gated communities, and irrigation & agriculture.

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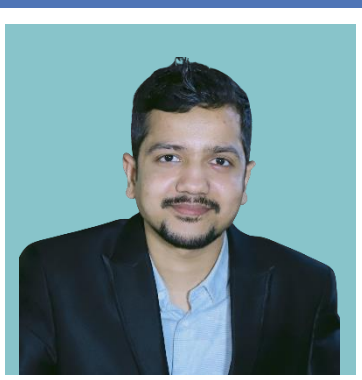
Implementation and Impact

DBD water systems have installed the DBD platform under the Trivandrum Smart city Limited Smart water project by NEC in Kerala. The project provided smart water meters and control valve supply with Integrated Command and Control Centre(ICCC) and billing integration. Under National Jal Jeevan Mission, DBD implemented projects in Haryana, Rajasthan and Manipur for efficient data management. In addition, around 665 smart meters were installed for individual water consumption at Bhuvana Green, Bangalore. In Tashkent K-Water Project, the DBD Platform was used for data collection with App and provided wireless water meters.

Installation of DBD water systems at various places

START-UP 34

Environheal Research Industries



Founder

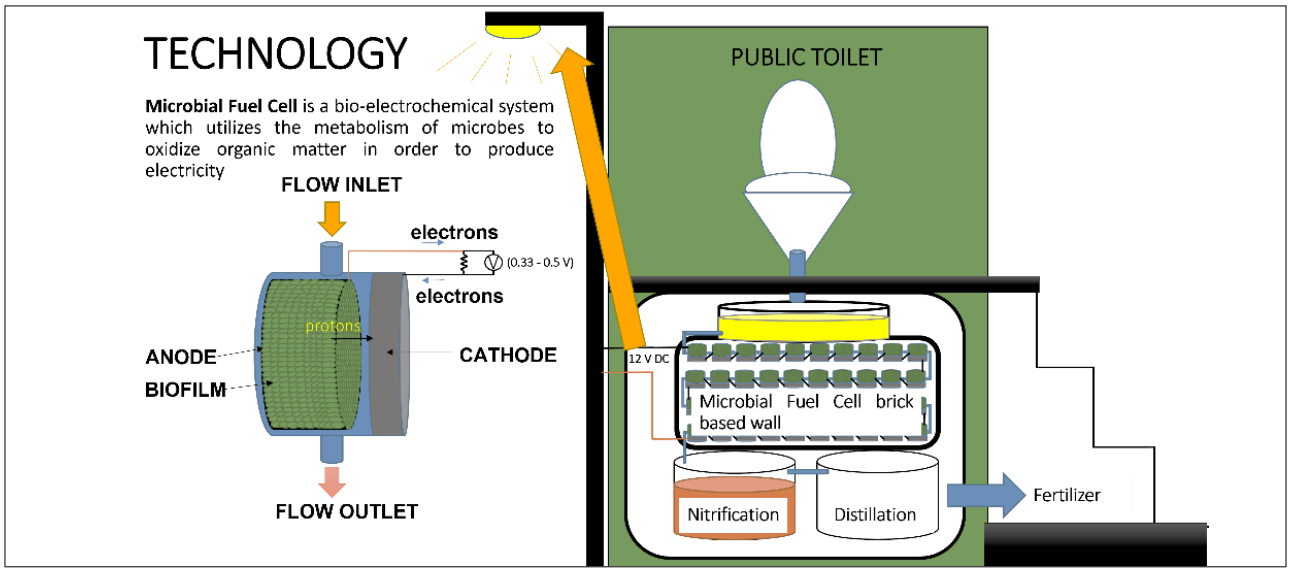
Rahul Kandpal

Challenge

Public urination contributes to the unhygienic conditions in Indian cities. Urine contains 95% water and lots of unutilized compounds, and their recovery is needed. Approximately 1725 MLD urine is wasted daily in India! Similarly, discharge from public toilets and households creates environmental and public health issues. The current technologies for the treatment of black water and faecal sludge/septage require a massive amount of chemicals, an intensive workforce, and energy which are not sustainable. Therefore, there is a dire need for cost-effective alternate technology that must be more efficient and environmentally benign.

Solution

Environ_Heal developed a system that includes improvised urinals using Microbial Fuel Cells (MFC). The MFC-treated urine is used as flush water, manure for roadside trees, and as an input for small amounts of electricity.

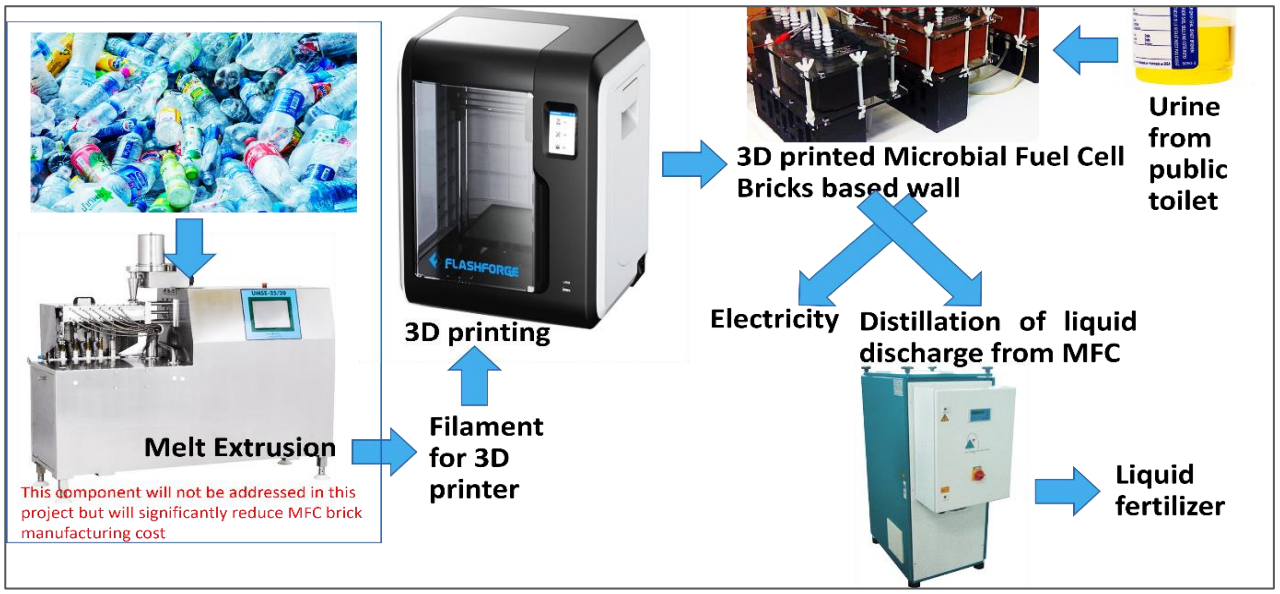


Microbial Fuel Cell technology

MFC are sustainable and green energy sources that can convert the chemical energy of organic matter in the wastewater into electricity. Environ_heal implemented this technology in the form of an MFC brick. MFC bricks can be used to replace walls of the parking spaces present in existing housing societies, public offices etc., for the onsite and extremely decentralized treatment of wastewater from toilets. The miniaturized individual MFCs inside the brick, when combined in a stacked MFC system in the form of a wall, lead to higher values of global electrical power output. Additionally, the space required for the wastewater treatment process has been solved, and the burden of existing sewage treatment plants has been reduced. The point sources of domestic water pollution are being eliminated, resources recovered, and this innovative technology has reduced the burden of existing sewage treatment plants to make our cities truly circular.

Implementation and Impact

The system is an energy-positive wastewater treatment that can work in high salinity over a long pH range, producing less sludge and water recovery. Environ heal technology assists in resolving some of the industry's most challenging wastewater management issues. For example, the Environ heal technologies can be used in food and beverage units, petroleum industries, armed forces to treat scattered wastewater on border side outposts and other military locations, textile Industry for dye degradation etc. In addition, the technology provides a solution to convert existing public toilet infrastructure into a resource-generating platform. Environ heal is also working towards the extreme decentralization of waste treatment and resource recovery for circular homes and cities. The first 500 L pilot scale reactor will be set up in Gurugram, Haryana.



START-UP 35

EyeNetAqua Solutions

Founder

Kamalesh Chaudhari

Challenge

Water quality monitoring (WQM) is essential for ensuring the portable tap water. However, capital-intensive solutions for WQM and the higher cost of the sensors are significant limitations in implementing the real-time WQM solutions at a large scale. Ideally, the WQM should be implemented at the household level. Management of water supply infrastructure from a central location also needs data monitoring from each source and consumer point for better decision-making. Awareness creation at the consumer end and alert systems are also necessary for ensuring water quality.

Solution

EyeNetAqua Solutions solved the issue by innovating and demonstrating a real-time "Smart water supply measurement and monitoring system, " an IoT-based WQM monitoring system with technologies for low-cost indigenous sensing solutions. It was implemented in 13 villages in the Ambala district of Haryana. Based on the experience and the requirements, they have developed a less capital-intensive WQM solution. The solution will also be a validation platform for indigenously developed low-cost sensing solutions. The key features of the unit include modular construction, solar-powered function, adaptability to most of the sensor interfaces available in the market, upcoming in-house sensors, which will reduce the cost of the unit several folds and a configurable dashboard with data analytics.

Installation of IoT based Water monitoring systems

Implementation and Impact

The real-time water quality monitoring unit was installed at the source location (Tubewell) in Jawahargarh, Haryana. In the subsequent projects at Rampur and Haryoli, Ambala, the units were installed at both the source and consumer nodes.

EyeNetAqua has been the 2nd runner-up in the Information Communication Technology (ICT) Grand Challenge organized by the National Jal Jeevan Mission in partnership with the Ministry of Electronics & Information Technology (MeitY). The award was for developing a product per the NJJM specifications for measuring pH, TDS, Residual chlorine, Nitrate, pressure and water flow volume. This product has been deployed at thirteen villages in the Ambala district of Haryana. The funding support required for product development and demonstration of the product in the field conditions was provided by organizers (MeitY and NJJM). Continuous water quality monitoring data these units communicate is available at the Ejalshakti portal.

The data from these units are helpful in monitoring and ensuring daily LPCD for the households in villages. However, the solution's cost depends on the site-specific requirements, power, automation of surrounding infrastructure, quality and durability of sensors, and the type of communication protocol.

Real time water monitoring unit

START-UP 36

Faclon Labs

Founder

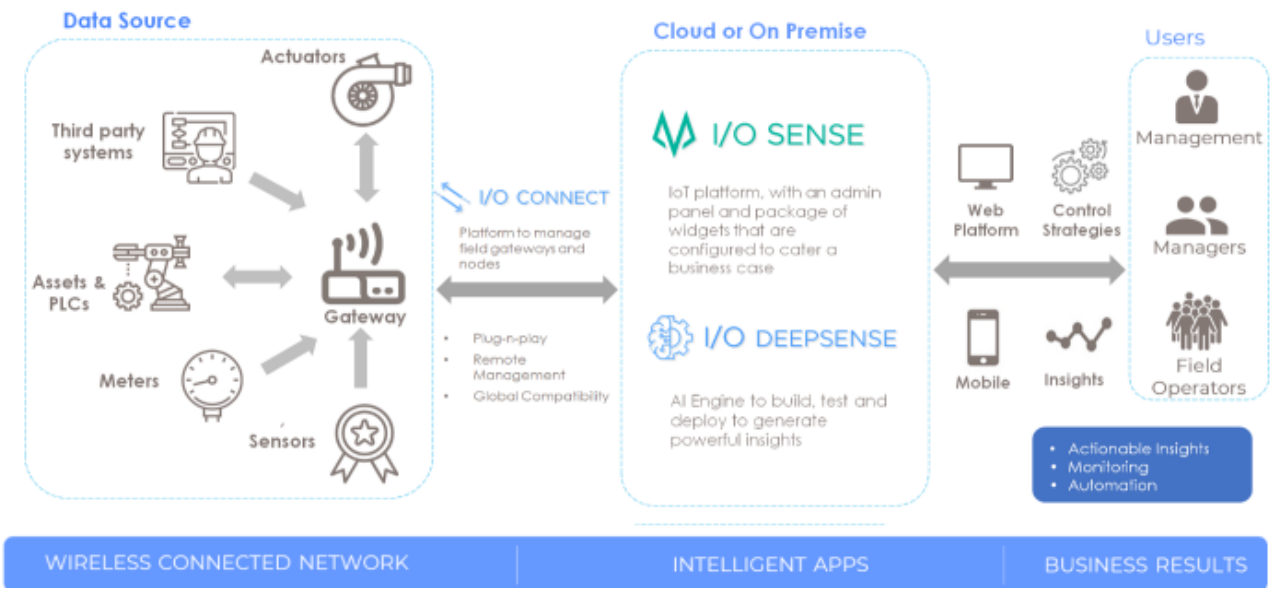
Archit Naraniwal

Challenge

In urban areas, Sewage Treatment Plants (STPs), Effluent Treatment Plants (ETPs), and Water Treatment Plants (WTPs) play a vital role in purifying wastewater before it's discharged or reused. Yet, managing these facilities presents significant challenges. Manual controls add complexity, while high maintenance costs strain budgets. Additionally, relying on workers to detect issues with essential equipment such as pumps and motors can lead to delays and breakdowns. Addressing these challenges requires innovative solutions to streamline operations, reduce costs, and enhance the reliability of urban water supply systems.

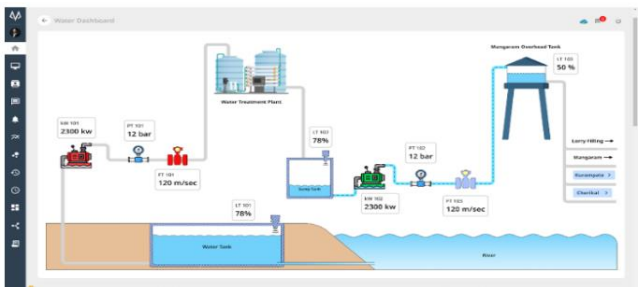
Solution

IO Sense is an AI platform designed for infrastructure digitalization, offering a holistic solution to track, measure, monitor, and optimize operational expenses, promoting sustainability. Through sensor deployment, real-time data is provided, enabling analytics to pinpoint underperforming assets and infrastructure. Advanced machine learning-driven analytics predict potential issues, fostering proactive maintenance strategies and reducing downtime and costs. Our IoT platform enables remote monitoring and control, ensuring prompt issue resolution. Emphasizing preemptive identification of breakdowns and efficiency KPIs, IO Sense aims to cut maintenance costs and enhance operational efficiency across water utility bodies, promoting agile and responsive water treatment management.



Implementation and Impact

IO Sense's significant impact on water utilities in India and Malaysia, particularly in managing pumping stations and treatment plants, is evident. Successful implementations under AMRUT and the Jal Jeevan mission in India have enhanced operational efficiency, emphasizing proactive pipeline flow monitoring. The platform's influence extends to the industrial sector, with automation and predictive maintenance benefiting companies like L&T, Hindalco, and Escorts Kubota, resulting in improved reliability, reduced downtime, increased productivity, and cost savings. IO Sense's versatility and effectiveness in diverse applications underscore its transformative role in monitoring, automation, and predictive maintenance across utility and industrial sectors



Dash Board

START-UP 37

FluxGen Sustainable Technologies

Founder

Ganesh Shankar

Challenge

The overall water demand is expected to exceed the supply twofold by 2030 (Niti Aayog). In addition, increased urban migration exacerbates the need for water in cities. Furthermore, water pollution and depleting groundwater due to over-extraction add to the problem. Therefore, judicious utilization of available resources by adopting an inclusive, integrated technological approach to water management is necessary.

Solution

FluxGen helps cities and townships to monitor their water service delivery standards in real-time with advanced water metering infrastructures and provides data to make appropriate and timely decisions. They also offer awareness on water consumption patterns and help target net water zero projects.

FluxGen's AquaGen, a patented Innovation platform, is a wireless, IoT-enabled water management system that periodically generates prescriptive and predictive notifications based on water consumption patterns. AquaGen users can view data through a customizable Graphical User Interface over a web browser or mobile app. The Mobile Application notifies users over the Internet and makes data available over the cloud for remote access. Analytics of AquaGen can be assessed from anywhere, at any time. AquaGen is designed to - measure and analyze water consumption in manufacturing units, identify inefficiencies in water consumption, and measure the "true cost" of water at various points, including energy cost. In future, the "true cost" modelling will include chemical and material carrier costs, process costs, etc., ensuring savings for concerned industries. AquaGen helps to digitize the water infrastructure in Commercial facilities, Campuses, Industries and Residential Sectors. It is compatible with any digital sensors and devices available in the market and acts as a hardware-agnostic cloud connector. It uploads water data from pipes, sumps and overhead tanks in real-time.

Implementation and Impact

Understanding that each city requires varying quantities of water, FluxGen provided customized consumer applications to their clients in the segments they cater to, like Fast Moving Consumer Goods(FMCGs), Dairy industries, Cement Manufacturing, Mining, Textile & Dyeing Industries. The solution has been deployed in 40+ locations pan-India. It is actively monitoring more than 250 MLD of water enabling the facilities to save up to 30% of water consumed in the region and leading to considerable energy savings.

The level monitoring solution provides seamless integration with the bore well to monitor the level of the water in it and also the quantity of water extracted. End-to-end water management digitizes the entire infrastructure and reduces the industry's overall water footprint. FluxGen has formed ecosystem partnerships with the Confederation of Indian Industries (CII), Project Amplify program (in collaboration with Microsoft & Accenture), CISCO Launchpad, Deshpande Startups, Institute of Engineering & Technology (IET India), and Leap Cities to create a water positive ecosystem.

START-UP 38

Greengine Environmental Technologies

Founder

Nitin Srivastava

Challenge

Indian Industries consume around 10-13% of water. However, there is no continuous monitoring or data logging of water production and consumption. Water wastage occurs without set benchmarks for water consumption in various process and utility areas, increasing the water footprint. Upstream wastage leads to more effluent generation and decreasing treatment efficiency. In addition, low-quality discharge from industries affects the nearby aquatic ecosystem. Current gaps in the industrial infrastructure are mainly in water and effluent monitoring and data logging.

Solution

G-Water-i is a 24 x 7 IoT-based decision support system for conserving water and monitoring other critical water parameters in industries through real-time data analysis from various sensors at critical nodes within the entire industrial setup. The solution significantly helps conserve water for industries, supports monitoring and decision-making with plant data and analytics, reduces effluent generation & improves the aquatic ecosystem. It enables a web portal to view real-time data/reports, understand trends and share. It supports efficient operations with its compatible hardware, easy installation, low setup and subscription costs.

G- Water- I – 24 * 7 digital water management system

Implementation and Impact

The pilot was carried out at a large-scale Tannery in the Kanpur region, where five devices were installed to capture real-time data at critical nodes to reduce water consumption. The system is rugged and has been functioning well for the last two years and has supported the client in conserving water in their process (basis industry benchmarks) and acted as a monitoring tool.

G- Water- I – digital water management system

Jaljeevika
Water for Livelihood, Water for All
www.jaljeevika.org

START-UP 39

Jaljeevika Infotech

Founder

Neelkanth Mishra

Challenge

The lack of livelihood opportunities in the agri-allied business is a major constraint for many marginalised communities. The main bottleneck is, poor maintenance of fisheries and aquaculture in cities due to various factors like the lack of knowledge on innovative, locally suitable aquaculture technologies, better management practices (BMPs), lack of required quantity of locally produced quality fish seed and input supply, and lack of skilled manpower for fish seed production and fish farming. The supply chain cost is also increasing substantially making it unaffordable for the poor to venture into this business.

Solution

Jaljeevika provides an affordable backyard recirculatory aquaculture system, to produce high valued fish as backyard system. The system provides employment opportunities through promotion of the micro-entrepreneurship model. An affordable RAS system requires much less water and power than a traditional aquaculture system, thus reducing the water footprint in producing fish.

Affordable backyard recirculatory aquaculture system

Implementation and Impact

The Solar operated, affordable recirculatory aquaculture system to produce high valued fish as backyard system requires 600-800 square feet of land area and each tank needs only 15000 Lt. water. The water needs replacement up to10% over 3 days. Each tank produces 400-500 kg of fish in each cycle. Yearly two cycles of production can be leveraged using mini RAS system. Solar power reduces electricity cost.

The project is established in Alirajpur, Madhya Pradesh and Supaul, Bihar. In Alirajpur, Madhya Pradesh, total of 120 women are employed with the support of SRLM, Madhya Pradesh. It also helps in ensuring higher and safe nutrition in fish-eating households.

Affordable backyard recirculatory aquaculture system

START-UP 40

Kephi Innovations

Founder

Pavan Kumar Pabba

Challenge

India accounts for more than 10% of fish stocks and ranks second in total fish production. The aquaculture market is valued at $17 billion, with fish accounting for 92 per cent of production output. The traditional aqua farming process is usually done in ponds which contain stagnant water. In the process, the amount of carbon dioxide in the water increases due to the respiration of fish. Carbon dioxide, thus released, reacts with water and forms carbonic acid, decreasing the pH level, making the water acidic. The aquafarmer uses lime to neutralize the water in such situations. However, the lime reacts with carbonic acid and precipitates calcium carbonate to the bottom of the pond. The continuous addition of lime decreases the soil fertility and slowly the land becomes barren. Such phenomena are hazardous to both environment and the ecosystem.

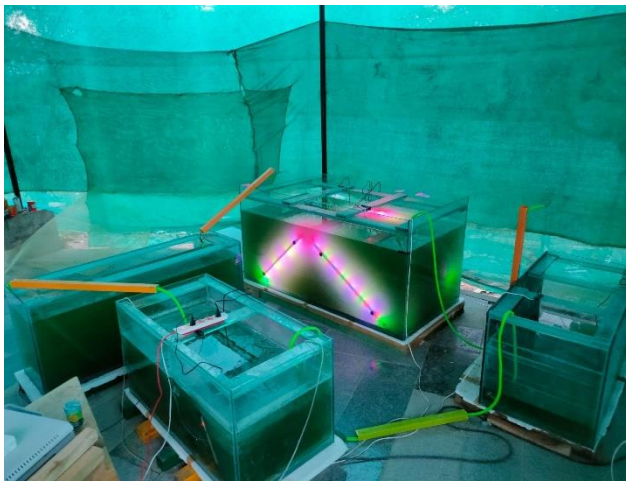
Solution

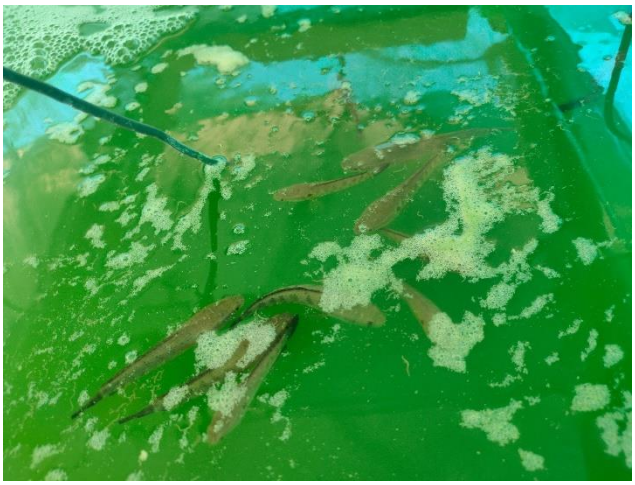
As a substitute for lime, Kephi has introduced Spirulina algae. It can ensure that the water quality meets aquaculture's criteria. However, algae can become a hindrance if it develops directly in the ponds. As a result, a novel method has been devised for growing algae in a controlled environment utilizing a Photobioreactor. This artificial photosynthesis mechanism resembles sunlight to induce photosynthesis. The water containing carbon dioxide flows through a photobioreactor, where it is mixed with algae and then released back into the fish tank after filtering. Then, the carbon dioxide is substituted with oxygen, and the process is repeated. Fish excreta is a nutrient for algal growth, and algae is a food source for fish. The solution is eco-friendly and creates a biological loop between the algae and the fishes. This solution replaces the cost of lime and fish food in the traditional aqua farming system.

The entire system is based on an IoT platform that continuously monitors and transmits data from all parameters to a central server. As a result, it also leads to a faster pace of growth and higher output.

Implementation and Impact

META-Center for Ponics at - Hyderabad Institute of Technology and Management, Telangana, implemented the solution. Kephi Innovations Private Limited is currently Incubated at HIIC(HITAM Innovation and Incubation Center)- Hyderabad Institute of Technology and Management, Telangana. An initial prototype was made, which went into several iterations to finalize the proof of concept. The entire setup costs 25 Lakhs, including R&D and civil structure and HIIC entirely funded it.

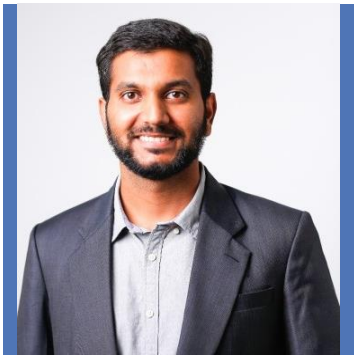




META Center for ponics at Hyderbad, ITM

START-UP 41

Kritsnam Technologies



Founder

Vinay Chataraju

Challenge

There is limited genuine data available for large-scale decision-making in India for river management to household water usage. One of the key reasons for such a poor situation is the lack of dependable instrumentation. In this context, there is a critical need for low-cost, low-power consuming, field robust, and IoT-enabled instrumentation that acquires data remotely and builds decision support systems.

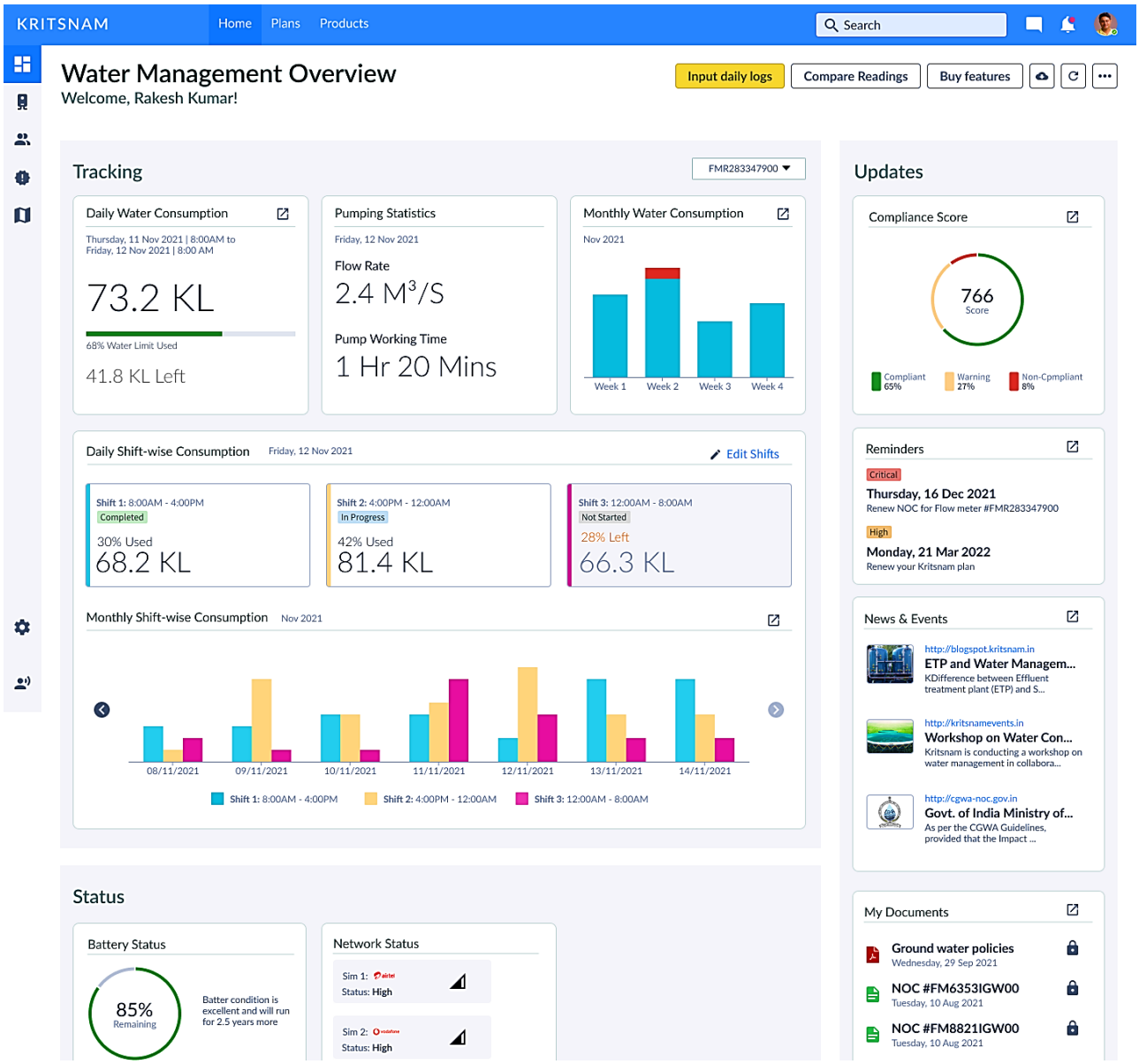
Solution

The instrumentations required for data collection can be standard for multiple use cases with minimum customizations. Hence, Kritsnam technologies choose to build a tamper-proof flow meter entirely independent of external power sources and can plug the data into the cloud from remote locations for easy analysis.

Dhaara Smart Ultrasonic Flow Meter is one of the most advanced flow meters ever built for governance purposes. The battery-operated tamper-proof flow meter has in-built IoT and is built for long-term unattended pipe flow monitoring from remote locations. The device is ISO4064 certified for performance from FCRI, Palakkad and is fully weatherproof with an IP68 rating. The data from the flow meters are secured in the cloud, and the users shall have private access through web and mobile apps to easily view and interpret the data. In case of unexpected events, the users will be alerted. The product is available in sizes 25, 40, 50, 65, 80, 100, 150 and 200mm diameters. It is best suited for three applications - groundwater abstraction monitoring, water network monitoring and automatic billing for bulk consumers.

Implementation and Impact

Kritsnam has deployed more than 1000 smart flow meters on the field, with more than 90% installations for groundwater abstraction metering for various industrial and commercial users. They have received grants worth 2 Crores+ from multiple governments and private agencies such as MHRD, DST, IIT Kanpur, DST, BIRAC, Villgro, Social Alpha, Ericsson, Scotland India Impact Link and others to implement the project. The product's unit cost varies with the meter's size and ranges from Rs. 30,000 to Rs. 75,000. The extensive abstraction of data across the country helps understand groundwater source sustainability in the regions.



START-UP 42

Kumbhi Kagaz

Founder

Rupankar Bhattacharjee

Challenge

The water hyacinth is a weed, a parasite that can duplicate itself every nine days. Due to its fast-growing nature, the weed quickly spread across most of the wetlands in India. It covers the surface layer of the water body and blocks sunlight from entering, automatically degrading aquatic life. Aquatic animals and plants die due to a lack of oxygen as water hyacinth releases excessive carbon dioxide and methane. In addition, it clogs waterways and water bodies, making them a breeding ground for mosquitoes. It affects irrigation directly and causes socio-economic problems for the communities dependent on the wetlands for their livelihood.

Solution

Kumbhi Kagaz makes natural, chemical-free handmade papers out of water hyacinth, replacing the traditional wood to make pulp. Handmade papers reduce the dependency on trees for paper and reduce discarded paper waste, which, if not recycled, contributes to 26% of the solid waste. The product not only aids the ecological restoration of the wetland but also gives alternative livelihood opportunities to the communities dependent on the wetland. Some of its key features include:

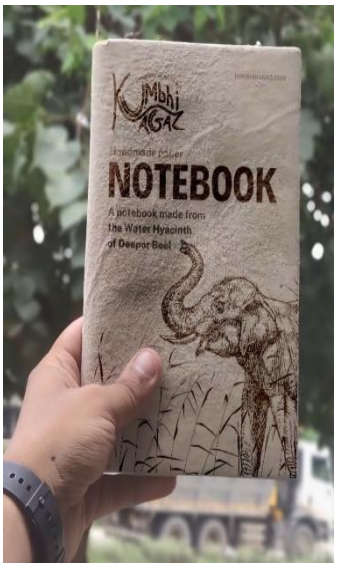
- Blot free
- Premium quality, stronger and efficient paper
- Printer-friendly and resistant to chemicals
- Eco friendly
- Cheaper pricing

The product is aimed at wetland rejuvenation with a focus on providing alternative livelihood to the communities who depend on the wetlands. It will give them livelihood and teach them a lifelong skill of removing Water Hyacinth contributing to safe environment.

Implementation and Impact

The pilot project is implemented in the wetland of Deepor Beel, a RAMSAR site in Assam. The water Hyacinth is procured from Deepor Beel, and two people from the local community are employed in production. The project is revenue positive with the first batch of orders from the Assam Forest Department. The current cost of the pilot project is around 16 Lakhs for establishing a fully functional facility with machinery and equipment.

Environmentally, if 10 tonnes of Water Hyacinth is removed in one month, it could give space for local species to thrive and induce back better fishing efficiency in the wetlands. Kumbhi Kagaz started its journey by winning the Zero Waste Cities Challenge organized by WasteAid and the TIDE 2.0 Startup Competition organized by Downtown Venture Labs.



Products of Kumbhi Kagaz

START-UP 43

LimelightIT Research

Founder

Tarun Purohit

Challenge

The Indian subcontinent faces an acute shortage of fresh water leading to water scarcity and depletion of groundwater levels. India's most significant challenge in urban water planning are the knowledge gaps and lack of data on water usage, whether at the source or the at the consumer level. No government agency has accurate and real-time data on water usage in urban-rural and industrial areas, leading to inaccurate water management. The need of the hour is accurate metering to assess water usage such that there can be a precise analysis of where water wastage can be reduced, and we can move to a water-based economy.

Solution

LimelightIT is a deep tech IoT hardware start-up with its proprietary IoT hardware platform to develop low-cost yet highly secure and customizable solutions. They have developed an indigenous electromagnetic flow meter at low cost, which accurately collects real-time data on water flow and usage, and detects leakage and usage pattern data at household and industrial levels.

The solution is a network of NB-IoT-enabled electromagnetic water flow meters. These water flow meters have been completely developed in-house, including the sensing element, the embedded hardware, and the IoT enablement. The solution comes with a companion dashboard that provides machine learning-enabled analytics on water usage and how it can be saved for various use cases. In addition, the hardware and the firmware have been completely indigenously developed so that there is absolutely no dependency on foreign imported water flow meters.

The solution has three parts:

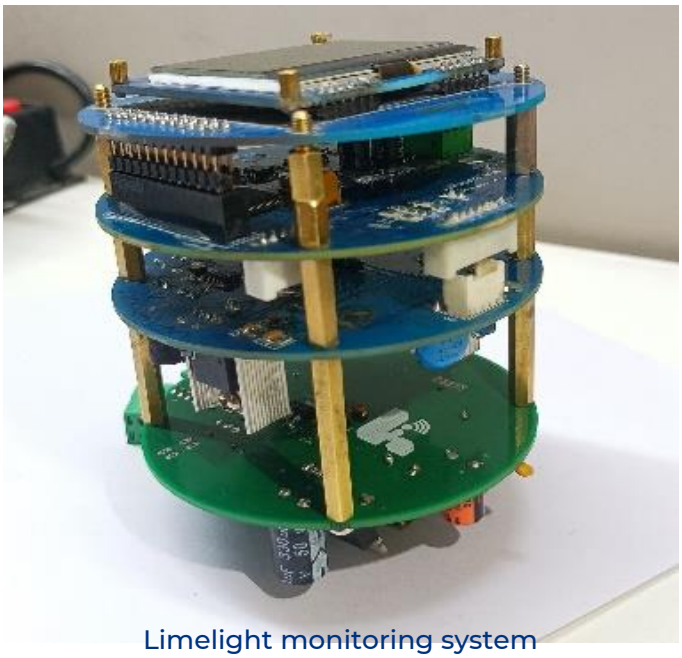
1) Indigenous, low-cost electromagnetic flow meter
2) Propriety and robust IoT platform for data aggregation
3) Cloud-based dynamic analytics platform

Through this system, they deliver data regarding water usage and its pattern to the end consumer and produce extraordinary results in detecting water leakage and wastage. Moreover, it can be used for any pipe size.

Implementation and Impact

The Limelight IoT hardware platform has been deployed in multiple locations for different use cases and served big industry giants like TATA, JBM, Escorts, etc. They also had a distributor agreement on this technology even before the launching of the product, with an estimated minimum quantity of 1000 units of sales for industrial use. Moreover, this technology has been tested and deployed in various harsh environments for reliability and robustness. They plan to reduce the cost of this solution to 1999 INR per unit so that it can get deployed at a mass scale. Furthermore, depending on the quantities, the charges can further be brought down as the complete technology and design are held in-house with no significant import dependency or supply chain problems.

With the support of an accurate water usage monitoring system such as the Limelight, the concerned agencies can access robust data for better planning and managing water in urban and highly populated areas. Moreover, the data can ensure holistic planning for a water-positive economy. As a result, water will be used wisely, and a direct monetization element for water will be developed as an incentive for producing water and reducing wastage.



Limelight monitoring system

START-UP 44

LivNSense Technologies

Founder

Avnish Kumar

Challenge

India possesses only 4% of water resources across the globe. Industrial water growth is projected at 400%, while the per capita water availability is less than 1100 m3. Around 75% of Indian households lack essential drinking water. Therefore, access to clean, safe water must be ensured in India with adequate household supplies. Also, real-time tracking to address quality and leakage problems is essential, along with accurate reporting and analytics-based decisions.

Solution

LivNSense has launched GreenOps™, a Digital Twins Metaverse Platform enabling cognitive functions for a cleaner, optimized and streamlined process to deliver water stewardship and sustainability. The solution captures the real-time process data by integrating with OT-IT systems and generates real-time predictive recommendations for managing water quality and efficiency and reducing losses in a complex distribution network.

The solution uniquely addresses the energy and water chemical balance by harnessing the power of Artificial Intelligence (AI) and Digital Twins technology to impact decarbonization across the process value chain with patented IPs. The solution also provides a box solution for root cause analysis of water distribution problems, reducing water losses. In addition, it is cloud agnostic, providing real-time monitoring and optimization from a single platform. The single platform is for heterogenous process data integration and real-time visualization.

Their partnership with edge and cloud vendors helps to deploy the solution on low-form factor edge to high-end servers for virtualization on private/public clouds with a hybrid approach.

Implementation and Impact

Production is deployed in the industrial utility segment, where they optimize real-time wastewater and chemical dosage for improved water quality. A pilot is done for demand prediction in wastewater operations to optimize pumping station operations. In Delhi Jal Nigam, the product is used to check on water chlorine level changes due to the mixing of drain water. Their solution is already production deployed in North America and India across ten customers offering GHG Carbon Reductions of up to 10%.

It delivers 2 to 4% yield improvement for the utility industry and offers GHG Carbon reductions of up to 10% with an ROI of 25-30% per year. Their vision is to impact 100+ MT CO2 reductions across water utilities in 5 years. The solution also affects sustainability parameters such as carbon tracking, carbon reduction & carbon offset. They have delivered on the following KPIs for a leading utility company

- 1.5-2% of blow-down reduction; 1-1.5% of increased steam quantity; 10% of time savings on maintenance.
- 5% GHG emissions reduction (for a mid-size utility plant) has saved an equivalent of 17000+ Trees. Overall, their solution across industries has reduced 1.5 Mega Tons of Carbon Emissions.

START-UP 45

NEEROVEL INNOVATIONS

Founder

Subrahmanyam Kosuri

Challenge

The management of water on a day-to-day basis is a tedious task. Leakage and overflows from water tanks have become a significant household concern leading to a massive amount of water wastage, and it's a big challenge to implement a water management system. Hence there is a dire need for water management solutions at an accessible and affordable rate.

Solution

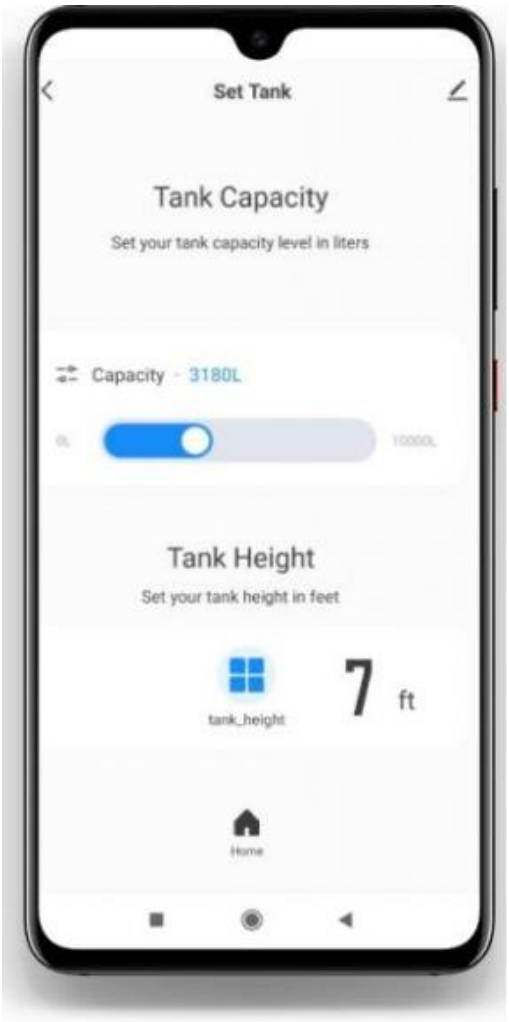
Neerovel is a smart IoT device for effective domestic water management at a community level suitable to measure water tank levels precisely with its Artificial Intelligence. It is operated through device automation to measure water levels using a non-contact LiDAR sensor application connected to the internet. All the related data is stored on a cloud platform. It saves water from overflows and leaks in apartments and villas, and the AI algorithms alert users to unusual water behaviour/leaks. Users can schedule the motors or on/off the connected valves from the mobile application itself.

Neerovel works with wireless Ultrasonic/LiDAR sensors to measure precise tank capacities and securely transmits data with LoRa to the dedicated servers. Users can access this data from the mobile application. Neerovel has a battery-operated non-contact Ultrasonic/LiDAR sensor which sits inside the roof of a water tank for precise water level measurement, and a collection device connected to the internet collects this data (LoRa) and stores on the cloud platform. Users can manage/control the other connected devices from an android/ IOS application. The same solution can be applied to public places and city water tanks.

AI algorithms can analyze the data to alert users to unusual water behaviours/leaks. Users can schedule the motors or on/off the connected valves from the mobile application itself. This device gives a chance to create a simple solution for water management. Neerovel Innovations simplifies the measuring technology with modular sensors customizable at the user end.

Implementation and Impact

The device has been piloted, and the price of a unit starts from 3999 INR. Water usage patterns can be tracked daily. In case of unusual water usage, users will be notified through the mobile app, encouraging users to conserve water. Consequently, a more water-conscious society is created.



Neerovel wireless ultrasonic sensors devices

START-UP 46

Neerovel Innovations

Founder

Subrahmanyam Kosuri

Challenge

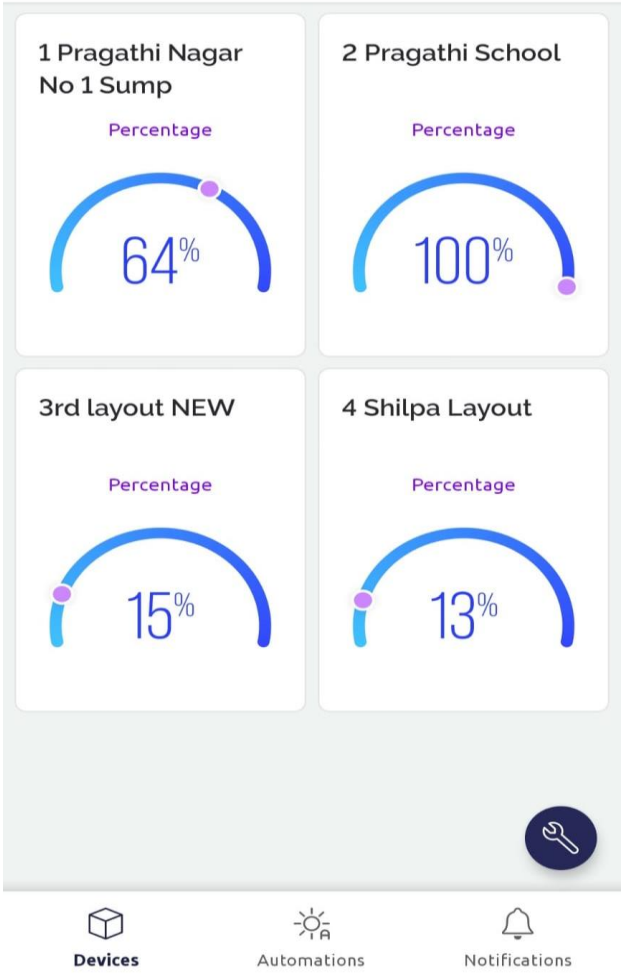
The need for simplified water management solutions arose from the increasing complexity and challenges faced in traditional water management practices. Historically, water management has been labor-intensive, relying on manual measurement and monitoring methods, which are prone to errors and inefficiencies. Moreover, the growing demands on water resources, coupled with the impacts of climate change and urbanization, have intensified the need for more sophisticated and automated approaches to water management.

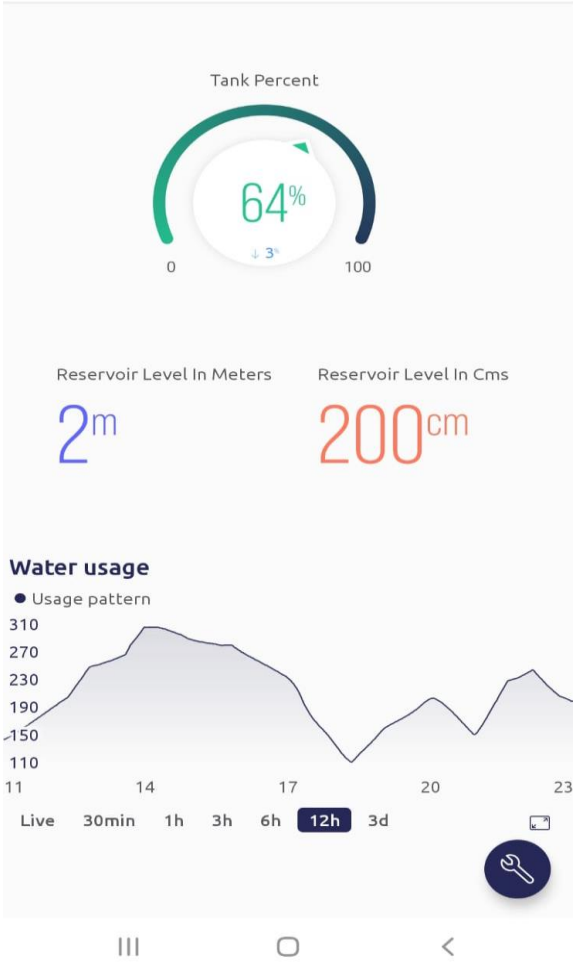
Solution

The Neerovel Initiative introduces an advanced IoT device tailored for efficient water management across various industrial sectors, boasting precise water tank level measurements. This cutting-edge solution seamlessly integrates into water distribution systems via a wireless network, utilizing both Non-contact sensors like Ultrasonic and Contact sensors such as Hydrostatic Pressure sensors to ensure adaptability to diverse requirements. All data collected is securely stored on a cloud platform, accessible through a user-friendly mobile app and PC dashboard. Notably, the device features an Automatic motor control unit that continuously monitors motor health in real-time, updating the cloud with live information. In critical scenarios like low water levels or overflow, the device can autonomously control the motor, further detecting issues like low voltage or high currents and taking preventive measures. Users benefit from remote motor management capabilities, enabling on/off control and scheduling via mobile applications. Neerovel Innovations streamlines water management by simplifying measurement technology with customizable modular sensors, promising decentralized access to comprehensive data throughout urban water networks.

Implementation and Impact

Neerovel Innovations strategically deployed state-of-the-art online water level measurement devices across Hyderabad, facilitated by AMRUT 2.0 from MoHUA. This implementation has led to significant water conservation, saving an impressive 100,000 litres per day per Node. Such success underscores our commitment to optimizing water distribution efficiency and promoting sustainable resource management in the region. Furthermore, Neerovel offers cost-effective solutions in water quality management, facilitating the measurement of various physical parameters like pH, turbidity, temperature, EC (electrical conductivity), and DO (dissolved oxygen). Additionally, our innovative products enable monitoring of crucial chemical parameters such as chlorine, fluorides, and arsenic. Through these initiatives, Neerovel continues to drive advancements in water management, addressing critical challenges and contributing to the overall well-being of communities.





Analysis model for water usage

START-UP 47

Openwater.in

Founder

Prabha Nagarajan

Challenge

Increasing urbanization and industrialization have raised the strained demand for freshwater access. Due to the rapid depletion, freshwater is becoming a finite resource. Poor management of the resource has caused the water crisis. Water reuse is a reality and is needed to reduce stress and demand for fresh water.

Solution

Openwater.in develops hassle-free technologies that put the power to treat water in the hands of individual users. They have developed a greywater treatment unit that is compact and easy to install in a household, just like any other household electrical appliance. This plug-and-play automated appliance is small enough to be installed under a regular kitchen sink counter. This system complements existing home appliances in the market that do not treat discarded wastewater. This technology for treating water is based on the principles of electrocoagulation and oxidation, which is very effective in dealing with a wide range of pollutants. The contaminants are coagulated by passing a current through the water, and the particulate matter is subsequently filtered out. The target contaminants include total suspended solids, heavy metals, oil and grease, bacteria, BOD, COD, phosphates, sulphates and turbidity.

The compact under-the-counter treatment unit sits under the kitchen sink, and an inbuilt input tank collects the wastewater flowing down the sink. Next, the treatment unit's solid food particles and waste are sent to the drain. After that, the input water flows through the treatment unit and is finally stored in a collection tank. The design for the treated water collection tank can be flexible based on customer preference.

The first model integrates the treated water tank with the treatment unit and offers lower storage capacity owing to the space constraints under the sink. Another model is suitable for houses with larger spaces, including a storage tank outside the kitchen to collect larger volumes of treated water. In either model, there is a provision to use this treated water in the same kitchen sink through a smart faucet.

Implementation and Impact

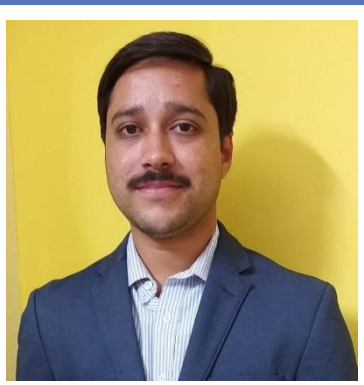
The cost for this prototype is approximately 65,000 INR, which will reduce once manufacturing is scaled up. This unit can recycle up to 200 to 500 litres of water daily in a household. Considering the average cost of a tanker in the city of Bangalore at 700 INR for 6000 litres, this technology can save up to 1750 INR per month.

Openwater.in has received several government and corporate grants for their startup, enabling them to develop and fine-tune their core technology over the past few years. They have also received angel investing and support from the Indian Institute of Science incubation centre and have been recognized nationally and internationally for their patented technology.

Hassle free units to treat water

START-UP 48

Paryaavarneer Engineers & Consultants



Founder

Arjun R

Challenge

In India, the issue of non-performing Sewage Treatment Plants (STPs) is critical, with only 39% of those installed by Urban Local Bodies (ULB) meeting regulatory norms. Despite an estimated 20,000 decentralized STPs, many remain defunct or operate suboptimally, primarily due to inadequate infrastructure and improper operation. Addressing infrastructure gaps requires significant capital investment and skilled technical teams. Improper operation often stems from manual processes lacking standardization and skilled manpower, resulting in high operational costs, inconsistent water quality, and limited monitoring capabilities.

Solution

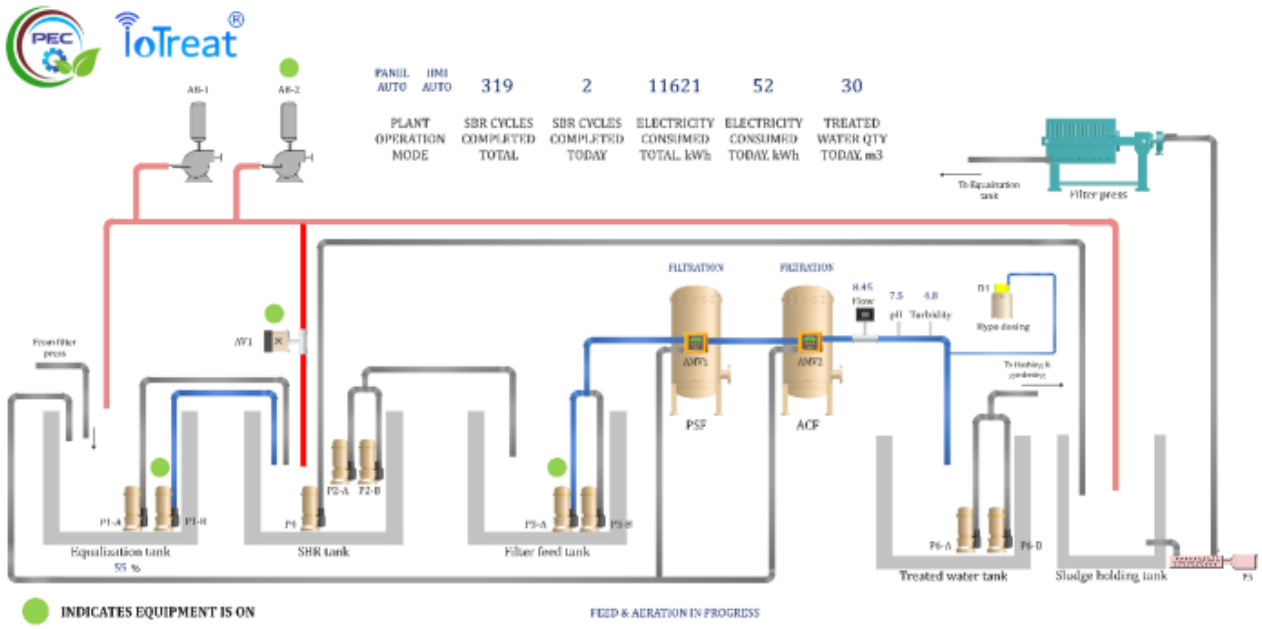
Paryaavarneer's IoTreat® embodies a revolutionary convergence of IIoT technology with the core tenets of environmental engineering operations. This seamless integration serves as a beacon of reliability, ensuring optimal and precisely executed processes. IoTreat® transcends traditional boundaries, ushering in a new era where environmental engineering operates with unprecedented finesse and foresight. The treatment plant undergoes automation with the installation of essential instruments, sensors, PLC, and HMI. Real-time data is seamlessly transmitted to a cloud server via an IIoT gateway, accessible through the intuitive IoTreat® dashboard. Developed by a team of experienced environmental engineers, intricate logics and unique interlocks safeguard against potential emergencies, cementing IoTreat® as the pinnacle of modern environmental engineering solutions.

Implementation and Impact

oTreat® can be incorporated in new STPs/ ETPs and can be retrofitted to existing STPs/ ETPs without requirement for any shutdown in operations. It can be installed in any capacity and any technology treatment plants. Oldest installation of IoTreat® was done 2 years ago. All treatment plants where IoTreat® is installed are working in good condition by providing consistent quality of treated water, and with reduced cost of operation by 50%. Return on Investment is obtained in 1-3 years depending on capacity of the treatment plant.

Treated water from IoTreat® operated STP

IoTreat dashboard for operation monitoring



START-UP 49

Prayaga Scientific Laboratories

Founder

Sudhirdas Prayaga

Challenge

In urban water management, the existing methods for detecting bacterial contamination in water are marred by inefficiencies. These methods, characterized by their time-consuming nature and reliance on sophisticated equipment, pose significant challenges. A considerable portion of waterborne diseases, notably those prevalent in urban areas, stem from bacterial species like E. coli, Salmonella, Shigella, and Vibrio, primarily found in enteric and gram-negative coliforms. The cumbersome nature of current detection processes hampers timely intervention and response, increasing the risk of outbreaks and public health crises. There is a critical need for innovative, rapid, and accessible technologies to streamline bacterial contamination detection in urban water systems, ensuring the provision of safe and potable water to urban populations.

Solution

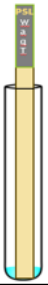
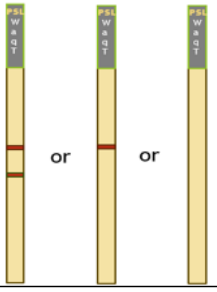
Pragya Scientific Laboratories transformed our laboratory test for detecting gram-negative bacteria into 'WaqT: Water Quality Test,' a rapid, user-friendly solution. WaqT provides results in minutes, usable at home or any location, ensuring safety and convenience. Environmentally friendly, affordable, and with no special storage needs, WaqT empowers individuals to test drinking water before use, crucial in combatting waterborne diseases that contribute significantly to mortality in India, especially during the monsoon. By putting the power of water testing into people's hands, WaqT offers a vital tool for safeguarding public health and preventing waterborne illnesses, addressing a critical need in the country's water management landscape

Implementation and Impact

With this grant, India Water Pitch-Pilot-Scale Start-up Challenge under AMRUT 2.0, we hope to bring this technology-based product to commercial usage quickly. This product may be distributed through the local hospitals, towns, or municipalities. It will also be available for purchase commercially through local pharmacies or similar outlets. We hope this product will not only save thousands of lives but help to reduce hospitalization and the financial burden on our economy.

Product Info:

Test Procedure:

Step-1 Add sample	Step-2 Run test	Step-3 Read result
		
Add few drops of water to the tube provided in the kit.	Insert a strip provided in the kit. Wait 5 minutes.	2 red lines positive. 1 red line negative. No lines false positive, retest.

START-UP 50

Shuvoneel RAS System

Founder

Suvo Sircar

Challenge

Pollution from urban runoff and inadequate wastewater treatment presents a dire threat to water quality, as roughly 80% of wastewater is discharged untreated into water bodies. This discharge introduces a host of pollutants, including heavy metals, pathogens, nutrients, and organic compounds, into aquatic ecosystems. These contaminants adversely impact aquatic life, leading to disruptions in ecosystems' balance and biodiversity loss. Excessive nutrients like nitrogen and phosphorus trigger algal blooms, depleting oxygen levels and causing fish kills. Moreover, toxic substances from industrial discharges accumulate in aquatic organisms, posing risks to both wildlife and human health through bioaccumulation and biomagnification. Pathogens in untreated wastewater further exacerbate these issues, threatening aquatic organisms' health and population dynamics. Urgent action is imperative to enhance wastewater treatment and pollution control measures, safeguarding the ecological integrity of water bodies and the wellbeing of aquatic ecosystems.

Solution

The initiative revolves around employing Recirculating Aquaculture Systems (RAS) to transform urban wastewater into a conducive environment for fish farming, utilizing advanced water treatment techniques such as mechanical, biological, and chemical filtration. This approach, integrated with IoT technology for real-time monitoring and control of water quality, aims at fostering sustainable aquaculture while minimizing environmental impact. The system incorporates proprietary water treatment formulations, prioritizing sustainability and efficiency by recycling water and reducing waste. Biosecurity measures are integrated into the system design to prevent disease outbreaks and ensure high-quality fish production. Additionally, AI and predictive maintenance are utilized to enhance efficiency, marking a significant step towards revolutionizing urban aquaculture for greater environmental friendliness and resource optimization.

SNRAS waste water purification system infrastructure

Implementation and Impact

Pilot projects have demonstrated the system's effectiveness in various urban settings, showcasing significant improvements in water quality and fish health. The developed equipment will promise the purification of 1 Lakh metric ton of water in a single go. The initiative has received recognition for its innovative approach to sustainable aquaculture, with awards highlighting its contributions to reducing overfishing and enhancing the livelihoods of traditional fish farmers and retailers. Financial projections indicate the need for investment in technology development, hardware, and operational expenses to scale the project and expand its impact.

Figure 2. SNRAS Ponds and other water bodies Waste Water Purifier

START-UP 51

SQUAS
Pure Solutions

Squas Solutions

Founder :
Hareesh Nambiar

Challenge

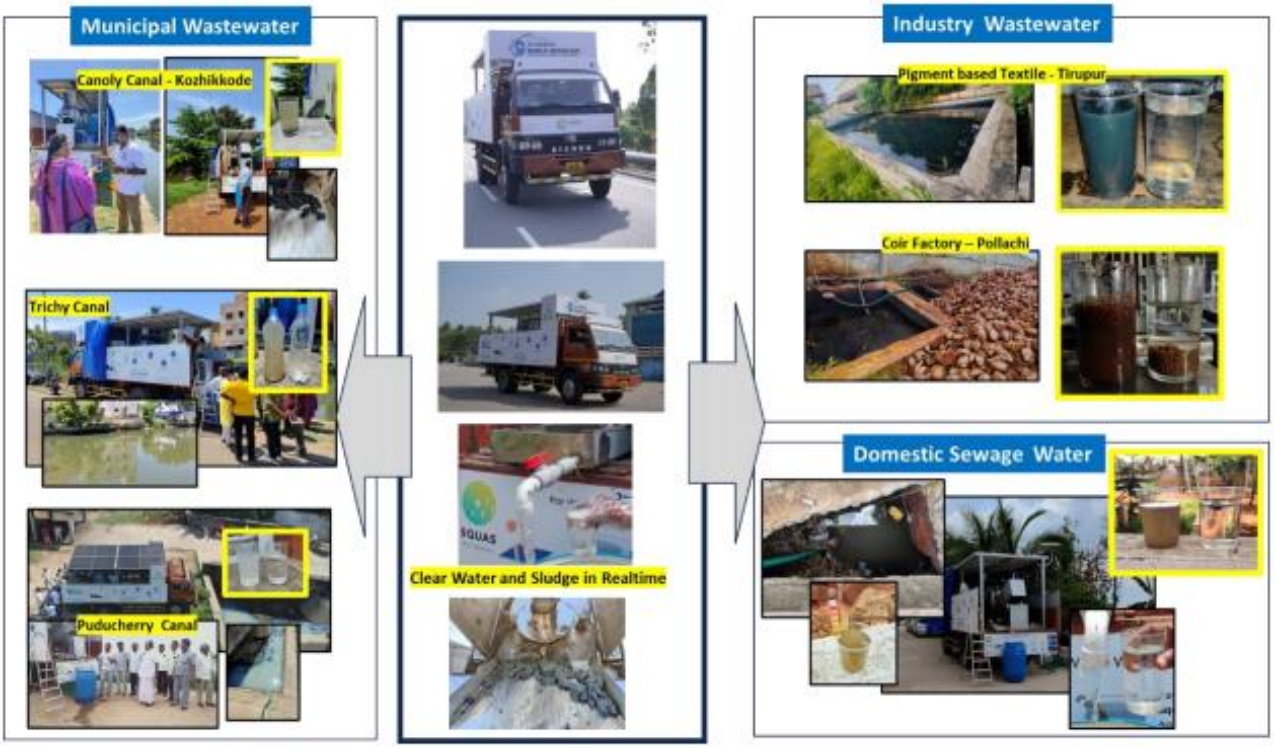
Pollution, contamination, and scarcity of water resources are pervasive challenges, particularly in densely populated urban areas. According to the World Health Organization, around 80% of wastewater worldwide is discharged into the environment without treatment, exacerbating pollution levels. In India alone, the Central Pollution Control Board reported that over 70% of the nation's surface water is contaminated with pollutants. With rapid urbanization and industrial growth, the demand for clean water has reached a critical point. Efficient wastewater treatment technologies are urgently needed to alleviate strain on water resources and mitigate environmental degradation.

Solution

In response to the imperative to protect the environment and public health, Squas Innovation has emerged as a promising solution to address the challenges associated with conventional wastewater treatment methods. By leveraging a unique combination of minerals, Squas Innovation offers a revolutionary approach to wastewater treatment, capable of converting various types of wastewater into clear water in real-time. Through collaboration with Japanese technology and customization for the Indian context, Squas Innovation has developed a highly effective coagulant. Advantages over existing methods include reduced infrastructure requirements, rapid sludge settling, simplified oil coagulation, and significant sludge reduction, leading to lower disposal costs. Moreover, the stability of treated water and quick settling time obviate the need for large sedimentation tanks. Squas Innovation has successfully scaled up its decentralized system to treat continuous flow urban streams, offering a versatile solution applicable to domestic, industrial, and municipal wastewater treatment needs. The scalable prototype system comprises an Agitation Tank, Sludge separator, and solar-powered unit, housed within a mobile unit, as depicted in the accompanying figure, showcasing the potential of Squas coagulant technology.

Implementation and Impact

The developed prototype of Squas Innovation has undergone rigorous testing across various segments in different parts of South India, as evidenced by field test snapshots demonstrating its potential benefits. Recently, the system was deployed for real-time treatment of kitchen wastewater at a food festival in Trivandrum, successfully treating 100 KLD of wastewater for gardening reuse. Under the Amrut challenge, Squas intends to embark on an urban streaming pilot project in coordination with the Trivandrum Municipal Corporation. This project aims to treat input water from a drainage before it reaches the canal or river. Challenges to be addressed include real-time operation and control of the system, flow rate control, Squas-coagulant dosage automation, and identification of unknown risk factors. The pilot test will enhance the existing prototype by incorporating a master control unit and coagulant dosage automation system, paving the way for scaling up to address numerous urban streaming challenges effectively.



START-UP 52

Sustainable Livelihood Initiative Private Ltd

Founder

Vardan Rathi

Challenge

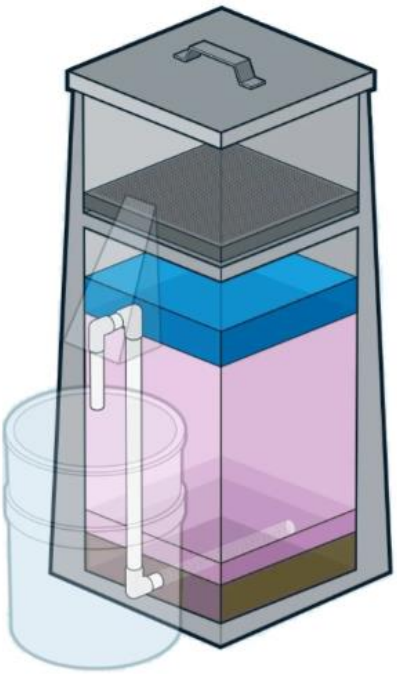
As per NITI Aayog, 75% of Indian households do not have piped drinking water supply on the premises, and of the remaining 25%, nearly 70% receive contaminated water. The non-piped sources of water like wells, ponds and rivers are full of life-threatening contaminants harmful to human consumption. Government reports inform that 7 Indians are killed, and 36,000 Indians suffer from waterborne diseases daily.

Solution

To address this issue, SLLI has developed the Vardan Water Purifier, which uses two core technologies:

- An inexpensive way of synthesizing graphene, which is used for purifying water
- Usage of solar cells from e-waste (Dye Sensitized Solar Cells).

The system can purify water for at least ten years with a purification volume of 150,000 litres without any maintenance costs. The invention also gains importance as the National Green Tribunal, and the Supreme Court of India has banned RO water purifiers in areas where the TDS of water is below 500 ppm. The purifier adopts a three-way process to ensure that the outlet water quality is on par with the notified limits of Indian Standard Specifications for Drinking Water (IS: 10500) and is 100 per cent safe for consumption.



Vardan Water Purifier

Three versions of the technology are available for family sizes ranging from 4 to 20 and for communities, and it is designed with women in mind. The aim is to employ one women supervisor per cluster of villages/towns.

Implementation and Impact

Minimum Viable Product (MVP) has been finalized and successfully beta-tested for one full year with five households across various seasons. Each test lasts at least 87 to 102 days. The cost per purifier is INR 5500/- with no extra maintenance cost, service cost or replacement cost throughout its life cycle of 10+ years.

SLII has been sanctioned an equity and debt-free seed grant of INR 21.2 Lakhs from the Government of Gujarat under the Startup Assistance Scheme. They plan to install at least 875,000 Vardan water purifiers in the next five years (4.6% of the Indian market), saving 78 billion litres of water compared to other point-of-use water purifiers. In addition, it will prevent 9 million tonnes of CO2e emissions compared with boiling water using fuelwood, directly impact at least 4.3 million lives, and employ 2500 women. Moreover, employment will lead to multiplied benefits such as reduced waterborne diseases, reduced inequalities, increased disposable income, reduced waste and reduced pressure on groundwater withdrawal. Vardan Water Purifier provides an integrated approach toward dignified health and life for people living in water contamination and scarcity locations. In addition, no water wastage, free of electricity and zero operational costs and reduced carbon footprint make the technology climate-resilient.

SLLI Product

START-UP 53

Sustainable Water Technologies

Founder

Priyanshu Kumath

Challenge

Urban lakes today receive sewage which causes depletion of oxygen, resulting in the death of aquatic life, breeding of mosquitoes and pollution of groundwater. It also results in the deterioration of the entire ecosystem & biodiversity and leads to waterborne diseases and deaths. Further, high nutrient levels in the water cause growth of algae and water hyacinth, and methane emissions from the water bodies can accelerate climate change impacts.

Solution

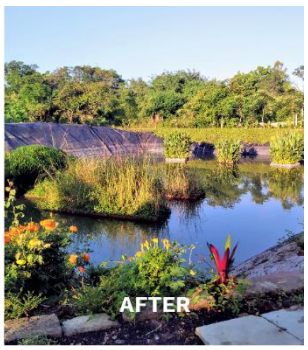
Clean-Water, registered as Sustainable Water Technologies Pvt. Ltd., developed a scalable product, Floating Islands (Floating Treatment Wetlands), that restores and beautifies water bodies. It is conceptualized based on how nature cleanses itself through wetlands and how wetlands species of plants are used in planted gravel filters in Sewerage Treatment Plants (STPs) to treat the water and productize it towards waterbodies.

Floating Islands are floating platforms with wetland species of plants planted on top of them, and the roots of these plants eventually extend into the water below. Friendly bacteria called biofilms attach to the long plant roots and the biomedia added underneath the islands. Together the plants and the biofilms help settle sediments and uptake nitrogen, phosphorous, heavy metals and other pollutants, thereby cleaning the water. With no nutrients left in the water, the algae, water hyacinth, and other invasive species starve and eventually recede from the water surface.

These are modular and available in wood, metal & FRP materials with varying shapes (round, square, rectangular, etc.) and of varying sizes such as 1mx1m, 2mx2m, 1m diameter, 2mx3m, etc. Once the Islands reach the site, they can be installed within 1-3 days and start showing the effect immediately. The Islands are manufactured centrally at Indore, Madhya Pradesh and can cater to any waterbody across the globe. They require low maintenance and can easily be facilitated by a gardener.

Implementation and Impact

Clean-Water has made more than 16 types of Floating Islands and installed them on more than 12 waterbodies, including lakes, ponds and rivers. They have restored Nalanda Sarovar inside the Police Training College campus in Indore and received the award of Water-Hero from the Ministry of Jal Shakti, Government of India, for the same. They have set up research facilities in Bengaluru and have worked across the country, covering cities like Bengaluru, Delhi, Chennai, and Indore, including Sabarmati Riverfront in Ahmedabad. The one-time cost of installing Floating Islands is 3000-3500 INR per sq. ft. of area. Generally, only 2-5% of the lake's surface area is covered with the units. For more polluted waterbodies, they use aeration, micro-bacterial cultures, and other techniques depending on the intensity of the pollution.



START-UP 54

Synthera Biomedical

Founder

Nilay Jayant Lakhkar

Challenge

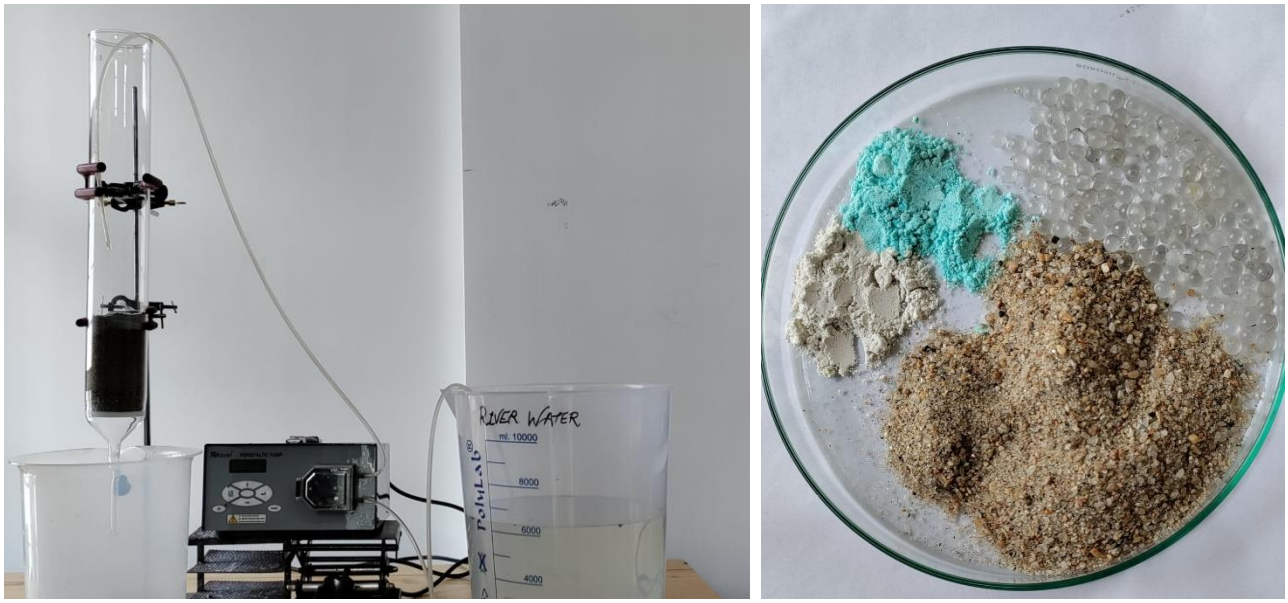
Current disinfection systems in water and wastewater treatment most commonly use chlorine compounds, sand and gravel mainly due to cost-effectiveness, but can cause significant problems. Excess chlorine has carcinogenic effects and causes irritation to skin and other tissues, and is poisonous to aquatic plants and animals, even in small quantities. In addition, its corrosive, toxic and flammable nature poses health risks for workers in wastewater treatment plants. Further, the sand and gravel pose difficulties in heavy metal removal and form biofilms that lead to antimicrobial resistance. Finally, the mining and quarrying activities for sand & gravel production cause tremendous harm to the environment.

Solution

Synthera has developed a unique antimicrobial bioactive glass material technology to replace chlorine-based compounds in water and wastewater treatment systems entirely. The material technology is non-corrosive, non-toxic, environment-friendly, non-irritant, has no odour, versatile and scalable. It can be used for small-scale community-level wastewater treatment, industrial wastewater treatment and cooling water systems, swimming pools, hospitals and all other areas where the conditioning of water with sterility and reduction of germs are prime necessities. It also has long-term disinfection and efficacy over a broader range of temperatures and does not require post-chlorine removal steps.

Implementation and Impact

A minimum viable product of bioactive glass composition has been developed, and proof of concept has been demonstrated in in-house lab trials. They have tested samples from the Mutha River, Ram Nadi River, and Khadakwasla Dam in Pune to illustrate the material's microbiocidal efficacy. They currently focus on designing and fabricating prototypes, producing test batches of antimicrobial bioactive glass powder, and demonstrating effective water disinfection through testing/ validation and pilot field trials in water and wastewater treatment plants. They aim to make the filtration medium comprising bioactive and activated glass available at less than Rs. 100 per kg. They believe this will be a safe and green solution technology for the coming generations that will transform water management systems in India and globally.



Bio active glass composition

START-UP 55

URDHVAM
Environmental Technologies Pvt Ltd

Urdhvam Environmental Technologies

Founder

Rahul Suresh Bakare

Challenge

Statistics show that India is the world's largest groundwater abstractor and has more than 4 Cr borewells. 80% of India depends on groundwater for its agriculture, industrial and domestic needs. Unregulated rapid pumping without rainwater harvesting and storage in deep aquifers results in dry borewells. Reviving groundwater levels is the need of the hour to prevent the impending depletion of groundwater reserves. The current solutions are costly, ineffective, inefficient in recharging the borewells and have severe limitations. Hence there is a need to find innovative, affordable and scalable solutions to solve this impending disastrous challenge.

Solution

BoreCharger technology increases the recharge of borewells and the water production capacity of an existing borewell with minimum investment. BoreCharger is a unique, patented technology that harvests rainwater from shallow aquifers and stores it in deeper confined aquifers that act as a source of borewell water. It performs "Angiography" of borewells using an underwater camera system. Using a Robotic Tool, it then undertakes "Angioplasty" of an existing borewell casing pipe in “in-situ” from inside. The perforations made by the tool enhance borewell recharge substantially. It revives existing, low-yielding, and dried borewells without any civil construction, space or surface water source.

Implementation and Impact

Since its inception, they have revived more than 1800 borewells in 10 States in India and West Africa with Bore charger Technology, cumulatively inducing more than 187 crore litres of rainwater through recharge. Their work has positively impacted more than 85,000 individuals by providing drinking, domestic, irrigation and industrial water. Urdhvam won several awards from the Maharashtra State Innovation Society, FICCI, Indigram-Adhunik Gram, Rotary International, Aegis Graham Bell award, Columbia Global Center, etc. They have also received funding under Startup India and are a part of several accelerators

Bio charger technologies on site

START-UP 56

Ushva Clean Technology

Founder

Ashutosh Kumar

Challenge

In a world increasingly strained by water scarcity and inefficient resource management, over two billion people worldwide lack access to clean drinking water, while nearly half of the global population is projected to face water scarcity by 2030. Inefficient irrigation practices result in significant water wastage, with agriculture consuming approximately 70% of the world's freshwater resources. Moreover, leakages in urban water supply systems account for the loss of an estimated 30% of treated water annually, exacerbating shortages and infrastructure strain.

Solution

Frino Smart prepaid water meters represent a transformative solution aimed at promoting water conservation, streamlining billing processes, and enhancing operational efficiency in the water industry. These innovative meters offer a range of critical features designed to address key challenges in water management. They ensure accurate billing, enable leak detection to prevent water loss, and significantly reduce water wastage through improved control over resources. Moreover, Frino Smart meters are known for their reliability and longevity, providing long-term benefits for both consumers and utility providers. The meters also enhance transparency and customer service by providing real-time data on water usage and billing, empowering consumers to make informed decisions about their water consumption. With these features, Frino Smart prepaid water meters are paving the way for a more sustainable and digitally advanced future in the water industry

Implementation and Impact

Frino Smart prepaid water meters have gained significant traction among urban local bodies and private builders nationwide for effectively monitoring and controlling municipal water usage across homes. As part of our commitment to address water management challenges, we have partnered with the Mira Bhayandar Municipal Corporation in Maharashtra to implement our innovative prepaid water metering solution. This collaboration involves water consumption monitoring and control, coupled with streamlined billing processes, for approximately 300 households. By leveraging the Frino Smart meters, the corporation aims to enhance efficiency in water distribution, curb water wastage, and ensure fair and accurate billing for residents. This initiative not only empowers consumers to track and manage their water usage but also enables the municipality to optimize resource allocation and promote sustainable water management practices. Through such partnerships and deployments, Frino Smart prepaid water meters continue to play a crucial role in advancing water conservation efforts and improving overall water governance in urban areas.

START-UP 57

WeGOT Utility Solutions

Founder

Abilash Haridass

Challenge

Depletion of water resources is an impending reality. As urban centres are growing, the demand for clean water is rising. The main reasons for the depletion of water resources can be fourfold: groundwater exploitation, leakages and theft, lack of accountability, and lack of data.

Solution

WeGot Aqua's Water Source Management System offers a solution to fill these gaps. The system tracks the pressure, flow, and quality of water in real-time to ensure no pilferage, theft, or leakage. The system also tracks water quality at the source and enables the optimization of water usage based on demand, availability, cost, and quality at each source. In addition, the process and distribution management solution tackle all water issues once it has been delivered from any source.

Source water gets treated at a treatment plant(s)(STP / WTP /RO) and is delivered either through a sump or an overhead tank. WEGoT aqua monitors the efficiency of treatment plants. Using an algorithm based on usage patterns, only the necessary amount of water is stored in the overhead tanks, thus increasing the efficiency of all the pumps and other plumbing equipment on the property. Lastly, once the water is delivered to the end-user, WEGoT aqua tracks the usage of every apartment and bills each resident according to their use. The system also detects leakages, broken pipes, and abnormal consumption in real time. Thus, the solution integrates every facet of water management and provides a simple and convenient platform to manage water usage in a facility.

Implementation and Impact

WEGoT Aqua's ultrasonic sensor has been certified by the FCRI (Fluid Control Research Institute) to have a>98% accuracy rate. Landmark Vertica, an upscale residential community in Chennai, was following a conventional system of billing water. Every resident paid a flat rate as a part of the water charges. After the WEGoT Aqua solution was deployed here, the residents began to get access to its dashboard and mobile application. Valuable insights from the app brought about a positive behavioural change in the average water consumed per unit. Overall consumption was reduced by 49% within six months of installation. Per capita consumption decreased from 234L to 119L, and the running time of water treatment plants and hydropneumatic systems was effectively reduced from 14 to 10 hours a day.

WEGoT Aqua's ultrasonic sensor and a dash board

START-UP 58

Wenalytics IoT Solutions

Founder

Desu Sunil Manohar

Challenge

In the realm of used water management, the unnoticed depletion of vital resources, particularly water, presents a formidable challenge for both business and government operations. This wastage significantly impacts the management of physical assets and the day-to-day operations of facilities. To ensure the success of initiatives in used water management, it is imperative to establish a robust monitoring and evaluation process to effectively track and mitigate resource depletion.

Solution

At Wenalytics (Water:Energy:Air:Light:Analytics), our expertise lies in crafting cutting-edge Internet of Things (IoT) solutions that revolutionize facility management. We pride ourselves on seamlessly integrating customized sensors and control devices with a robust web and mobile software application. With an expansive selection of over 100 sensors at our disposal, our solutions are meticulously designed to monitor, control, and automate a wide array of building equipment, spanning mechanical, electrical, and plumbing systems.

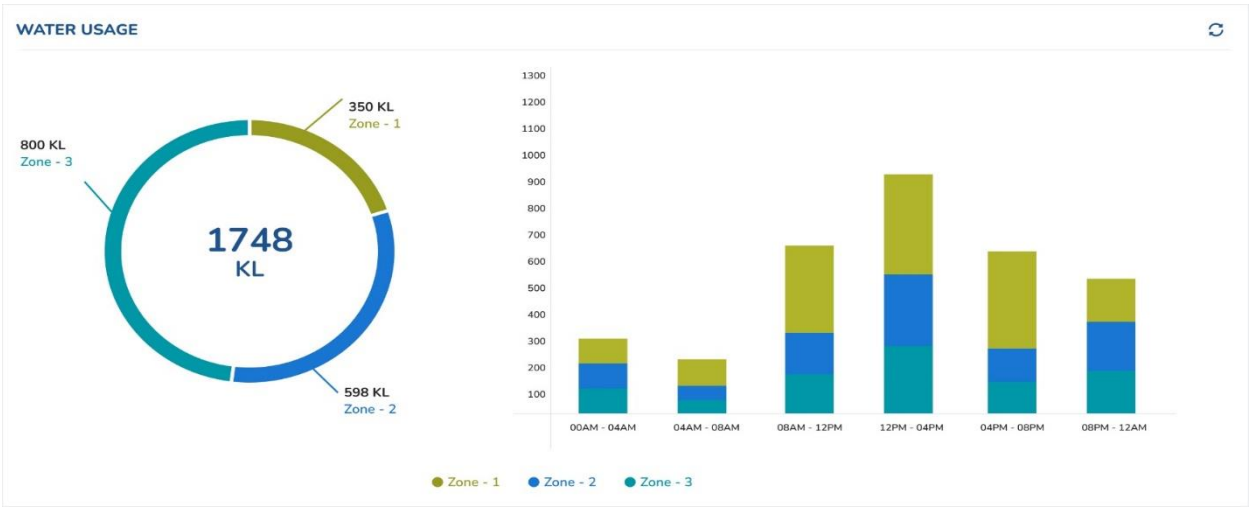
Our commitment to innovation extends to our comprehensive software suite, which serves as the digital backbone of facility operations. Through advanced analytics and intuitive interfaces, our software empowers facility managers to optimize energy usage, improve indoor air quality, and enhance overall operational efficiency. By providing real-time insights and actionable data, we enable our clients to make informed decisions and proactively address maintenance needs, reducing downtime and minimizing costs.

Furthermore, our IoT solutions are tailored to meet the unique needs of each client, ensuring seamless integration with existing infrastructure and workflows.

Implementation and Impact

Our seamlessly deployable plug-and-play hardware and software solutions have revolutionized facility management, leading to significant benefits across various aspects. These include marked reductions in water consumption and substantial decreases in energy usage, resulting in enhanced equipment lifespan and optimal utilization of manpower. With real-time visibility into on-ground operations and timely reports and analyses, our solutions empower both managerial and operational teams with actionable insights.

These transformative technologies not only streamline operations but also contribute significantly to resource conservation and operational efficiency. We have successfully implemented our technology at various sites, delivering tangible Return on Investment and operational effectiveness. Notable deployments include the First Space Industrial Park in Chennai, the Warangal Municipal Corporation, Oberoi Exquisite residential complex in Chennai, and Apollo Hospitals, among others. Through these implementations, we have demonstrated our commitment to driving innovation and excellence in facility management, providing our clients with the tools they need to achieve their operational goals and contribute to a more sustainable future.



3. USED WATER MANAGEMENT

START-UP 59

ABCONS INFRA LLP

ABCONS INFRA

Founder

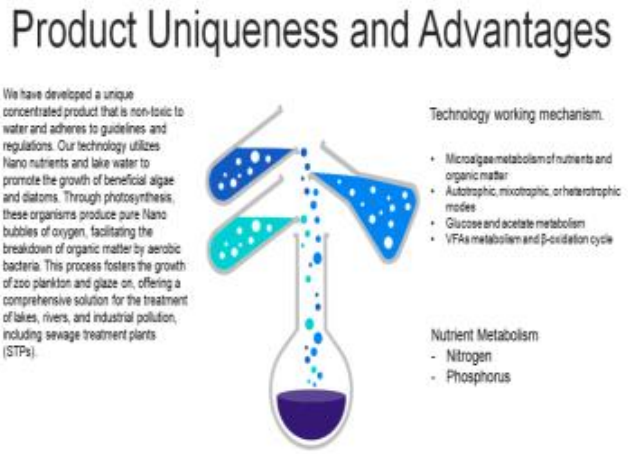
Abhilash Tiwari

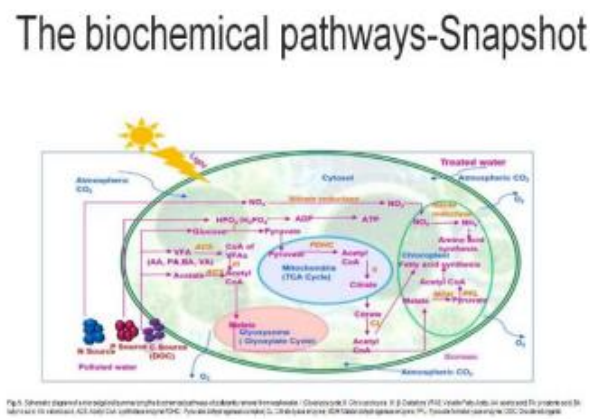
Challenge

Conventional water treatment methods are plagued by inefficiencies, environmental degradation, and unsustainable practices, exacerbating issues of water scarcity and compromised water quality. Ecosystems face threats, and industries contribute to pollution.

Solution

ABCONS Technology pioneers a sustainable approach to water management, leveraging phycoremediation to address conventional treatment challenges. Harnessing algae's natural power, this groundbreaking solution efficiently removes pollutants from water bodies, revolutionizing wastewater treatment for urban and industrial settings. Versatile in its applications, ABCONS Technology promotes responsible water consumption and production practices. Central to its mission is environmental stewardship, striving to restore ecosystems and contribute to global sustainability goals. As a beacon of innovation, ABCONS Technology offers a transformative and scalable solution for a cleaner, healthier, and more sustainable water future.





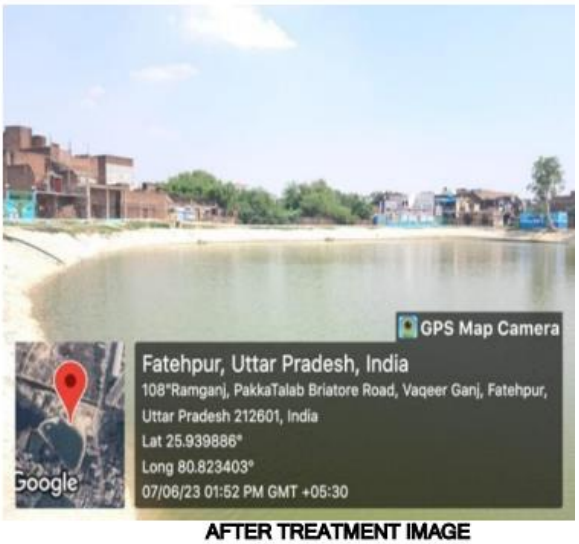
Implementation and Impact

ABCONS Technology's implementation spans various urban and rural water bodies, including Atal Bihari Park Lake in Fatehpur and Matha Talab in Sihora Jabalpur. Its all-encompassing approach addresses water quality challenges across Sewage Treatment Plants (STPs), Effluent Treatment Plants (ETPs), and agricultural runoff areas. The eight-step process begins with a preliminary assessment and feasibility study, followed by preparatory phases and implementation. Ongoing monitoring, maintenance, stakeholder engagement, and evaluation ensure sustained effectiveness. The impact, exemplified by the Atal Bihari Park Lake case study, demonstrates regulatory compliance, nutrient reduction, improved dissolved oxygen levels, pollutant reduction, algae and water weed control, odor elimination, enhanced biodiversity, and sustainable management. These outcomes underscore ABCONS Technology's efficacy in diverse water scenarios, promoting ecological restoration and sustainable water management practices

BEFORE TREATMENT SAMPLE

AFTER TREATMENT SAMPLE


BEFORE TREATMENT IMAGE



AFTER TREATMENT IMAGE

START-UP 60

Megaliter Varunaa

Banka Bio

Founder

Vishal Murarka

Challenge

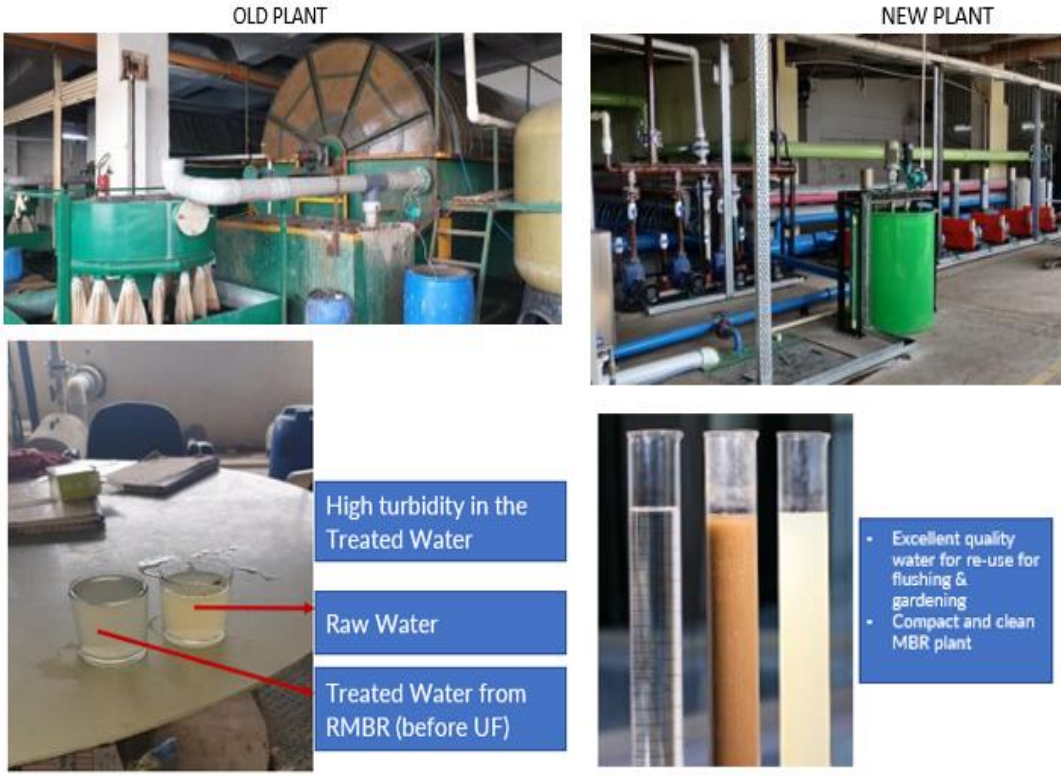
Wastewater management in residential and commercial buildings poses significant challenges, including the need for constant operation and maintenance of sewage treatment plants (STPs), refurbishment of dysfunctional systems, project management complexities, and ensuring regulatory compliance. Additionally, traditional models often struggle with achieving optimal STP utilization and real-time monitoring for proactive issue resolution.

Solution

Megaliter Varunaa Pvt Ltd, a subsidiary of Banka Bioloo Ltd, pioneers the "Urban SaaS" (Urban -STP - As - A - Service) model, a revolutionary approach to wastewater management. This transformative initiative addresses challenges with dysfunctional onsite sewage treatment plants (STPs) in residential and commercial buildings, aiming to enhance lives through sustainable water and sanitation solutions. The service-based approach empowers property owners by assuming comprehensive responsibility for wastewater infrastructure, including operation, maintenance, refurbishment, project management, and compliance monitoring. Clients pay a monthly fee, relieving financial burdens as Megaliter handles all capital expenditures and equipment investments. Tailored to meet individual client needs, the model aims to breathe new life into dysfunctional STPs and Effluent Treatment Plants, ensuring effective management, environmental sustainability, and community well-being.

Implementation and Impact

Megaliter's initiative has strategically transformed wastewater management dynamics through a comprehensive approach. Assessing existing STPs, the company engages in 5 to 7-year lease agreements with partnering projects, infusing capital for necessary upgrades. This commitment, evident across flagship projects like My Home Vihanga, Sky View 10, Sky View 20, and My Home Abhra, witnesses a notable shift from Rotating Moving Bed Biofilm Reactors (RMBR) to MBR technology, enhancing treated water quality. Emphasizing real-time monitoring for proactive issue resolution, Megaliter's service-oriented approach has surpassed expectations, achieving 100% STP utilization in some cases. Noteworthy energy efficiency gains and repurposed space for community-centric activities underscore the initiative's success, alongside significant reductions in O&M costs, ensuring a sustainable financial model.



Existing working plants

START-UP 61

CLEANTECH WATER

Founder

Vipul Chavda

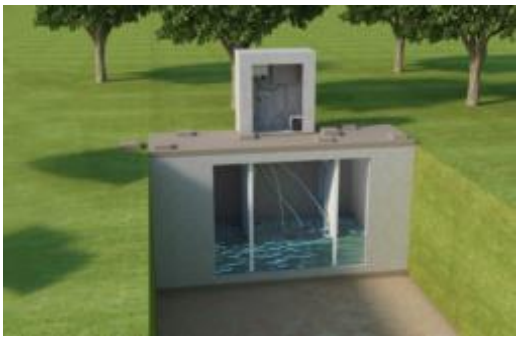
Challenge

Untreated wastewater cannot be used for irrigation or domestic purposes because it may contain harmful elements and toxic chemicals. Similarly, industries require large quantities of water on a daily basis, but cannot use the untreated water. Hence, a cost-effective water recycling using decentralized automated technologies is vital to conserve water for domestic and industrial purposes.

Solution

Cleantech Water provides decentralized sewage treatment systems that are fully automatic, efficient and meet the treatment standards. The Innovative and sustainable sewage water treatment systems address varied needs.

The Advanced Sequence Batch Reactor-Sewage Treatment Plants can be installed in Reinforced Cement Concrete underground tanks. The choice of electro-mechanical equipment and the meticulous design provides high-quality sewage treatment systems. It is a fully automatic system and does not require an operator or human resource, which reduces operating costs. The Air-lift technology eliminates the conventional pumping system from treatment. Advanced features like holiday/vacation mode enable the system to run with a low sewage load. It does not require a tertiary system (sand filter & carbon filter) to use the treated water in the Garden. The eco-friendly self-sustainable system does not need to feed mixed liquor suspended solids (MLSS) for bacteria growth.



STP underground tanks

Implementation and Impact

Cleantech Water ensures that CPCB and State Pollution Board norms are met to ensure the outlet's water quality. The discharged water can be used in Gardening, Horticulture or disposed of in natural water bodies.

Cleantech water completed many school projects through Sarva Siksha Abhiyan in Gujarat for over twenty schools. In addition, a 10-12 KLD plant is installed in Kasturba Gandhi Balika Vidhyalaya, where the treated water is recycled back into the Garden and disposed of in the Lake.

Other projects include the installation of a 60 KLD STP plant in the Regional Science Museum, Bhavnagar and Patan, Gujarat; 5KLD to 100 KLD capacity plants in manufacturing industries in GIDC; and a 3 KLD plant in the irrigation Department. In addition, Cleantech Water implemented a 550 KLD plant at Omkareshwar Temple for the Madhya Pradesh Urban Development department, and a 350 KLD SPT was installed in Dr Baba Saheb Ambedkar Vaidyakriya Pratisthan Multispeciality Hospital in Assam.

Sequence Batch Reactor-Sewage Treatment Plant at household

START-UP 62

Climate Care Venture

Founder

Srikanth Raghavachari

Challenge

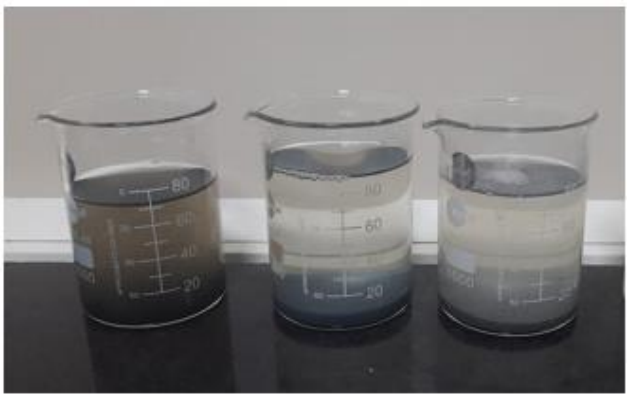
In urban water management, challenges such as inadequate infrastructure, rapid urbanization, water pollution, and governance issues significantly impact effective water treatment and distribution. With urban populations growing at an unprecedented rate, infrastructure struggles to keep pace, leading to strained water supply systems. According to recent figures, over 20% of urban residents globally lack access to safely managed drinking water services, exacerbating water scarcity concerns. Additionally, rapid urbanization contributes to increased pollution from industrial discharge, sewage, and runoff, further compromising water quality.

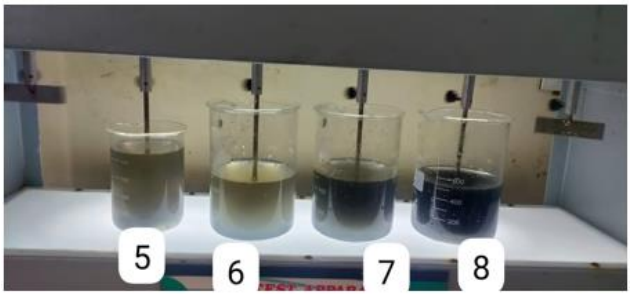
Solution

The implementation of Ecofloc, a plant-based protein biocoagulant, promises significant positive impacts on water treatment and environmental preservation. This natural solution enhances water treatment efficiency by efficiently coagulating and flocculating suspended particles, organic matter, and contaminants, leading to cleaner and safer water. It remarkably reduces turbidity by 80%, TSS by 75%, COD by 50%, heavy metals by 80%, and effectively removes phosphates, nitrates, and toxic algae from wastewater. Unlike chemical coagulants, Ecofloc is non-toxic and environmentally friendly, posing no harm to aquatic life when discharged back into water bodies. Additionally, it reduces chemical usage in water treatment processes, minimizing ecological footprints and promoting cost-effectiveness with lower dosages. Moreover, it facilitates the provision of high-quality potable water, particularly beneficial in disaster-stricken areas. With the added advantage of significantly lower sludge production compared to traditional chemical treatments, Ecofloc stands as an innovative and sustainable solution for water treatment challenges.

Implementation and Impact

The successful piloting of Ecofloc in DJB STP and its promising results, particularly in pond cleaning and algal bloom settlement, demonstrate its effectiveness. Under Amrut 2.0, the product will be piloted with the Municipality of Mahbubnagar, Telangana, for wastewater treatment. This innovative and eco-friendly water treatment solution showcases the transformative potential of Ecofloc plant-based extract in sewage and drinking water treatment. Its environmentally sustainable approach holds promise in addressing global water challenges. We invite stakeholders to join us on this transformative journey, pioneering sustainable technologies that positively impact water treatment processes worldwide. Together, we can revolutionize water treatment, ensuring cleaner and safer water for communities and ecosystems alike





Treating process

START-UP 63

COFBA NETWORKS

Founder

Subeesh S

Challenge

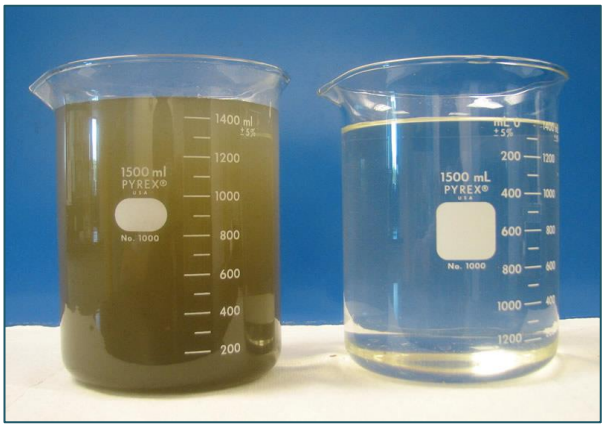
Liquid Waste Management poses a significant challenge in Kerala. Hotels and medium-level waste generators currently lack viable solutions for effective liquid waste management. Moreover, bulk generators are grappling with operational efficiency issues in their waste management processes. Addressing these concerns is imperative for creating a more sustainable and environmentally conscious waste management system in the region.

Solution

The Micro Level STP (Sewage Treatment Plant) represents a groundbreaking approach to household wastewater management, with each dwelling equipped with a compact, uncomplicated system. Utilizing organic solutions derived from Moringa and soap seeds, this technology expedites sedimentation and eliminates bacteria in an environmentally friendly manner. Its innovative design, devoid of complex components or moving parts, ensures simplicity, cost-effectiveness, and easy scalability. With minimal electricity demand and low maintenance requirements, the micro STP offers a sustainable solution for grassroots wastewater treatment. By enhancing efficiency at the household level, this straightforward approach contributes to environmental preservation while addressing the pressing need for effective sewage treatment in communities.

Implementation and Impact

At the source level, sewage water is effectively treated using ECOCLEAN-2300 or ECOCLEAN-2300, both herbal-based reagents. These versatile solutions offer dual functionality, suitable for either primary treatment of sewage at a dosing rate of 50 ppm or tertiary treatment of Sewage Treatment Plant (STP) effluent with a dosing range of 25 to 30 ppm. The treated water attains a quality conducive to reuse in secondary or tertiary applications across industries, construction, and agriculture. Implementation of this system is streamlined by its low cost, easy installation, and compact design, maximizing space efficiency.



Its minimal power requirement not only contributes to energy savings but also aligns with green initiatives. Moreover, adhering to Central Pollution Control Board (CPCB) standards ensures water conservation and significant savings on freshwater resources, reinforcing its environmental impact. Additionally, the chlorine-free output water enhances safety for diverse applications, underscoring its usability and environmental friendliness

START-UP 64

Digital EcoInnovision- Digital Paani

Founder

Mansi Jain

Challenge

Once treated efficiently, wastewater reuse can meet 60-70% of urban water needs. But unfortunately, over 75% of the existing treatment plants end up dysfunctional or non-compliant with standards, and cities incur enormous costs for maintaining the plants. Moreover, there is an absence of skill and expertise to maintain the facility and resolve dynamic issues. Finally, untreated sewage is discharged into water bodies leading to contamination and significant health risks.

Solution

Digital Paani is a technology-enabled ecosystem to release wastewater's potential to meet 65% of urban and industrial water needs. The ecosystem begins with an award-winning lifecycle management tool that enables every facility to be managed with leading industry expertise 24/7. The tool comprises a combination of software, sensors, and automation hardware with three core functions – firstly, the software determines how each facility should operate given its particular physical configuration and effluent type. Second, it manages the entire gamut of workflow in these facilities automatically. Thirdly, it recommends operational and physical improvements to improve performance.

Digital Paani detects, diagnoses, and sends out the appropriate instructions to resolve the issue instantly, preventing them from worsening. These instructions are linked to video-based training modules, ensuring that people are well equipped to execute the required action well. If tasks are not done on time, they escalate through phone and email-based alerts throughout the operations hierarchy.

Digital Paani automates key plant equipment, provides comprehensive reporting on the plant, and manages the plant's entire lifecycle by suggesting retrofits when needed and managing each plant's maintenance history over time. Finally, they also have a centralized control unit that monitors plants 24/7 and coordinates directly with the operations team to ensure work is done correctly and on time.

Implementation and Impact

Digital Paani's operations differ from existing solutions like PLC/SCADA as the solution engages with different processes and does not just limit itself to equipment automation and showing data from facilities. DigitalPaani has demonstrated consistent results in pilots in various settings, like residential complexes, office or retail settings, or municipal plants, across Sikkim, Delhi-NCR, Aurangabad, and more. The team has over 25+ years of experience and managed 380+ wastewater treatment plants. They have transformed failed STPs into assets that treat 100% of sewage and reuse it. With the support of Digital Paani, breakdowns have gone down by 86%, and energy needs have declined by 32%, saving customers' resources at scale.

Digital Paani's operations on site

START-UP 65

Drona Automations Private Limited

Founder

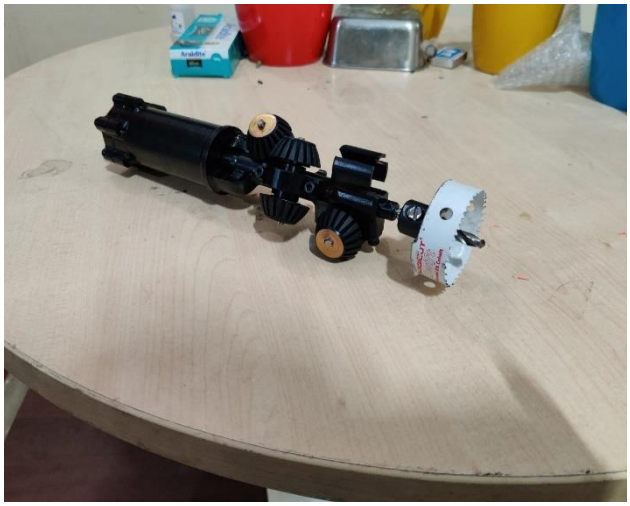
Suraj N

Challenge

The formation of scales in sewer pipes is quite common. The scales contain large quantities of salts, carbides, etc., which accumulate over time, affecting sewage flow to the main drainage duct. In addition, sewer blockage occurs due to improper waste disposal methods by individuals. These blockages are a mixture of human excreta, sludge, tissue waste, napkins, clothes etc. In India, sanitation workers often have to enter the maintenance holes to clear the blockage, which is hazardous and sometimes leads to death of the sanitation workers. Often conventional sewer cleaning technologies also fail to remove the blockages effectively.

Solution

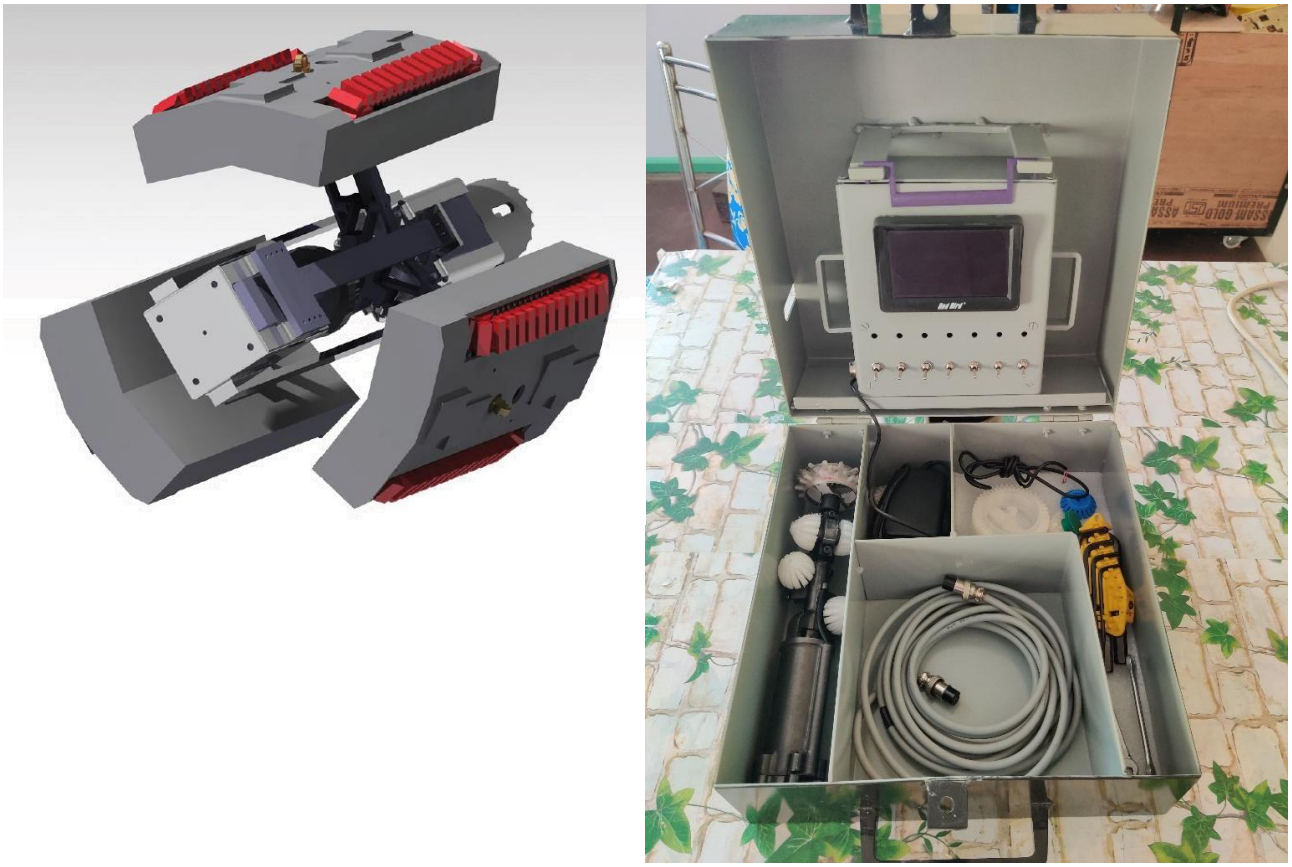
Drona has developed a customized sewer pipe cleaning and inspection robot which can enter into the maintenance hole and travel along the sewer pipe, expand according to the size of the pipe and clean the pipe.



Drona customized sewer pipe cleaning and inception robot

Implementation and Impact

The Manhole Sewer Robot (MSR) can operate in any maintenance hole condition in India, detecting blockage with a camera. The Robot enters and removes the block of any dimension (6 inches to 13 inches) from the sewer pipe. It is rugged and can clear blockages such as bricks, stones, slurry etc. It is suitable for all kinds of maintenance hole dimensions in India. It requires low maintenance, is portable and cost effective compared to other cleaning machines.



Manhole sewer robots (MSR) unit

START-UP 66

EcoDew

Founder

Muhammed Nujoomaa

Challenge

Micro, Small and Medium Enterprises (MSMEs) in India are bound to operate within the standards given by the Central Pollution Control Board (CPCB) for disposing of treated water. Around 30% of the capital investment of a new small-scale industry thus goes into setting up effluent treatment plants. There is no option for a plug-and-play wastewater treatment plant in the market. The systems available are bulky with a lot of civil construction, energy-intensive equipment and very difficult to maintain.

Solution

Ecodew solutions help conserve water for a sustainable future. Ecodew proposes a plug-and-play or compact effluent treatment system with state-of-the-art Hyper helix membrane technology. AOX technology developed by Ecodew in its in-house R&D uses chemical radicals to treat high COD Effluents in Pharma, Paint, Paint and Paper industries where the normal bacterial process cannot be applied. Similarly, the Fermento technology can be used to treat effluents which contain a high amount of Sugar, particularly from Soft Drinks and food processing Facilities

Eco dew plug and play treatment units

Implementation and Impact

Ecodew has been commercially implemented in Cooperative Diary societies across three districts of Kerala. Notable installations in Kerala are in Konnakulam Dairy Farmers Cooperative Society in Kottayam District, the Thevalakkara Dairy Farmers Cooperative Society, Kollam District, and the Irumpupaalam Dairy Farmers Cooperative Society, Idukki District. The capacity of all three installations is 2 KLD each.

START-UP 67

ECOSTP Technologies

Founder

Tharun Kumar

Challenge

Cities in India generate around 35,000 MLD sewage, out of which only 11000 MLD is treated. Partially treated and untreated sewage pollutes the environment and creates health risks. Energy consumption is also one of the significant issues that conventional STPs encounter. However, adequate innovative solutions are unavailable in the market to address this problem.

Solution

ECOSTP proposes decentralized, natural and cost-effective wastewater treatment to recover maximum water and help housing builders craft a sustainable community where wastewater management is brought within a closed loop system.

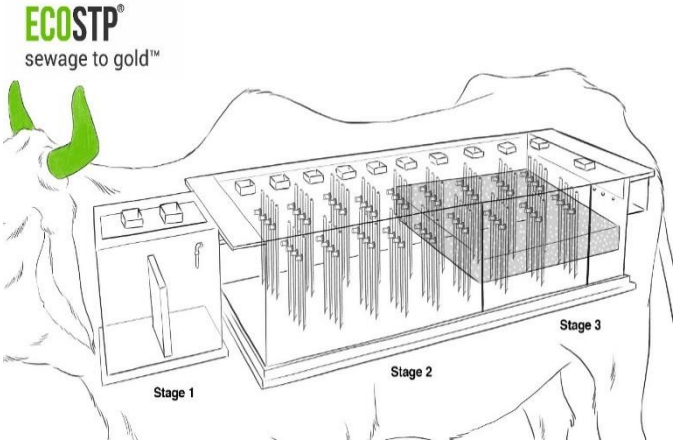
Their unique patented technology treats sewage in a decentralized, self-sustainable way in underground chambers without power, chemicals or human intervention. Using Biomimicry (rediscovering nature's genius in treating sewage in the cow's stomach) and regenerative innovation inspired by nature, the ECOSTP utilizes functional principles and strategies of microorganisms and ecosystems found in a cow's stomach. The core ECOSTP product comprises three separate chambers designed to ensure the 'up- flow' of sewage based on gravity. Each chamber has specific functionalities and components, such as baffle pipes and media.

ECOSTP has introduced custom anaerobic bacteria, which is a natural pollutant remover. The unique technology does not use chemicals or energy to treat the water. Instead, sewage is treated by a combination of microorganisms, plants and gravel to return clean water to mother earth.

Implementation and Impact

ECOSTP addresses UN Sustainable Development Goal Number Six (SDG 6) and is selected as a best practice case study for the United Nations ESCAP SDG Sustainability Asia Pacific report (http://www.ecostp.com/customer-stories/).

ECO STEP has 100+ paying clients across 20+ states and has received impact funding for the technology from Terwilliger Center for Innovation in Shelter, Habitat for Humanity.



Cow's digestive process inspires purification plant

An installation at VR Grand, Hoskote, Bangalore

START-UP 68

EnviroChem Services (OPC) Pvt. Ltd.
Engineering Environment for Better Tomorrow

ENVIROCHEM SERVICES

Founder

KD Sameer

Challenge

By 2050, the worldwide urban population will almost double, and global water demand is expected to increase by 30%. Consequently, this rise in urban water demand will lead to more wastewater generation. Further, urban area development demand and climate change stress the existing available water sources. Hence, there is a need to adopt an actual sustainable urban water management before urban areas run out of water.

Solution

EnviroChem Services (OPC) Pvt. Ltd. has been at the forefront of developing innovative solutions for wastewater treatment and odor control. With successful installations like the Underground Odorless STP at ESSAR Bulk Terminal, Surat, and the Ultra High-Rate Chemical Scrubber at Taj Cidade de Goa Horizon, Goa, the company has proven its expertise in odor elimination and wastewater treatment. Moreover, their anaerobic STP based on CE effectively utilizes GHG emissions for energy generation, significantly reducing carbon footprints. However, addressing GHG emissions from aerobic treatment processes remains a challenge. To tackle this issue, EnviroChem Services has designed and developed the SRRS, a Carbon Capture Unit (CCU) coupled with STPs/WWTPs. This innovative solution captures CO2 emissions and reutilizes them within the treatment processes, contributing to sustainability efforts. The CCU unit, operational since March 2020, demonstrates the company's commitment to environmental stewardship. Monitoring of Carbon Capture Soup (CCS) saturation is facilitated through pH indication, ensuring efficient operation.

Implementation and Impact

The counter-current vapor-liquid flow of UHRCS with ultra-high mass transfer rate, with a gas velocity of about 10 m/sec, where no packing media is required, along with the results of lean gas CCU where a change in pH of CCS was observed, after one week of operation in continuous recycling of the CCS, justifies the carbon-capturing from the atmosphere and ensures the viability of the combined system. For the 10 KLD STP, SRRS will reduce the 4.62 kgCO2eq./Day directly from the CCU and the total 5.55 kgCO2eq./Day from the combined process.

Treatment Plant

START-UP 69

Grace Green Infra

Founder

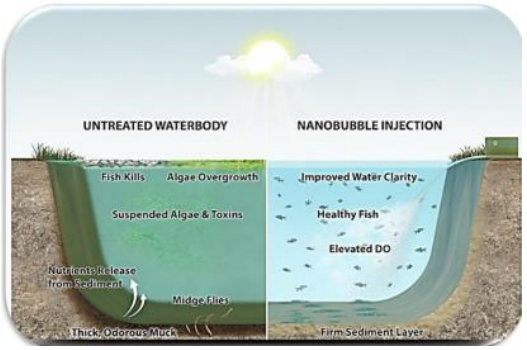
Ankit Thakur

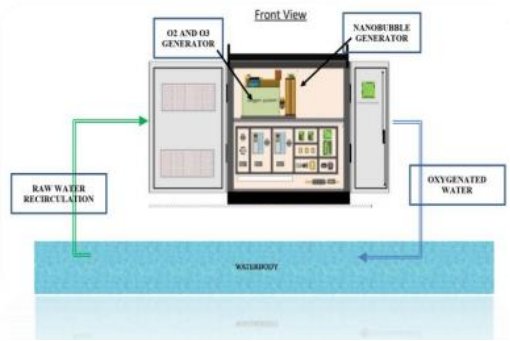
Challenge

When untreated effluents are released into freshwater bodies or wastewater and sewerage management systems are inefficient, it results in significant pollution. This pollution manifests in various forms, such as elevated levels of phosphates and ammonia in the water, leading to detrimental effects like eutrophication, algae growth, unpleasant odors, and the creation of breeding grounds for diseases. Consequently, these water bodies are often termed as "dead water bodies," characterized by extremely low Dissolved Oxygen levels, typically at 2 ppm and below. Such conditions severely impact aquatic life, causing harm and, in some cases, leading to near-zero levels of biodiversity.

Solution

Nano-Bubble is well established technology in the application of water and wastewater treatment and the results are promising. Nano bubbles are miniature size gas bubbles in liquids, 200 nm in diameter, which have several unique physical properties. Longevity, virtual disappearance of buoyancy, high internal pressure, extremely large surface/volume ratio, high oxygen dissolution rate and generation of free radicals are the important features of Nano bubbles. The internal pressure of nanobubbles in liquids is much higher than that of their environment, which helps in very efficient dissolution of the gas into the liquids. While rising in water, the collapsing nanobubbles generate free radicals that catalyze chemical oxidation..





Implementation and Impact

The Grace Green Infra Nano-Bubble Technology initiative introduces a unified approach to treating wastewater-filled ponds spanning rural and urban settings, particularly those covering an area of 4 acres. Focused on achieving fixed Dissolved Oxygen (DO) levels and ozone disinfection of algae, it aims to enhance water quality significantly. With concentrated oxygen of 93% purity and a minimum ozone production of 2 liters per minute out of a total oxygen flow of 20 liters per minute, the technology achieves a precise mixing ratio ensuring 97% dissolution of injected gas into the water. Piloted in various ponds across Haryana, the results were promising, showcasing non-continuous operation and long-lasting effects. Advantages include self-purification stimulation, organic compound degradation, nutrient reduction, odor elimination, and improved aquatic life. The oxygen-enriched water, with DO levels exceeding 8 ppm, becomes suitable for irrigation and horticulture applications.

Samain Pond after Nano-Bubble Treatment

START-UP 70

GREYEAST TECHNOLOGIES

Founder

Atharva Patankar

Challenge

Every day, India generates a staggering 63 billion litres of wastewater, enough to fill more than 25,000 Olympic-sized swimming pools. But only a fraction of this water is treated before being dumped into rivers, lakes and ocean. About70% of India's surface water resource are polluted due to the discharge of untreated wastewater. One of the main culprits of water pollution in India is the industrial sector, which produces chemical waste that cannot be degraded by natural processes.

Solution

Greyeast empowers nature to help fight back. SewoClean Technology, our proprietary process innovation utilises data from the polluted site and the metabolic data of local organisms to brew a magic fortified microbial cocktail. These bacteria can then degrade chemicals that cause high chemical oxygen demand (COD), a measure of water pollution. By doing so, they restore the oxygen level and the quality of the water. SewoClean is completely natural and sustainable. It does not use any chemicals that could harm the water or the ecosystem. Moreover, our bacteria are self-generating, meaning they can multiply and adapt to the changing conditions of the water. This makes our solution cost-effective and long-lasting.

Treatment Plant

Implementation and Impact

Sewo Clean Technology is suitable for upstream as well as downstream of the effluent waste water. It is being implemented in sewage and effluent treatment plants which can treat few million litres of waste water every day. The beauty of this solution is that it doesn't require additional infrastructure which makes it highly scalable. The SewoClean is just injected in aeration tanks of industries whereas in open ponds and lakes it can be activated in-situ. Along with COD it can also help reduce colour and odour. This technology is widely adopted by more than 50 industrial and local bodies owing to its satisfactory results. So far, Greyeast has treated more than 2000 million litres of water. The technology has also made its mark outside India and is being exported to countries like Singapore, Malaysia, UAE etc. Under AMRUT challenge Greyeast aspires to work in Maharashtra-Gujarat industrial belts to help reduce chemical pollution thereby impacting health and hygiene of the surrounding ecosystem.

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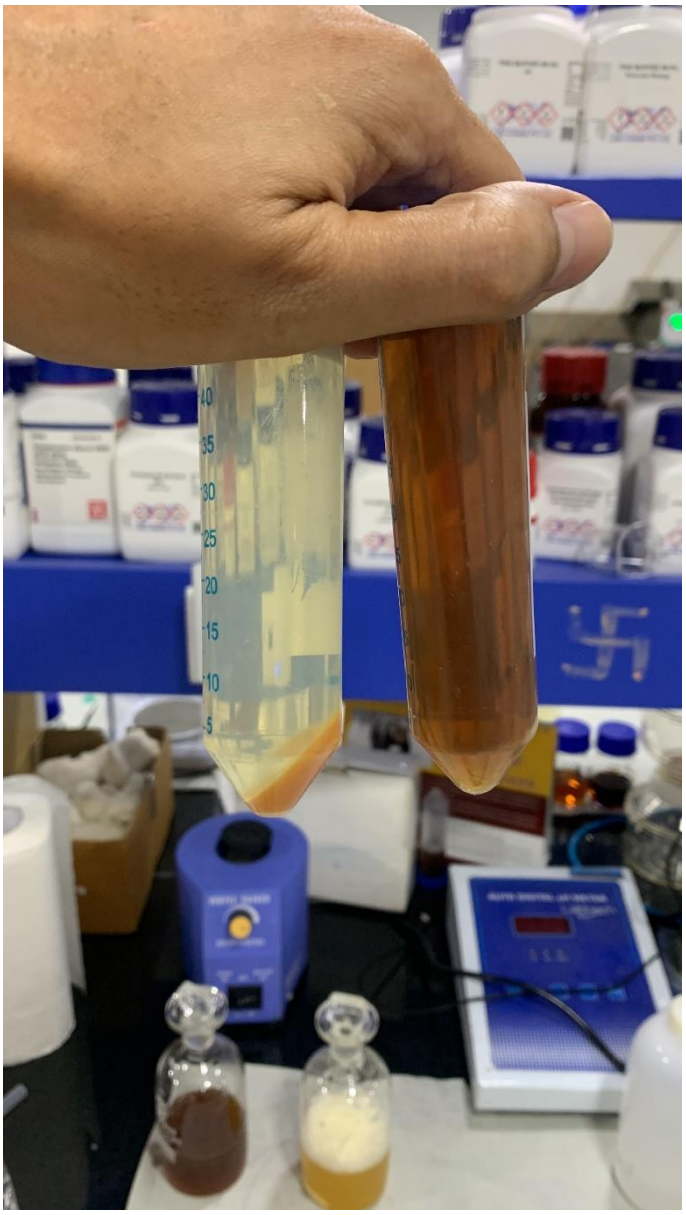


Purity of water after processed

START-UP 71

HUMUS BIOSYSTEMS

Founder

Vasanth Ramesh

Challenge

Process intensification is gaining traction in the water reclamation industry as urban land becomes increasingly scarce. The challenge lies in finding space for building water reclamation infrastructure in densely populated urban centers, where every square foot is valuable. Conventional treatment plants, while robust and sophisticated, struggle to adapt to decentralized settings due to their high energy footprint, maintenance demands, and skilled operator requirements. Miniature versions of these units often prove ineffective in decentralized setups, hampering sustainable operations. Therefore, there is a pressing need for innovative solutions that minimize energy consumption and maintenance while maximizing efficiency, ensuring sustainable water reclamation in urban environments.

Solution

At Humus Biosystems, we're pioneering the development of next-generation fixed film bioreactors for both domestic and industrial water reclamation. Our Quorum bioreactor treatment system aims to efficiently remove organic carbon and nutrients (nitrogen and phosphorus) without the need for mechanical aerators, all within a single bioreactor structure. Utilizing a patent-pending process control system, our technology integrates microbial biofilms with IoT platforms and AI tools for robust operations and real-time control. By promoting the grazing of microbial biofilms with protozoa and metazoans, our system facilitates the formation of thin biofilms, maximizing efficiency. With a biofilm carrier media boasting a high specific surface area and enhanced oxygen mass transfer via natural draft, our bioreactor occupies at least 50% less space and infrastructure compared to conventional systems. Moreover, its design accommodates various redox conditions, enabling comprehensive removal of organic carbon, total nitrogen, and phosphorus. With UV or ozone as tertiary treatment options, our autonomous and robust Quorum bioreactor consumes 50% less land and 80% less energy than competing water reclamation systems.

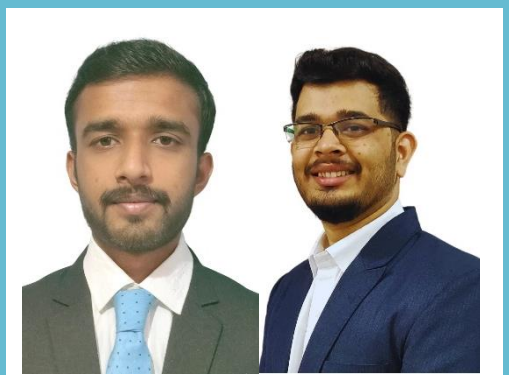
Implementation and Impact

Humus Biosystems made its market debut with a 3KLD pilot project aimed at a community toilet (CT) in Trichy, Tamil Nadu. Due to the CT's remote location, irregular desludging led to water overflow from the third chamber into a nearby surface water body, violating critical water quality parameters. To address this, a small collection tank was installed to collect overflow water, which was then introduced into a bioreactor using a pump. Once established, microbial biofilms in the bioreactor significantly degraded organic carbon, total nitrogen (TN), and total phosphorus (TP), ensuring compliance with Central Pollution Control Board (CPCB) norms throughout the one-year pilot study. Additionally, Humus Biosystems implemented similar treatment systems for a caravan parking space in Wayanad (5KLD), a restaurant in Kozhikode (10KLD), and a food processing unit near Chennai (20KLD).

3KLD pilot plant for a community toilet containment in Trichy, Tamil Nadu.

START-UP 72

Hygienity Solutions Private Limited



Founders

Vipul Chavan, Adwait Joshi

Challenge

Unlike Men's restrooms, women's restrooms typically have either a western-style commode or Indian-style toilets installed with no separate urinals. Therefore, women are forced to use the same Pan for urination and defecation, which leads to three major issues: significant water wastage, urinary tract infections (UTI), and soiling of seats and toilet space, which leads to unhygienic conditions.

Solution

'Hygienity Solutions' have come up with a non-stick Nano Coatings technology product (patent pending), which replaces highly acidic cleaning chemicals, eliminates the need for high human resources, minimizes water usage and improves surface quality. Hygienity Nano-Coating is a chemical solution that removes surface contamination, bacterial accumulation and odour with its preventive coating and provides continuous disinfection. After cleaning the surface, the Hygienity coat forms a Nano-layer of polymers on ceramics that exhibit anti-scaling and anti-bacterial capabilities.

In addition, it is a non-stick Coating that repels all waste particles & prevents surface damage. The Hygienity coats last 7-15 days after application and must be reapplied after 15 days. The top coat is applied to disinfect the surface and is odourless. Furthermore, since the coating is anti-scaling and staining , it enables organizations to use recycled/used water for flushing and maintenance and prevent significant water loss.

The eco-friendly composition of the product ensures no damage to the environment and enables hygienic maintenance with less water, chemicals, and time. The key features are its anti-scaling, anti-bacterial, anti-odour properties,eco-friendly and low environmental footprint (reduces up to 94.25 kgCO2eq/year), ceramic quality and productivity improvement, saves cost up to 85% alogn with savings on water, time and effort.

Implementation and Impact

Hygienity Nano-Coating is patented and is suitable for ceramics (mainly toilets, urinals, basins, and tiles). This solution has been tested in various market segments like office spaces, project sites at BVG India (Pune), Wipro Ltd. (Bangalore), OPUS Consulting Solution (Pune), Cummins India Office (Pune), at Manufacturing Plants of Cummins India Engine Plant (Pune). Additionally for Hotel Project sites at Sayaji Hotel (Pune), Utsav Deluxe (Pune), and Educational Institute project sites at Flame University (Pune), Maharshi Karve Stree Shikshan Sanstha (Pune), Elpro International School (Pune), COEP's Bhau Institute (Pune).

Hygienity Nano – Coating solutions

START-UP 73

Inphlox Water Systems Private Limited

Founder

Amrit Om Nayak

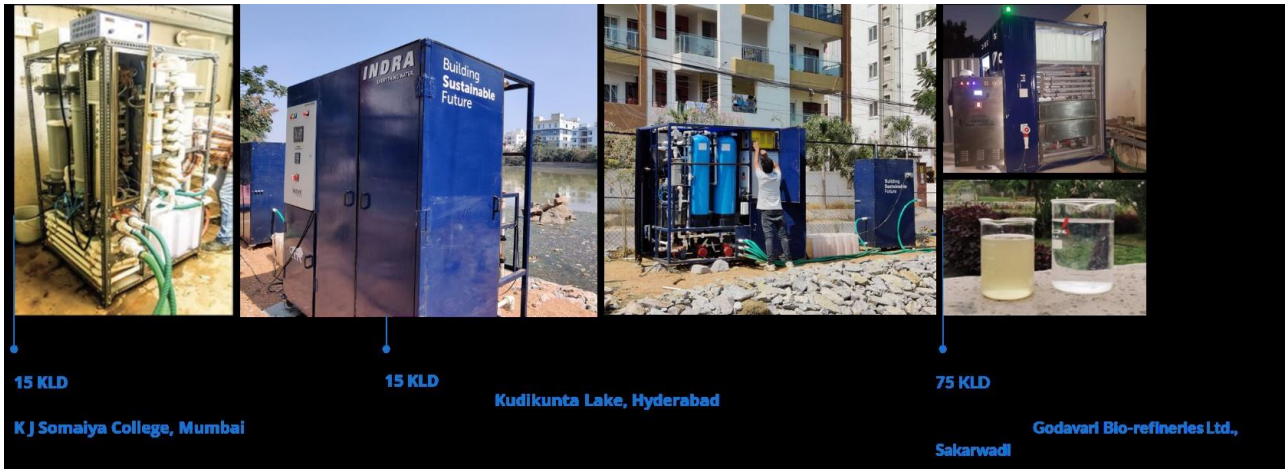
Challenge

Over 600 million people have been adversely affected without water access in India. As per Niti Aayog, twenty-one cities will run out of groundwater reserves. Moreover, around 74% of our wastewater is discharged into freshwater bodies without any treatment causing water pollution, further limiting the availability of and access to clean/potable water for people. Lack of water affects industrial activity and people's daily lives, negatively impacting the economy. Therefore, treating wastewater at the source and recovering it for reuse applications is crucial.

Solution

Indra is the pioneering decentralized treatment of domestic, commercial and industrial wastewater at the point of source with its patented electrically driven modular technology. With the support of the Department of Science and Technology and IIT Bombay, Indra developed the solution, which recovers up to 99% of the water for reuse applications. The novel broad spectrum pollution removal process can handle oxygen-demanding pollutants (COD, BOD), oil, fats, grease, heavy metals, nutrients (Nitrates, ammoniacal nitrogen, phosphates, sulfides etc.), pathogens, suspended and dissolved pollutants, volatile organics, dissolved gases among other things.

The plug-and-play solution is 30% cheaper, 80% smaller in footprint, and generates 70% less solid waste. No chemicals are used in Indra's reactors for the primary treatment of wastewater. Indra has also conducted trials under Telangana Water Resource Development Corporation's supervision of cleaning Kudikunta lake in Hyderabad. EPTRI successfully did the water testing. Trials were also conducted in textile effluent treatment under the supervision of KSPCB.



Decentralized installation units at various places

Implementation and Impact

With four patents, eight installations and 30+ commercial trials, Indra has treated over 750 million litres of water, positively impacting the lives of 500,000 people. In addition, Indra's technology has reduced 3200 tonnes of toxic sludge, 2000 tonnes of harmful chemicals and 500 tonnes of greenhouse gas emissions, which translates to 70-75% lifecycle carbon savings.

START-UP 74

Jalconserve Technologies

Founder

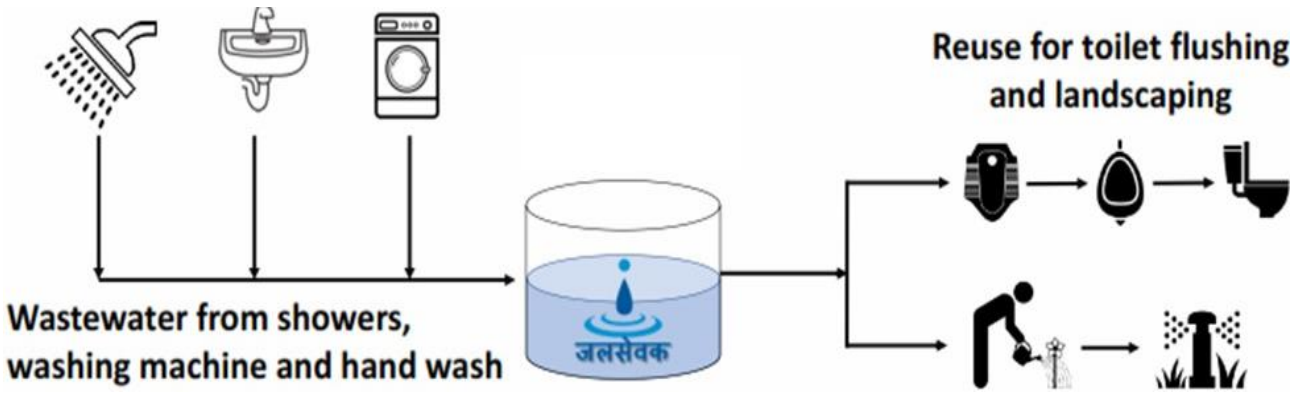
Abhijit Sathe

Challenge

Most rural and urban areas in India face water scarcity due to climatic change, overexploitation of the groundwater and pollution of the freshwater bodies. Even in such water-stressed situations, fresh potable water is used for flushing toilets. Water stress also pushes people to opt for open defecation or poor maintenance of public toilets.

Solution

Jalsevak Solutions provides a decentralized on-site grey water recycling system which is scalable. The technological solution can conserve up to 35-40% of fresh potable water. JalSevak Solutions enables the recycling and reuse of household greywater through a simplified solution for toilet and urinal flushing and gardening/landscaping with low maintenance costs. Their product - Washing Machine Wastewater Recycler called JalWASH ™ has been patented. Another product, Washroom Wastewater Recycler, is successful, and the patent is pending. Both products ensure recycled water with quality acceptable for toilet flushing and landscaping.



Implementation and Impact

The pilot was carried out at a large-scale Tannery in the Kanpur region, where five devices were installed to capture real-time data at critical nodes to reduce water consumption. The system is rugged and has been functioning well for the last two years and has supported the client in conserving water in their process (basis industry benchmarks) and acted as a monitoring tool.

Pilot installation of devices to capture real time monitoring to reduce water loss

START-UP 75

JK Nanosolutions

Founder

Dr Kiruba Daniel

Challenge

More than seventy per cent of the water reaching households goes out as wastewater and sewage. Unfortunately, cities do not have the space or funds to provide conventional sewage treatment plants and sewerage systems that connect to the treatment plant. Therefore, large volumes of untreated wastewater gets pushed into the environment leading to pollution. Untreated sewage often mixes with the drinking water supply pipelines, leading to public health implications.

Solution

JKN's nanotechnology-based products are low-cost, and treats the sewage rapidly in a single step and this technology does not need aeration to reduce COD and BOD in the treated water. Aggregation of polymeric nanoparticles based on the rapid treatment of effluent occurs, resulting in the formation of micro and macro-sized particles, which also acts as plant micronutrient. Their treatment mechanism or strategy is nano-coagulant and nano-flocculant-based aggregation and precipitation, followed by settling in a flow process 10 meters from the dosing spot. The product's key features are its rapid treatment, low cost (economical – 350 INR for treating 1,00,000 litres of water), less space requirement and low power consumption, simple operation, and eco-friendly.

Nanosolution based effluent treatment in garments washing units for industries, apartments

Implementation and Impact

JKN has completed early-stage pilot studies at eight spots in Bengaluru, as referred by Bengaluru Water Supply and Sewerage Board (BWSSB). Still, more elaborate trials are needed, which will be accomplished during AMRUT 2.0 challenge with grant support. In Channapatna, Karnataka, a critical issue has been solved by implementing their technology.

START-UP 76

Liqsure Systems

Founder

Dr Sarjerao Doltade

Challenge

Industrial wastewater treatment is a burning problem today. Outdated technologies are used for the treatment, which is insufficient to clean the new generation of complex chemicals. Several regional and multi-national industries are looking for solutions to change the current industrial wastewater scenario.

Solution

LiqSure systems Pvt Ltd is a technology-driven organization which brings a new approach to solving this problem by providing innovative and cost-effective solutions for industrial wastewater treatment, which works on the principle of cavitation. The system developed by LiqSure works on the principle of cavitation, where the pressure difference generates micro-bubbles. These micro-bubbles subsequently grow and collapse violently to release large amounts of energy, killing the microorganisms and destroying organic chemicals in the wastewater.

It does not require any chemical, filter, or membrane to purify the wastewater. Only electricity is necessary to pump the wastewater through the developed system, making it energy efficient and providing an economical solution for treating industrial wastewater. The benefits of LiqSure systems include low footprint, no secondary waste and easily retrofittable. It saves 30% of overall processing cost and has low maintenance. It works at any pH scale from 0-14, does not use membranes and filters and has faster treatment, meeting International Standards.

Implementation and Impact

The system is optimized onsite for various industrial wastewater, including textile, dairy, distillery, pharmaceutical, open lake, etc. Three types of demo systems are available for demonstration having treatment capacities of 160, 1000, and 20000 litres per day. The demo units can be installed onsite with per day pricing model. The higher capacity systems with treatment capacities of 80/160/240/320/500 KLD could be made available upon customer requirement. LiqSure systems Pvt Ltd is supported by Indian Oil Corporation Limited during their initial period and are currently supported by NMDC & ITIC incubator at IIT Hyderabad. The developed system treats water efficiently so that it can be reused in the process, and freshwater demand for industrial use can be reduced. Treated water will save the environment and indirectly will improve human life.

Installation for industrial wastewater treatment

START-UP 77

New Unnat India Techno Solutions and Innovations

Founder

Jitendra Singh Choudhary

Challenge

Various feasibility studies show that industrial-grade STP and ETP plants cannot be used for domestic purposes. In households, around 80% of water is used for secondary purposes like bathing, flushing and cleaning, etc. and 20% is used for drinking and cooking purposes. This 80% water, after its usage, goes into drains. The wastewater creates the twin problems of water scarcity and pollution. While this water can be recycled in situ, the available solutions for the same are costly and require many house modifications.

Solution

For recycling waste greywater at the domestic level, New Unnatural India Tech has developed a compact, low-cost water recycling machine called Shuddham. This machine can recycle water with zero chemicals and minimum energy consumption. It can be easily installed or retrofitted in bathrooms. It is fully automated and collects the wastewater from the outlet, filter it through 4 multi-stages, and pumps this water to the storage or flush tank.

The water can be used for all secondary purposes like flushing, gardening, cleaning, car washing, etc. The recycled water is tested in NABL accredited lab as per the grey water reuse standard.

Implementation and Impact

They have implemented Shuddham in two places- one in Madhya Pradesh and one in the draught area of Rajasthan to recycle the grey water and reuse it. They are developing a fully automated compact product and aim to install it in every building to recycle 80% of the wastewater. Recycled water can be reused for all secondary purposes and reduce the daily demand for fresh water. A household-level unit may cost around 15,000-20,000 INR.

SHUDDHAM device – pilot at household level

START-UP 78

Priora Water Solutions

Founder

Revan Akhade

Challenge

In most rural areas of India, untreated wastewater is discharged directly into the local surroundings and water bodies. In cities, only 30% of the total sewage is being treated, and the rest is discharged untreated into water bodies, leading to surface and sub-surface water contamination. Similarly, India has many industrial areas where advanced wastewater treatment technologies can be adopted.

Solution

Rural areas have low electricity coverage and abundant land. Therefore, Priora has developed a suitable hybrid technology that uses natural wastewater treatment, i.e., a combination of vermifiltration & constructed wetland system.

Vermifiltration is a natural engineered system in which the wastewater is treated using the potential of earthworms capable of degrading the organic fraction of waste present in wastewater, wherein the earthworm's body works as a biofilter. It is an eco-friendly and sustainable technology that generates treated water suitable for irrigation purposes with no sludge formation. Moreover, Vermifiltration needs almost no external energy except pumping. Due to this, it can be beneficial for small communities, colonies, and villages.

The system uses only one sewage pump, which can be operated with the help of solar energy. The wastewater is first collected in the collection tank, and after passing through the screen, the grit chamber is pumped to the baffled septic tank for anaerobic sewage treatment.

Primary treated sewage is then distributed by gravity with the help of a piping network to the vermifiltration bed, which comprises decentralized compartments of vermifiltration units at top and filtration media of graded sand pebbles, gravels and brickbats at the bottom. The outlet of this bed is then passed through constructed wetland unit for further polishing if required. The outlet water of this system is suitable for reusing for gardening, irrigation or being discharged into surface water bodies. This treatment technology does not need any daily maintenance.

Implementation and Impact

Priora has implemented an STP of 50 KLD capacity based on the Vermifiltration technology at Wing Village, Satara District in Maharashtra. It was developed at the cost of 38.50 Lakh INR. Before the implementation of this project, untreated raw sewage entered the Neera River causing river pollution. Post implementation of this project, it has been stopped, and treated water is being utilized for irrigation purposes.

In general, the quality of life and hygienic conditions in the areas will be improved through this technology implementation. With the operation of the STP, the pollution of water bodies shall be significantly reduced. The wastewater treatment plant shall produce by-products such as treated biosolids. Treated sludge is used as a soil-improving substance mainly for garden cultivation. The treated water at the wastewater treatment plant is reused for agricultural and other purposes, which reduces freshwater requirements, thus reducing the load on freshwater resources.

START-UP 79

REVY Environmental Solutions Pvt. Ltd.
Committed for a Greener Earth!

Revy Environmental Solutions

Founder

Vanita Prasad

Challenge

Inadequate waste management and wastewater treatment have become significant public health, economic and environmental concern worldwide. In India, the rapid economic development and population growth, inadequate infrastructure and relevant expertise, and land scarcity have turned the management of municipal solid and liquid waste into one of India's most critical environmental issues.

In India, freshwater sources are depleting. In addition, around 70% of sewage and 40% of industrial effluent remain untreated and discharged into freshwater bodies worsening the water scarcity issue. Further, the cost of wastewater treatment plants is increasing daily due to stringent environmental norms and power shortages.

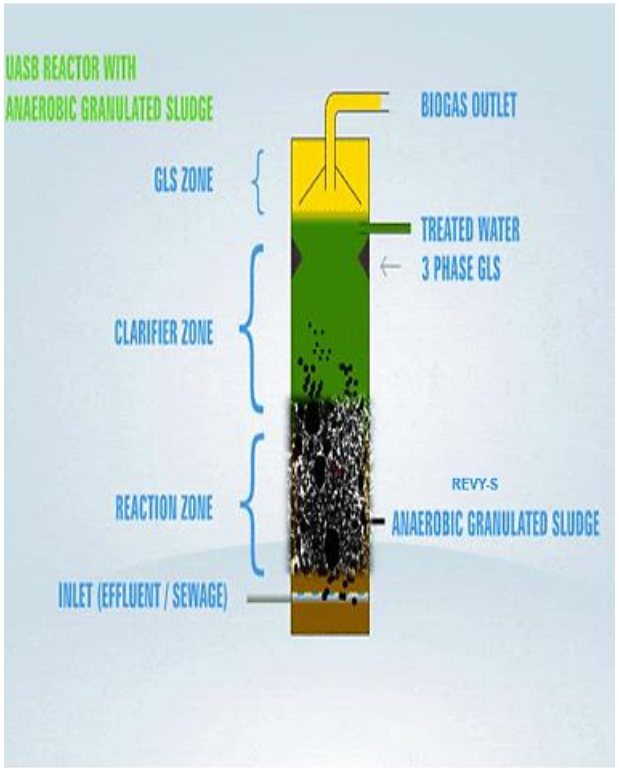
Solution

REVY-S is an anaerobic granulated sludge of 1.5 -2.0 mm in size and more than 650 bacteria. This consortium is proven to treat wastewater, and the treated water can be used directly for irrigation and energy recovery. The developed product is highly economical as it uses industrial effluent as feed material. This ready-to-use product will provide 26 times faster AD/ UASB reactors start. It can withstand a ten times higher loading rate and reduce 1.5 X higher COD/BOD while giving two times higher biogas yield. In addition, it provides highly stable operation of High-Rate Anaerobic Digestion based wastewater treatment technology. Revy is currently marketing optimized anaerobic and aerobic biomass and their core innovation of anaerobic granulated sludge with their growth enhancement formulations. To support these product applications and create a better user experience, an app is developed which helps track the daily performance of these biological reactors remotely.

Implementation and Impact

REVY is a recognized startup under the Start-up India mandate of DPIIT. Its R&D and productization activities are currently being funded by BIRAC, a section 8 company set by the Department of Biotechnology (DBT), Government of India. Their solution has already granted the process patent in India, the USA and South Africa. The application is under consideration in Europe and Malaysia. It can be easily employed in treating wastes from several sectors, including municipal wastes, sewage and wastes from industries such as dairy, distilleries, pulp and paper, slaughterhouses, sugar, food processing units etc.

The product provides a sustainable solution for water management and enhanced biogas generation, thereby supporting SDGs 6 & 7. The solution from REVY also addresses the twin-edged problem of managing wastewater and the organic fraction of municipal solid waste altogether in a single setup, helping make cities smarter in terms of waste management capabilities and thereby supporting SDG11. Their technological solutions also help in a significant reduction in carbon footprint to support SGD13. By implementing REVY's technical solutions to only 350 clients, about 3000 million MT of carbon dioxide mitigation is possible in 5 years.



Anaerobic granulated sludge of 1.5 -2.0 mm in size

START-UP 80

RUDHRA SOLAR AND AQUA INDIA

Founder

Raghavendra Bhat

Challenge

Every year roughly 380 billion M3 Wastewater (domestic and industrial) is generated globally. While 60% of this volume is discharged into the environment without any kind of treatment, almost 70-80% of the resources (including water) being throwing away can be easily recovered from the waste water.

The urgency to address water scarcity, with projections indicating that over 50% of the global population may lack access to water by 2050

Solution

The Deur Resource Recovery process utilizes the Panchatatva methodology, encompassing Netratalization, Oxidation, Distillation, Crystallisation, and Evaporation, to extract chemicals and reclaim water in an environmentally friendly manner. This innovative approach achieves high-rate pollutant removal within a compact footprint through a modified process, effectively addressing municipal and heavily loaded industrial wastewaters biologically. It minimizes sludge production compared to conventional methods while handling elevated pollutant concentrations. Additionally, Deur's resource recovery solutions operate on solar power, enhancing energy efficiency and reducing operational costs. This dual capability underscores its commitment to sustainability and eco-conscious practices, promoting both cost savings and a positive long-term environmental impact.

Implementation and Impact

Deur's clean water recovery solution has been successfully applied to address the industrial effluent challenges of a major manufacturing facility. This facility, which discharged 10,000 litres per day with an initial pH of 2.8, BOD at 36,000 mg/l, and COD at 150,000 mg/l, encountered significant wastewater issues. With Deur's resource recovery solution, an impressive 80% of the effluent water was efficiently recovered, achieving a purified state suitable for reuse in their daily processes. This showcases the effectiveness of Deur's solution in resolving complex industrial wastewater challenges while offering a sustainable approach to water management.

The impact of Deur's solution includes achieving a clean and potable water recovery rate of up to 90%. Through its unique Biological Treatment Process, the solution cuts wastewater treatment energy consumption by 30-40%, promoting energy efficiency. Additionally, it boasts low maintenance and operating costs, making it a cost-effective choice for industrial applications. With plug-and-play capability, Deur's solution offers ease of installation and integration into existing wastewater treatment systems, further enhancing its appeal for industrial users.

Treatment plant

START-UP 81

Smartwater Logistics and Services

Founder

Shravanth Donthi

Challenge

India faces an acute water shortage, with over 600 million people not having access to fresh/potable drinking water every day. The municipal water does not fully service most cities, and water tankers form a vital part of the supply infrastructure. Also, over-extraction of groundwater rapidly depletes aquifers and leads to unsustainable living conditions. On the other hand, Sewage Treatment Plants, both centralized and decentralized, generate large volumes of treated water every day, which is not fully utilized. This excess water, after treatment, is currently let out to the stormwater drains.

Solution

Tankerwala is a mobile application that enables a user to order water on-demand. The company is an aggregator of water tankers and Sewage Treatment Plants across the country. Using the mobile app, a user can call for STP treated water for secondary applications like construction/irrigation.

1 Country	1,000+ Tankers
200M+ Litres	18k+ Downloads

Upon receiving an order, the algorithm automatically allocates it to a particular STP to supply excess treated water and a tanker in the hyperlocal region to facilitate the transportation and delivery of this water. The app is live on Android Play Store and Apple AppStore. The app has over 25,000 downloads and active daily users. Tankerwala is facilitating the transportation of over 240,000 litres of STP-treated water for construction and irrigation

Implementation and Impact

Construction sites and infrastructure projects consume large volumes of water, and the requirement for water is temporary. Therefore, there is a demand for recycled water in the construction industry. However, it was observed that the suppliers do not meet the demand for treated water due to the lack of available tankers to facilitate transportation. Tankerwala is designed to impact the use of STP-treated water at construction sites, with improved delivery speed and increased volume of water transported. Tankerwala claims that tankers can save transport 65.7 million litres of STP-treated water to construction sites in one year

Tankerwala STP treatment plant (top) and team (bottom)

START-UP 82

SUKRITI SOCIAL FOUNDATION

Founder

Aditya Tomar

Challenge

Water conservation challenges persist due to excessive water usage, lack of recycling initiatives, and neglect of water sources. People in cities often misuse water, exacerbating the problem. The high costs and regulatory barriers hinder the establishment of recycling systems, impeded by public skepticism. Moreover, reusing recycled water is fraught with risks due to inadequate treatment and distribution infrastructure. Neglect and pollution have severely degraded lakes and ponds, with insufficient funding for restoration efforts. The absence of coordinated efforts among governments, communities, and businesses further exacerbates the water crisis, jeopardizing the future of water management.

Solution

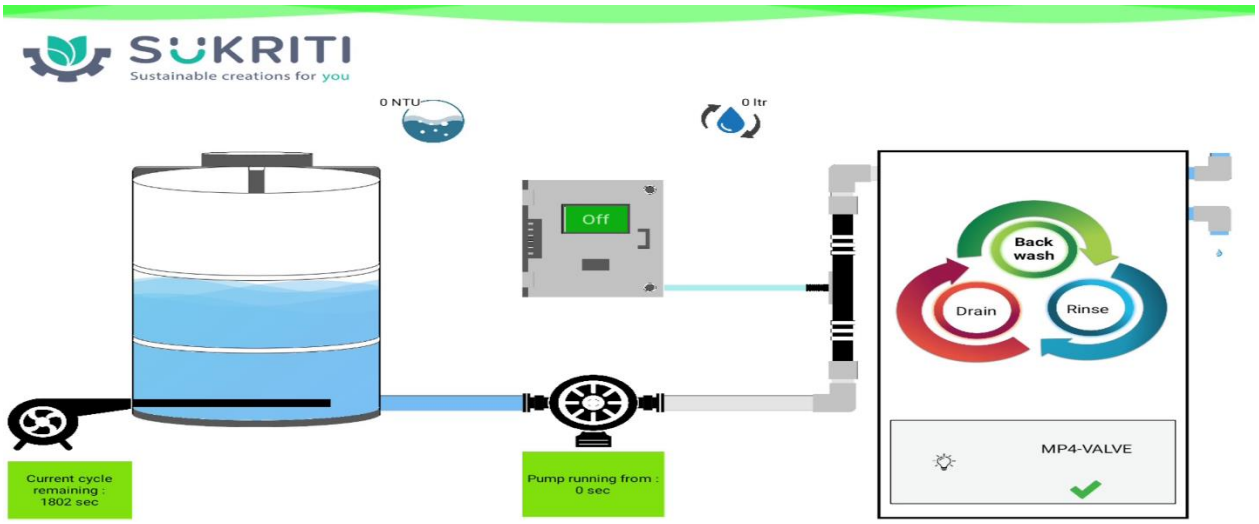
REWATER is a revolutionary onsite black water treatment system, designed as a compact, underground structure adjacent to public toilet units. This patented system employs biological and chemical treatment processes to efficiently treat sewage according to government guidelines. The treated wastewater is suitable for reuse in flushing, cleaning, and horticultural purposes. Notably, REWATERTM requires minimal maintenance, consumes low energy, and operates without the need for chemical refills. It features fully automated processes, eliminating manual intervention and chemical replenishment. Utilizing a hybrid of aerobic and anaerobic processes, REWATERTM ensures waste treatment on-site without releasing any harmful byproducts into surface water streams or land. The system utilizes naturally occurring microbes for treatment and employs ozone disinfection, eliminating recurring costs and foul odors. Additionally, its IoT-enabled design allows for remote monitoring and solar panel compatibility for energy efficiency. Highly scalable and user-friendly, REWATERTM offers an environmentally friendly, cost-effective, and easily deployable solution for various applications.

Implementation and Impact

REWATER™ is capable of recycling entire influent being generated from a public toilet. If we put things in perspective, we have over 2.5L WCs installed as public toilets across country under MoHUA. At an average, 1 WC generates 400L of Black water. This means that REWATER™ has potential to save approx. 10Crore/0.1 billion litres of fresh water per day. On top of it, this helps de-burdening our STPs and water bodies where this water is currently being dumped. When we add community toilets and other segments, we arrive at significantly higher numbers. In total, REWATER™ can make following impacts on environment and sustainability:

- Save up to half a billion of freshwater per day.
- Prevent over 500 water bodies from going into full depletion every day.
- Improve usability of toilets by providing ample quantity of water required by users.

REWATER™ has already been installed at 60+ locations including Fuel refilling station, Bus stands, Fuel Terminals of IOCL, Bottling Plants, and RRTS (Rapid Rail Transit System) sub stations. This has helped save 10 million+ litres of fresh water since the installation.



Processing Mechanism

START-UP 83

Trans Water Systems

Founder

Vikas Brahmavar

Challenge

Freshwater sources are over-exploited to meet various commercial and industrial water requirements especially in urban areas. If wastewater generated in cities can be recovered to potable water standards, then it will minimize the dependency on surface water sources and help to cope with climate change. The treated wastewater can easily be transported for commercial and industrial use at a minimal cost.

Solution

Transwater Systems Pvt. Ltd addresses this issue by recycling and re-using every drop of water. Their BOSON White Water System is a unique 11-stage (patent applied) water recovery system designed to recover high-quality potable water. This system is a decentralized potable water recovering unit designed to recover potable water from the partially treated wastewater produced in the existing Sewage Treatment Plant.

The process involves filtration and predictive analysis using IoT sensors. The pre-filtration system uses media sourced from environmentally friendly natural ores, which have larger dirt holding capacity, longer life, and lesser maintenance and are NSF certified. Later potable water is produced using low foul RO membranes. The inbuilt IoT platform helps monitor the system performance (design patent applied) remotely, reducing the need for a dedicated operator to manage the system. In addition, getting the system performance and water quality in real-time helps schedule preventive maintenance.

Implementation and Impact

BOSON White Water System is installed and operational at 8 locations across Bangalore with an installed capacity to produce 0.6 million litres of water daily. Malls, IT parks, industries and apartments in the city use their high-quality treated water (TDS <70 ppm) for their cooling tower and other needs for which they rely on fresh water.

In an apartment complex where they have installed the system, the excess water, after being treated, is transported to a laundry unit. The organization's decentralized water recovery approach significantly prevents the carbon footprint required to create a new infrastructure to distribute the wastewater while minimizing borewell water exploitation. Transwater Systems also gets the random water sample tested every month from a NABL-certified laboratory from their installed locations. As a result, the water quality produced by the BOSON White Water System is ensured to meet the BIS Standards of potable water.

BOSON White Water System installation

4. WATER GOVERNANCE

START-UP 84

Naturesani

Founder

Bhupathi P L

Challenge

In the existing models of sanitation fixtures, about 500-750ml of water is wasted per flush to clean, which amounts to thousands of litres every month within one household. This wastage adds to the current issue of acute water stress that the country faces.

Solution

Naturesani has developed a waterless urinal commode that works on the patented Hydro Mechanical Technology. It requires no sealant liquid and uses a water-repellent technology that prevents bad odour trapped in the drainage system from passing back into the restroom. The product has three components:

- A waterless urinal commode with a specially designed curvature profile and a non-stick coating helps ensure maximum slippery index. The design is such that urine and cleaning water slip into the cartridge and does not stick to the urinal basin.
- A specially designed eco-urinal screen with two stages of filtration
- A floor trap specially designed for odour and is also roach free.
- The Hydro-Mechanical Technology prevents gases from going back into the lavatory /restroom. It is heat, and cold resist or can sustain-10° C to 60°C.

Out-door units installed at various organizations

Implementation and Impact

They have successfully implemented a plug-and-play outdoor 3-in-1 urinal stand in Hyderabad Metro Rail LTD, Indian Railways. Naturesani was implemented in Chennai Central Railway station and saved high volumes of water and no bad odour with minimal maintenance. Other businesses where they have been installed include Oil and Gas companies, Seaports and airports.

The Naturesani Odorless, Waterless Urinal Commode (Ceramic) cost is 18,300 INR. The eco-urinal screen and block cost 350 INR, and the floor trap costs 450 INR. The SS 3in 1 Urinal stand, which includes three commodes, costs 3,50,000 INR. This price excludes taxes at 18%.

The innovation saves 96% of water and 97% of chemicals used in urinals. Each unit avoids using 150 litres of cleaning chemicals per year which would have polluted 5,00,000 litres of water. Each unit Saves 1,50,000 litres of water flushes per year, which can be used for drinking by 150 people. This innovation results in 5 times reduction in germs and unhygienic disease-causing conditions.

In-door units installed at various organizations

START-UP 85

Samaha Geosolutions

Founder

Tipu Sulthan

Challenge

The inhabitants of Lakshadweep are facing water-related issues with increased dependency on groundwater, reducing the health of the resource. In addition, saline water intrusion, hardness, and various other problems are permanently found in the minimal water resource of these tiny islands of India. Therefore, the location, geographical distribution, status (physical, chemical, biological), contamination, pollution, and other metadata about the resource needs to be mapped through GIS to have a clear understanding of the resource to aid sustainable decision-making by the Govt. and other stakeholders.

Solution

Samaha proposes to restore the groundwater to a sustainable level through rainwater recharging through well/pond recharging methods. The rainfall available in a particular location is collected from building roofs and recharged through open wells, ponds, and percolation pits instead of letting it go as surface runoff. Some of its key features are as follows:

- Assessment of spatial groundwater quality in islands
- Rainwater collection and mobilization from building roofs using pipes
- Filtration by specific methods for separating solid waste, if any
- Multi-level filtration by specific methods for dust/particles, if any.
- Recharging to well/pond/percolation pit to improve groundwater quality

Implementation and Impact

Currently, only a limited number of households have rainwater recharging facilities. Hence, there is a good scope for implementing the solution on a larger scale. However, it costs between 10,000-15,000 INR for installation per unit.

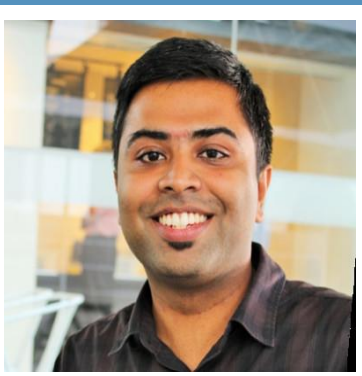
A pilot study has been done on a few islands of Lakshadweep. In initial experimentation, they demonstrated the solution in one key unit in a household environment and found it incredibly successful. However, a similar solution has to be installed in every building with a well or pond nearby to ensure the large-scale implementation of the solution to improve the overall groundwater resource in Lakshadweep.

Using water quality index and spatial distribution maps can assist in managing water quality development and public health. In addition, it would help them plan well for the future and create awareness in the community.

On – site rainwater recharging

START-UP 86

SmartTerra
Water Management



Founder

Giridharan Sengaiah

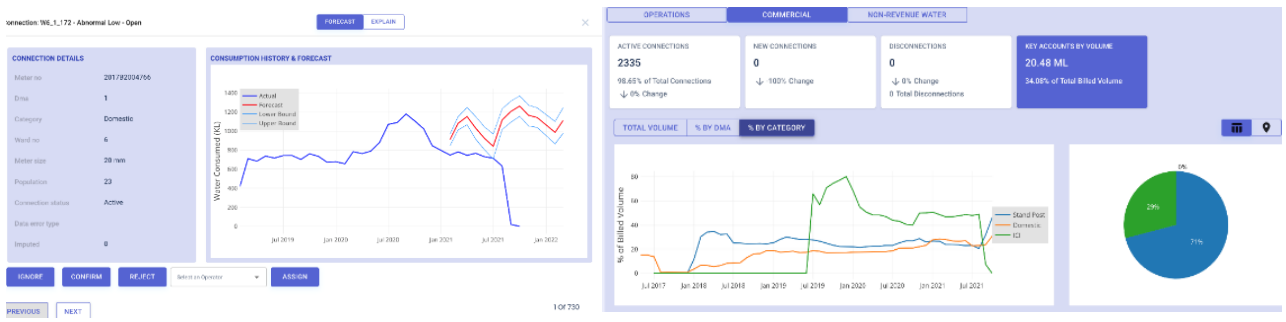
Challenge

Water utilities in India lose more than 40% of the water they produce as non-revenue water. These losses can be real or physical, caused by leaks or bursts in the pipe network and apparent losses caused by faulty meters, poor meter readings, or illegal consumption. Reducing water loss requires utilities to quickly detect and respond to loss events (leaks, meter failures, etc.). Given the size and complexity of the buried pipe network with a vast consumer base, it is expensive and unviable to detect loss events manually. Existing solutions for detecting leaks and other loss events are costly and unsuitable for operating conditions in India.

Solution

SmartTerra has developed AI-powered analytics software that helps water utilities detect water loss issues using data already available, such as billing or SCADA data. They have two products:

1. MeterCity – that builds a unified model of billing and consumer data to detect apparent loss issues such as faulty/ tampered meters, meter reading errors, etc.;
2. NetCity –builds a unified data cum hydraulic model of the utility's network monitoring and maintenance data to detect/localize leaks in the pipe network.



AI-powered analytics software

These modular solutions help detect apparent loss issues by analyzing consumption data and leak localization using calibrated hydraulic model runs. It also detects leaks and abnormal events with continuous flow analysis and has a KPI dashboard to monitor and analyze network performance.

The products can be deployed as cloud-hosted SaaS solutions with annual subscription-based pricing, depending on the number of water supply connections in the city/ utility. Based on the modules enabled and utility size, the yearly subscription fee would be INR 50 to INR 100 per connection per year. The products are also deployed on-premise of the utility along with permanent user licenses

Implementation and Impact

MeterCity and NetCity are being piloted in Cossipore (Kolkata), Coimbatore (Tamil Nadu), Pune (Maharashtra), and Bangalore (Karnataka) in partnership with water operators such as Suez and L&T. The MeterCity pilot in Bangalore demonstrated a potential 3% increase in revenue for the utility. They are also being deployed in the Philippines with water operators such as Manila Water and Metro Pacific Group.

SmartTerra is supported by leading incubators such as ImagineH2O Asia (Singapore), BREW 2.0 (Milwaukee USA), T-Hub (Govt of Telangana), ICCW (IIT Madras), and Microsoft for Start-ups. SmartTerra also received recognition and grant awards from water-focused programs such as Stockholm Urban Drinking Water Challenge, Akamai Water Innovators Incubation Program, and the World Bank's Water Technology Access Partnership.

START-UP 87

Solinas Integrity

Founder

Divanshu Kumar

Challenge

India faces enormous challenges in providing access to water. There are states with more than 40% of cities being drought hit, and Non-Revenue Water (NRW) as high as 40-50%, just in the distribution lines alone. These losses are generated due to disorganized maintenance and a lack of automation in leak detection. Also, the conventional methods to detect point leakages usually involve unnecessary trenching and manual search. Without a trenchless pipeline condition assessment and management plan, leakage happens at high volumes and is of grave concern to the utilities.

The corrosion, leaks, and sedimentation not only increase the losses but also affect the quality of water supplied, affecting the health of the households. Additionally, the asset managers don't have enough or proper insights to maintain the distribution system; thus, the pipeline assets reduce their lifeline

Solution

Solinas is an IITM deep tech startup developing robotic solutions for the pipeline and sanitation industry, solving problems of water leakages and eliminating manual scavenging. Endobot is a visual inspection crawler to identify defects and provide condition assessment for water & sewer pipelines (above 70mm). Its advanced techniques pinpoint the exact location of the critical defects, i.e. leaks, contamination, scaling and encrustations inside the pipeline using sensors. Swasth, a cloud-based dashboard, also processes the inspected data and provides insights into the pipeline's condition. The provided insights will help the cities or asset managers to maintain their entire pipeline distribution network and make data-driven decisions.

The cost would be about 4-8 Lakh INR, depending on the scope of work, including condition assessment, leak and contamination detection, dashboard and data analysis, and monthly report generation. The abovementioned cost includes the availability of 1 trained field engineer from Solinas and project coordination with the Solinas leadership Team during the first three months.

Implementation and Impact

Solinas has raised around 25 Lakh INR as investments and is supported through a startup fund scheme from STARTUPTN, NIDHI PRAYAS, IOCL, EIL, NTPC & CSR (IITM) worth 4 Crore INR. Solinas solution is deployed in some key cities like Coimbatore, Ulhas Nagar and Bhubaneshwar to improve the health of the pipeline network. As a technology partner, Solinas provide inspection and dashboard services to manage the pipeline distribution network more effectively to provide 24X7 water supply & reduce leakage and contamination complaints.

Using their robot, they can immediately act on contamination complaints and conduct regular inspections in high contamination-prone areas that improve their service and reduce shutdowns. It also helps reduce water leakage because of the early detection of leaks and the labour required to manage breakdowns, digging, etc. They also do the prospective analysis of the pipelines newly laid down by the local body

START-UP 88

Srishti Lifescience

Founder

Prateek Patel

Challenge

Disposable (Single-use plastic) water bottles contain harmful chemicals such as BPA that damage health and also have a highly negative impact on the environment. The entire life cycle of disposable water bottles uses fossil fuels, contributes to global warming, and causes pollution. According to World Health Organization, 90% of single-use plastic bottled water is contaminated with microplastic.

Solution

Srishti Lifescience's innovation (patent filed) is a plug-and-play compact device and mechanism for point-of-use packing and repacking locally available water in reusable bottles with IoT and AI-based technologies. The technology ensures water quality and reusable bottle hygiene assurance by implementing circular economy-based responsible production and consumption of bottled water and reducing ground water extraction load.

The device consists of a reusable bottle management system, bottle hygiene process, advanced antimicrobial treatment with quality control, audit trail of the processes, secured and metered filling, sealing and batch coding, data processing, cloud-based reporting, and machine-to-machine communication of data.

This circular economy-based innovation empowers bulk consumers to purify the locally available water with credible safety checks and live qualitative reporting and to pack the processed water locally in reusable bottles with bottle hygiene compliance checks and reporting

Implementation and Impact

With the support of the Self-Help group, Srishti piloted their In-house drinking water purification and bottling in reusable bottles in 2021 at Padamdungari Ecotourism Center, Gujarat, the biggest campsite of Gujarat forest department and the first single-use plastic-free campsite in the state. The water is sourced locally from Ambika River and purified, labelled, and packed on the campus. It is also laced with extracts of herbs like Tulsi to make it more refreshing and healthier. This pilot has served over 20,000 reusable water bottles for various conferences organized by Government organizations.

The CAPEX of the device is 30 Lakh INR, and the OPEX per 1 litre bottle is approximately 5 INR. The innovation saves Rs 6 to Rs 7 per one litre bottle compared to single-use plastic bottled water.

Applying this innovation will result in reduced water wastage, improved water quality, reduced carbon footprint, elimination of SUP bottles, reduced bottled water cost and effective implementation of the circular economy.

5. AGRICULTURE WATER MANAGEMENT

START-UP 89

Vertical Farming Technologies

Founder

Gaurav Narang

Challenge

The agricultural sector is the largest consumer of potable water (more than 83%). The commonly used flood irrigation process in agriculture leads to the wastage of a considerable amount of water. As a result, during the summer and dry spells, the water crisis is rampant, and many cities routinely suffer from water shortages.

Solution

In the developed world, farmers use technologies to improve water usage efficiency, thereby minimizing water stress. Along similar lines, the City Greens has developed a precision agriculture-based irrigation system which can be implemented in protected cultivation and open field agriculture. The innovation works at two levels - firstly, it uses sensor-based data to detect the irrigation need in the farmers' field and then automates the irrigation process to ensure that the water is provided only when the field is dry. Secondly, it links the irrigation cycle to vapour pressure deficit to ensure that the exact timing of irrigation is connected to the time when the propensity of plants' roots to uptake nutrients is maximum. Together, the two steps can lead to a saving of almost 87.2% water consumption.

Implementation and Impact

City Greens has implemented the solution in multiple urban farms under protected cultivation, using Hydroponics and Aeroponics technologies. In addition, the solution is customized for open field farms (apart from protected farms where it has already been tested). In protected cultivation, the solution has resulted in over 83% savings in water consumption.

6. INNOVATION IN CONVENTIONAL TAPS & PLUMBING SYSTEMS

START-UP 90

Earthfokus

Founder

Arun Subramanian

Challenge

More than 70% of the water is used through faucets and health faucets for washing hands, utensils and other cleaning activities in most households. A standard tap gives out close to 8-10 Liters Per Minute (LMP), and most of it goes to waste. Even in the faucets where ordinary water savers are installed, lots of fresh water goes unused or wasted.

Solution

Eartfokus offers retrofit plumbing fittings to the faucets and health faucets which helps to reduce water consumption by 50-85%. In the water savers, atomization technology converts the water into tiny droplets and covers the maximum area. This way, less water is used, effectively covers the hands and washes off the dirt. The product is made of high-quality brass and results in +90% water savings. In addition, the product has an umbrella flow output and comes with a 3-year warranty.

Implementation and Impact

The team has implemented their solutions for corporates like Honeywell (Pan India), Flipkart (pan India), Wipro, CTS (pan India), Accenture, JLL, CBRE and IBM.

START-UP 91

Ilonnati Innovations

Founder

Krishna Chalam

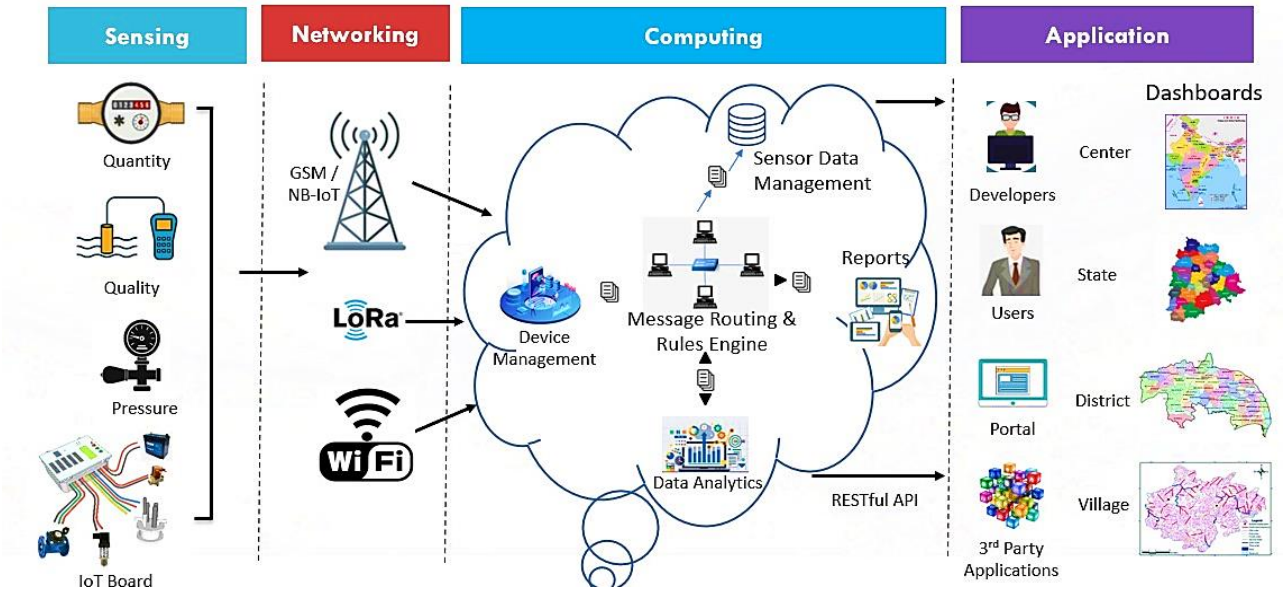
Challenge

The world would face a shortage of 2000 million mega-litres of fresh water (2030 Water Resources Group). In addition, the aged pipe network and the absence of control over water usage exacerbate water wastage. The Ministry of Jal Shakthi, Govt. of India, had estimated that a water shortage would negatively impact at least 6% of GDP. Non-Revenue Water in India is 38% compared to the global average of around 30% (World Bank). Also, water-borne diseases killed seven people every day in 2018. Hence, measuring and monitoring water quantity and quality is essential. Due to the growing population, increasing environmental and health issues, and pressure on the food and agriculture sector, there is an urgent need for measuring, monitoring and managing quantity, quality and pressure at supply, distribution, and consumption.

Solution

Ilonnati Innovations Pvt. Ltd has developed Smart Ideal Water Meter (SIWaM), an IoT-based smart water management solution to measure and monitor the water quantity and pressure in the entire supply chain, i.e., from water source to the consumer taps until the end of network. In addition, the solution also measures and monitors water quality parameters such as pH, TDS, Chlorine, Nitrate, Turbidity, Fluoride, hardness etc. The solution's key features are enabling easy supervision, water distribution, alerting for red flags when triggered, reduction of manual intervention, thus reducing human error, and flexible and customizable analytics to make well-informed data driven decisions.

The Concept : High Level View of Smart Ideal Water Management (SIWaM)



Implementation and Impact

"Smart Water Supply Measurement and Monitoring system" was implemented in 25 Villages in three States in Rajasthan, Manipur & Haryana as part of the ICT Grand Challenge, 2020. This IoT-based Water Supply Measurement and Monitoring system has helped to get real-time continuous Monitoring of Water Quantity to Functional Household Tap Connection (FHTC) in every rural home in the villages. The solution also ensured water quality, meeting the BIS Drinking Water Standards as part of NJJM Objectives. Ilonnati Innovations has deployed the solution in 11 Villages of 3 Divisions in Jaipur District. All the Systems deployed work seamlessly and transmit data to the dashboard on Real Time basis.

START-UP 92

KarIoT Solutions

Founders

Suresh, Aravind Natarajan

Challenge

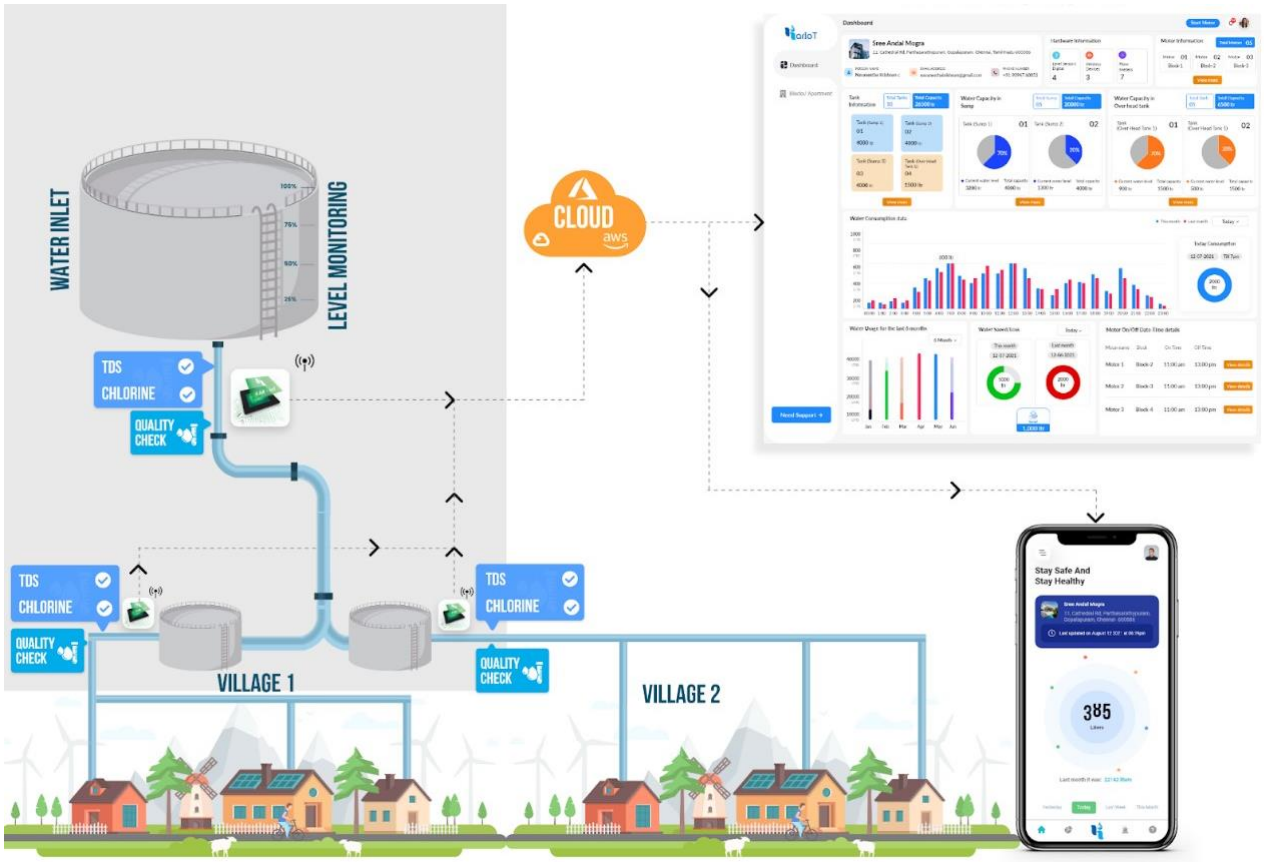
The water supply chain has multiple stakeholders to enable smooth operations. But, due to lack of data and continuous monitoring of different aspects of operation & maintenance (O&M), water systems become inefficient. In addition, there is inconsistency in the distribution network due to its inability to track supply vs consumption or track Liters per Capita Per Day (LPCD) at distribution points or household levels. The problem is that manual intervention is required to physically monitor failures, close/open valves, or record meter readings, even in remote locations. Manual interventions prolong the intervention time and increase maintenance costs, affecting efficiency. In addition, a lack of data metrics leads to the failure of the sustainability of water resources, and one cannot assure that every household gets the required LPCD of water with optimal quality.

Solution

KarIoT is an intelligent gateway solution that can be integrated with various components like flow meters, level sensors, and organic components like PH, TDS, chlorine, etc., to provide robust, remote, and automated solutions on a smart device. KarIoT is IoT enabled solution that collects data from physical devices/sensors via the cloud and uses Artificial Intelligence (AI) to remotely monitor, operate, predict, and generate reports for analysis via mobile and web dashboards. From the acquired data, It can trigger alerts, predict consumption, forecast future requirements, and reduce energy consumption. A robust dashboard is provided to every village/GP level, block/division/sub-division level, district and state official level, etc., with a common centralized application to follow a standard format for data transmission with security protocols.

The system monitors water level, pump functioning, opens and closes valves at the source, triggers alerts, automates pump operations, and ensures required BIS standards with instant alerts and automatic valve cut of operations. The solution provides end-to-end visibility of water supply with real-time monitoring and processes to enable quick response time and increase efficiency.

Key features of the technology are an open platform, compact size, solar panel compatibility, cloud storage with enhanced security, low or minimum connectivity to support the device in remote locations, four-layer PCB fabrication to resist extreme temperature and pressure, exchange of data from existing PLC without the need for SCADA software.



KarIoT dashboard

Implementation and Impact

The solution is implemented at Tiruchendur panchayat in 13 habitations to cope with the water stress. Automated alerts notify the key personnel of inconsistencies, malfunctions and anomalies. The solution monitors and audits energy consumption from pumps and filtering plants, controls water valves, and generates predictive analysis. HECS, India's largest wastewater treatment plant provider, uses KarIoT Solution

START-UP 93

Navyoni Technologies

Founder

Neeraj Dnyaneshwar Darwai

Challenge

With conventional faucets, people unknowingly waste a notable amount of water during their usage. In the 'COVID-19' scenario, consumers have become more hygiene conscious. Sensor-based faucets and dispensers are adequate for these issues, saving water and providing hygiene. But these technologies are not user-friendly and need supervision with the installation. Further, their dependence on power influences costs and limits its usage in its absence and remote locations.

Solution

Through technology-driven automation, Navyoni Technologies provides users with economical smart sanitary solutions for water and energy management. The proposed smart basin cabinet, with various sensors (radar, inductive, IR, Touch etc.), allows users to effectively monitor water & power consumption, along with other smart utilities like added luxury and convenience, at a relatively low cost. The system activates only in human presence; hence energy is conserved in standby mode. The touch of the human hand activates its water flow, and the LED mirror and liquid soap flow are activated via a touchless IR sensor. Along with these features, the proposed units are user-friendly in installation and maintenance, with only a few basic steps to follow. They can be installed in the existing basin/plumbing systems also.

Navyoni automation-driven units

Navyoni offers a wide variety of smart basin cabinet and faucet units with a wide variation in price tag. The mid-premium proposed Castalia and other sub-products range from a minimum selling price tag of 6K to 23K. Customers can even choose from the below smart basin models:

- Premium Segment (Akruti - an artistic human sculpture)
- Mid-Premium Segment (Castalia & Castalia Pro, Vajra, Pandora etc.)
- Vintage-Economy Segment

Implementation and Impact

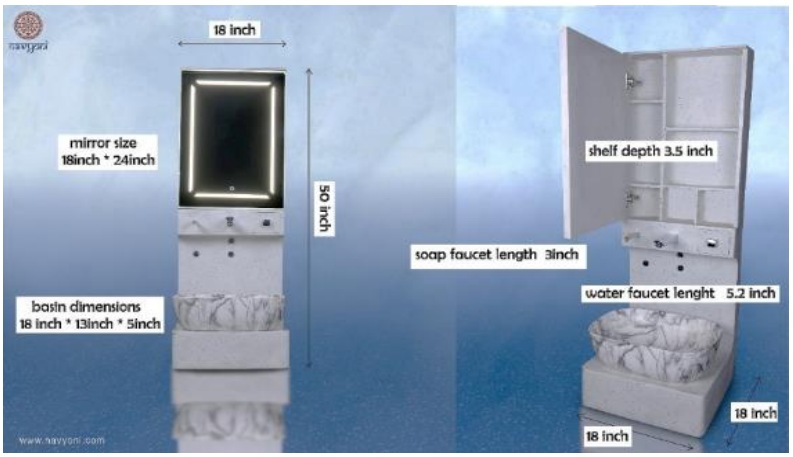
The initial model has been operating for nearly two years in a few homes. From February end, their mid-premium smart basin segment Castalia has been piloted in Nagpur. The technology has generated marginal revenue and provided valuable feedback for perfecting the product.

Along with water conservation, energy utilization is also at its minimum via a Radar sensor installed behind the unit, which activates the overall circuitry only on human presence. The proposed unit is also provided with different power options;

1) Battery-driven smart basin
2) AC-powered smart basin.
3) Wired basin with Battery backup during the power cut.

With R&D electronic circuits and programs, the proposed battery-run smart basin unit runs for months on a single quick charge. This makes the product viable for regular use even in remote localities, tourist locations, rural public and Government places, schools etc., where it can also be solar charged.

Thus water conservation is possible even in remote areas. Moreover, the contactless system helps avoids the spread of germs. It also helps to save water and provide hygiene in homes, hospitals, government offices and other commercial places.



neerajdarwai115@gmail.com

START-UP 94

Nimble Vision

Founder

Chinnayya

Challenge

Extravagant use of water, leakages, and manual operation in domestic and industrial pumping infrastructure (Plastic & Cement Tanks) is caused due to lack of insights on water availability, consumption, leakage, and quality in real-time. Another issue is overflow and blockage of machine holes causing infrastructure damages, traffic jams, and human casualties.

Solution

Nimble Vision has developed two innovations to address these challenges.

Ni-The Water Saviour is a smart water level controller meter and quality monitor. Existing plastic and cement tanks are made smart through sensors and an IoT unit using patent-pending technology. It controls the motor, monitors the water level, and provides real-time water usage, leakage, and quality details on mobile and web dashboards. It meets CE (IoT PCB) and IP65 (Enclosure) certification and standards.

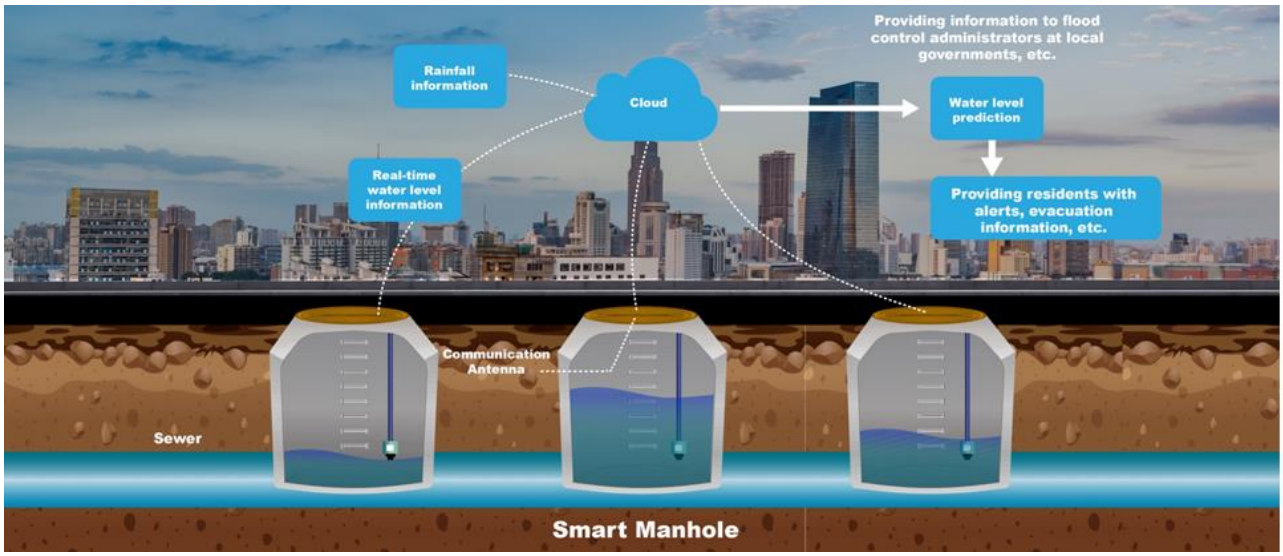
Ni-The Manhole Monitor is a smart IoT-based solution that makes all the machine-holes smart through retrofitting. It is a smart IoT (4G) solution with a submersible sensor that shows live sewage level, flow rate and geolocation in real-time on mobile and web dashboards. It meets CE (IoT PCB) and IP67 (Enclosure) certifications and standards.

Implementation and Impact

Ni-The Water Saviour has over 60 clients (B2B, B2C) and has saved over eight crores of water in the last four years. The cost of the Plastic Tank is 8000 INR, and Cement Tank is 20,000 INR. Four Ni- The Manhole Monitor units have been piloted in Faridabad Smart City for75,000 INR.

The smart water metering device provides data analytics on water consumption & availability, thus helping common people, industries and smart cities to reduce water consumption & wastage. Furthermore, it provides the required water quality details such as TDS, pH, etc., which helps avoid water-borne diseases. In addition, water leakage detection helps in avoiding wastage. The public water distribution, meter reading and billing are also completely automated, increasing the system's efficiency by reducing manual intervention.

The impact of the maintenance hole monitoring system is threefold; Social, Environment & Economical. First, it helps to avoid the human causalities that happen during the maintenance of machine holes. Second, it helps to keep the cities clean due to no overflowing machine holes. It helps to identify the harmful chemicals in sewage and helps to keep the sewage clean, along with identifying the sewage qualities in real-time. Third, it reduces the manual effort to maintain the machine holes and costs. The automation helps to manage the vast cities & STPs at a lesser price. It helps reduce the costs incurred because of damages to city infrastructure which would have been caused by overflowing machine holes. Finally, it helps to reduce the effort spent on the treatment of sewage water & helps to avoid pollution of the river, thus creating further savings on cleaning the river.



START-UP 95

Ushva Clean Technology

Founder

Ashutosh Kumar

Challenge

While water sources are facing depletion, there is a lot of water wastage due to the absence or delay in the information available from each water asset/inventory. This lack of knowledge leads to faster and larger water consumption and, eventually, over-exploitation of water resources.

Solution

Ushva Clean Technology has designed an IoT edge device which provides real-time access and data sets to enhance visibility and take corrective actions. The device is compatible with all water meters and sensors and works as a remote data control even under low connectivity. It is compact with on-device storage. The device management and analytics can be viewed on their software dashboard flowlinc.io

Flow-linc Product overview

Ushva Clean Technology monitors groundwater and water data of municipalities, urban local bodies, and residential complexes from a single dashboard. It creates water sampling schedules and notifies about upcoming sampling events. Ushva Clean Technology also developed groundwater management systems, effluent quality monitoring systems, municipal water management for residential complexes, water tank management, and water-level monitoring for various clients across India.

Implementation and Impact

Ushva clean technology is used by various urban local bodies across the country to monitor the groundwater. In addition, they have been awarded grants from the Department of Telecommunication, the Government of India and the United Nations Industrial Development Organization (UNIDO). They have also received many international and national recognitions' including the UNIDO Industrial IoT Innovation Award, Top 34 global innovations by the Japanese Government, runner-up at the Smart Energy Management by NASSCOM, offered Virtual Acceleration by the Ministry of Electronics & Information Technology, India under its electropreneur park initiative, and others.

ashutosh@ushva.com

7: URBAN SEWERAGE MANAGEMENT

START-UP 96

AROCROBOTICS DRIBLET

Founder

Shubham Vishvakerma

Challenge

India produces 72,368 MLD of sewage every day, however between 2016 and 2023, the number of treatment facilities increased by just 50%. Workers are exposed to hazardous gasses and garbage during the dangerous cleaning process, and automated solutions are incomplete. Delays in effective cleaning , forecasting and monitoring lead to ongoing inefficiencies.

Solution

We are pleased to present Krait, our dedicated robot designed for sewer upkeep. Krait's robotic arm may be adjusted to fit different sewer depths, and it clears debris and obstructions not only from center via a grabber system but also focuses on effective removal from the edges from pipes at the entrance and outflow channels.

This device records complex 3D structures for accurate cleaning and comes with state-of-the-art jet and suction tools. Krait has cameras and sensors to measure sewer dimensions, detection of Hazardous gases, and impure sludges along with impurities of waste. It is operated by an easy-to-use interface on its body. Problems encountered while cleaning are recorded, which helps with the study of demographic data and predict clogging and debris formations beforehand. Specialized city cleaning schedules are created based on dashboard data regarding operation, progress, and process kinds. Redefining urban sanitation, Krait guarantees effective, data-driven sewer management.

Implementation and Impact

Our groundbreaking device features a flexible robotic arm for seamless travel within sewage chambers, eradicating debris buildup and recurrent blockages. Its exceptional mobility, driven by a vehicle, ensures optimal suction and precise cleaning channeling via flexible robotic arm. The user-friendly interface requires minimal training can be operated via workers from the vehicle dashboard systems, effective in eliminating the sludge and debris formation across the edges in sewer lines and manholes.

1. Key Elements:
2. Overflow Prediction
3. AI-ML Data Analysis
4. Manhole Surveillance
5. Jet Mechanization
6. Support Suction System
7. 3D Chamber Mapping
8. Enhanced Maneuverability
9. Manhole Location
10. Real-time Progress Reports
11. Sewer maintenanceForecasting

Our solution champions predictive analytics, proactive maintenance, and seamless sewer cleaning and management, marking an end to hazardous manual processes. It's a pivotal step toward safer, automated, and highly efficient sewer systems, revolutionizing the landscape of sanitation practices, and most importantly securing the rights of workers for a better tomorrow.

START-UP 97

Cherries Engineering And Innovation India

Founder

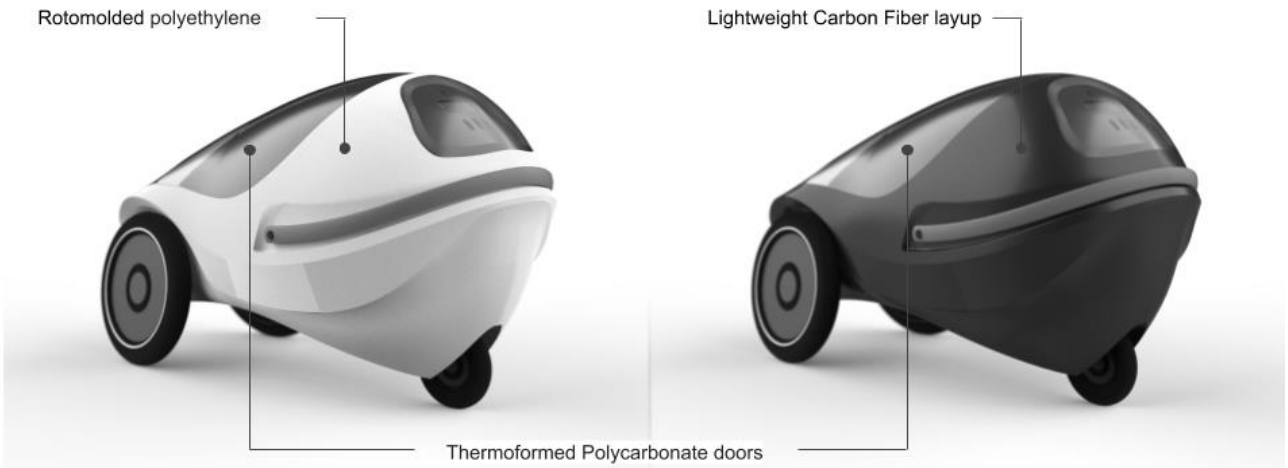
Rakesh Kasba

Challenge

Poor sewer and onsite system maintenance create environmental challenges and perpetuate the hazardous cleaning of sewers and septic tanks by sanitation workers. Therefore, techno-economically and socially viable solutions are necessary to protect the environment and eradicate manual scavenging/hazardous cleaning.

Solution

JALODBUST Systems are livelihood-generating indigenous mechanized systems for removing and transporting faecal sludge, septage, and sewage from leach pits, septic tanks and sewers. JALODBUST SaniPreneur and Pride Equipment isolate the worker from the dirt, particularly from the sight, smell and splash of the faecal matter, ensuring their safety. The key feature of this equipment is that it works on battery, lowering the fuel cost and environmental burden. It is a portable Machine for reaching basements, upper floors etc. The technology is designed for both congested urban spaces and remote rural areas.



Implementation and Impact

JALODBUST™ systems break, dislodge and liquefy the solidified sludge in crores of dry latrine, leach pits, septic tanks and maintenance holes. It removes this liquefied faecal and sanitary sludge without intervention and exposure of sanitation workers through micro-processor-based operations. Moreover, the operation is battery-powered and efficient, thus increasing the income of the worker manifold avoiding his/her exposure to faecal matter. The technology has been used in Weaver colony, Thannisandra and Hebbal in Bangalore.

START-UP 98

Ekam Eco Solutions

Founder

Uttam Banerjee

Challenge

Unlike Men's restrooms, women's restrooms typically have either a western-style commode or Indian-style toilets installed with no separate urinals. Therefore, women are forced to use the same Pan for urination and defecation, which leads to three major issues: significant water wastage, urinary tract infections (UTI), and soiling of seats and toilet space, which leads to unhygienic conditions.

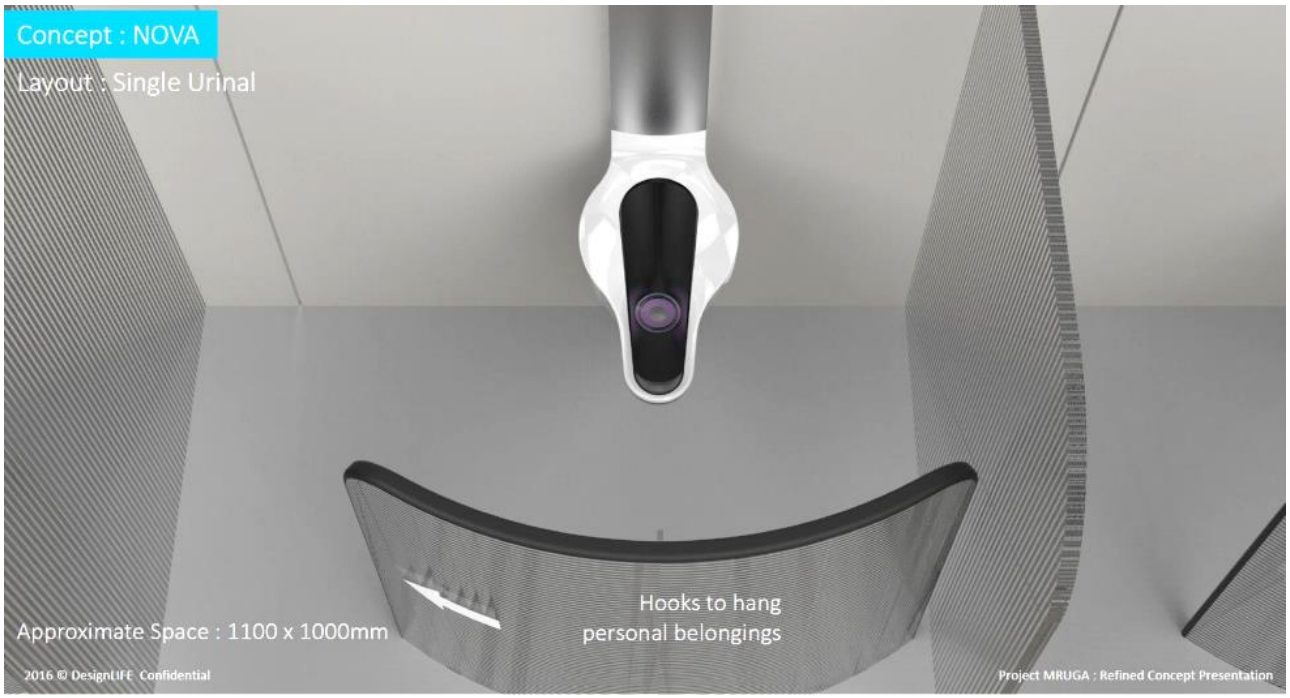
Solution

Ekam Solutions conducted a two-year in-depth needs assessment to understand women's needs concerning a urinal, constraints of the current system, the pain points, benefits, and solutions that address women's issues in different stages of their life, along with the ergonomics for devising an optimal system. In addition, a socio-cultural and behavioural understanding was also undertaken.

Based on the need assessment, a urinal pan was designed for women, which addresses the issue of water wastage. The newly designed dedicated hygienic urinal for women has thoughtfully designed contours and curves to the Pan to make the device anti-splashing. Furthermore, a centrally placed dome housing the waterless mechanism creates a one-way passage for the urine to flow into the drain line. It stops the odour-causing gases, thus making the whole system a very low flush urinal. Multiple versions of the design are planned to cater to different markets ranging from lower to premium and urban to peri-urban and rural.

Implementation and Impact

Two field trials were successfully conducted at a few commercial offices in Mumbai. The Ekam Solutions team gathered the feedback and insights and completed the design modifications accordingly. The product is now ready for large-scale field trials and 100 units per batch production have started, which will be used for a large-scale field trial in different cities in India. The large-scale field trial will help to understand the user reaction and provide insights into usage differences based on geographies, ethnicity and culture. This large-scale trial will also help us finalize the commercially viable model.



START-UP 99

FLUID ROBOTICS

Founder

Nidhi Jain

Challenge

In India, over 50,000 MLD wastewater goes into lakes, rivers, and coastlines without treatment. A lack of data (maps, condition, capacity, etc.) about underground wastewater pipeline networks makes it impossible to prevent sanitary sewer overflows. No data means no sustainable means to rehabilitate critical infrastructure in time. Moreover, manual scavengers are forced to enter the pipelines to identify and clear blockages, exposing themselves to toxic gases and chemicals. Therefore, this sector needs mechanization and is also ripe for disruption. Solutions either don't exist or are decades old and unsuitable for the present problems.

Solution

Fluid Ai is a wastewater analytics platform that combines robotics, IoT and artificial intelligence to monitor the health of wastewater infrastructure, waterways and public health. The in-pipe robot uses AI and sensors and can crawl, float, and swim through storm water systems and sewers. It maps and inspects them as it travels through, checking for leaks and structural health.

Implementation and Impact

Fluid Ai technology has been adopted across seven countries for their public water utilities, contractors, and EPCs. Projects ongoing/ completed in India are with the Municipal Corporation of Greater Mumbai (MCGM), Pune Municipal Corporation (PMC), Surat Smart City, Jodhpur Nagar Nigam, Delhi Jal Board, etc.

Fluid robotics pipeline monitoring and mapping

START-UP 100

Genrobotic Innovations

Founders

Nikhil NP, Vimal Govind MK, Rashid. K & Arun George

Challenge

India is urbanizing rapidly, and the municipalities and urban local bodies (ULBs) face the challenge of making cities liveable for the growing city population. Proper management and recycling of urban sewage is a critical challenge that the ULBs face in urban development. Ensuring the free flow of sewage is crucial for carrying out an efficient recycling process. However, manual entry is required to remove the clogging particles in the sewer holes. The risk involved in manual entry is fatal, causing immediate death from exposure to poisonous gases or increased mortality due to deteriorating health conditions over time.

Solution

Bandicoot – 'The complete solution for manual scavenging', is the world's first sewer hole cleaning robot designed to eradicate the age-old practice of manual scavenging by eliminating the need for manual intervention in the sewer holes. The Bandicoot robot, designed by Genrobotics using their own patented technology, has human-level flexibility to move inside sewer holes with multi-functional robotic arms and legs fitted with sensors and cameras. The drone unit will dive into the sewer holes for the cleaning operations. The drone unit has an extendable robotic arm with four degrees of freedom to perform grabbing, shovelling and unblocking actions inside the sewer holes. The diving depth of the robotic drone can be customized according to the need. The robot can perform effectively in any hazardous or corrosive sewerage environment. The operator can control the drone unit by monitoring through a high-definition display from IP68 waterproof cameras mounted on the drone unit. The stand unit also has a second display on the user interface area for various interactions, such as checking the quantity of poisonous gas inside the sewer hole.

Implementation and Impact

Bandicoot makes India the first country in the world to use robots in the sanitation sector. Genrobotics is on a mission to eliminate manual scavenging/hazardous cleaning using advanced robotic technologies, and they are now working in over 16 states. Genrobotics is also on a mission to convert sanitation workers to robot operators by providing training to sanitation workers on how to operate the robot, thereby empowering their lives. Genrobotics have received many prestigious awards, including the National Startup Award, AMRUT Tech Challenge Award, The Young change maker Award, and Anjani Mashelkar Inclusive Innovation Award, to name a few. They have also received support from the MoHUA and other government initiatives and missions such as Swachh Bharat, Swachh Survekshan, Safaimitra Suraksha Challenge, etc. In addition, bandicoot contributes significantly to 6 of the UN's Sustainable Development Goals.

Bandicoot robots for cleaning sewers

START-UP 101

Oxybee Solutions

Founder

Arvind Chaturvedi

Challenge

In urban and industrial environments, the challenge of maintaining optimal oxygen levels for aerobic microbial activity in wastewater treatment is significant. Traditional methods often fail to achieve this balance, resulting in inefficient decomposition of organic matter and the release of foul-smelling compounds like hydrogen sulfide, typically associated with anaerobic conditions. These shortcomings not only compromise the quality of treated water but also pose risks to both the environment and public health. Given the substantial volume of wastewater generated in such settings, addressing this challenge becomes imperative for ensuring the cleanliness of water bodies and protecting public health.

Solution

The Aqua Blaster technology revolutionizes wastewater purification by employing a unique approach that enhances the aerobic respiration of microorganisms without inducing putrefaction. Through a specialized Aeration Aqua Blaster, it creates a rapid flow and diffuses microbubbles throughout the water tank, significantly increasing oxygen concentration. This boost in oxygen facilitates optimal metabolizing and decomposing abilities of microorganisms, effectively breaking down organic substances, oil, and fat droplets. Patented blades within the Aqua Blaster pulverize solid particles such as SS and oil, rendering them small enough for microorganisms to consume easily. Moreover, the technology prevents the accumulation of sludge at the bottom, eliminating anaerobic areas and ensuring full aerobic respiration metabolism. As a result, unpleasant odors like hydrogen sulfide are eradicated, leading to efficient and odorless water treatment processes.

Implementation and Impact

The Aqua Blaster technology introduces a paradigm shift in wastewater purification, delivering multiple benefits that enhance efficiency and environmental sustainability. By optimizing the aerobic respiration of microorganisms, it achieves remarkable outcomes. Firstly, it significantly reduces power consumption by creating a rapid flow and diffusing microbubbles throughout the water tank, thereby increasing oxygen concentration without inducing putrefaction. This enhanced oxygen level not only boosts the metabolizing and decomposing abilities of microorganisms but also leads to an increase in dissolved oxygen (DO) levels by 0.3 to 0.75. Additionally, the patented blades within the Aqua Blaster effectively remove oil and fat droplets, reducing sludge output and eliminating the need for Dissolved Air Flotation (DAF). Furthermore, the technology eliminates odors such as hydrogen sulfide, ensuring odorless water treatment processes. Overall, Aqua Blaster offers a comprehensive solution for efficient, cost-effective, and environmentally friendly wastewater purification.

Comparison of Aqua blaster and MBBR for 100 KLD STP

Capacity	Description	Traditional Technology like MBBR	Aqua blaster technology
100 KLD	Sludge generation	130 KG	50 KG
	Power Consumption	20 KW	14KW
	Space Requirement	100M2	50m2
	Odour Generation	Yes	NIL
	Media requirement	Yes	NO

START-UP 102

REVY Environmental Solutions Pvt. Ltd.
Committed for a Greener Earth!

Samudhyoga Waste Chakra

Founder

Dhivakar Govindarajan

Challenge

Environmental sanitation is a significant public health issue, and India lags far behind compared to many countries. Lack of water is one of the main reasons for the lack of sanitation. Water scarcity is a significant issue in our country; many major cities are running out of groundwater. On the other hand, the pollution of available surface waters is caused by diverting water from Wastewater Treatment Plant (WWTP) either without treating them or partially without recovering valuable nutrients. Furthermore, growing worldwide demand for energy and problems of scarcity and environmental impact associated with conventional sources are at the base of a probable energy crisis in the next two or three decades. In this context, one resource that interlinks the water-nutrient nexus with sanitation is human urine. On the other hand, India imports about 80% and 100 % of phosphorus and potassium, paying a very high price. In contrast, urine is a potential resource for generating energy since it contains highly reduced chemical species in the form of urea and other organic compounds.

Solution

An integrated solution to the above issues is achieved by developing self-sustainable modular toilets, which aim to reduce carbon and water footprint and generate valuable chemicals and water for reuse from human urine. The product is unique as this helps in closing the entire loop of nutrients and the circular economy of sanitation. The process comprises a series of chemical and mechanical steps to recover 835 L of water from 1000 L of urine and generate 100 L of ammonia and 1 Kg of struvite. Ammonia and struvite can be used in agriculture as fertilizers. In addition, the recovered water can be used for flushing, gardening and other purposes.

Implementation and Impact

The patented technology is the first of a kind to remove all the nutrients in the form of fertilizers from urine and recover water from urine that can be used for gardening and flushing purposes. The setup starts with the implementation of waterless urinals at the front end of the toilets, followed by a collection and storage system and finally, a backend processing unit encompassed in a 6'X3'X8' enclosure. The system in the backend comprises smaller units arranged in a sequence that enhances nutrient recovery. A prototype is installed at the engineering design building terrace at IIT Madras. This unit can handle up to 450 litres of urine per day. Experiments have been conducted for the past year to optimize the system's parameters and components, resulting in an efficient and economical system.

Direct beneficiaries of setting up the unit are women, children, and men of underserved and unserved communities. With this product, public and community toilets can consume 80% less water by recycling urine, converting urinals to waterless urinals, treating urine on-site, and preventing mixing urine with the wastewater stream. This approach will aid in reducing the power consumption of wastewater treatment plants (if present) and improve water security (by eliminating the eutrophication of water bodies). It also generates green chemicals and creates a revenue stream to ensure continuous operation and maintenance of the toilet. Continuous operation and maintenance will improve the accessibility of toilets. Furthermore, it helps control diseases due to unsafe sanitation conditions. Also, it leads to:

- One thousand four hundred cubic meters of water per year to be saved, which can address the per day water needs of 10000 people
- Seventy tons of CO_2 emissions are reduced due to nutrients in wastewater.
- 1460 kg of green ammonia to be produced, which can help make 292,000 kg of vegetable/fruit per year.

START-UP 103

Saur Neer Technologies

Founder

Neeraj Darwai

Challenge

The Urinal Flush Unit is a critical component of restroom infrastructure, designed to facilitate hygienic flushing after use. However, traditional flush units often contribute to water wastage due to inefficient mechanisms and lack of maintenance. Many older models operate on a fixed flush volume, leading to excessive water usage with each flush. Additionally, worn-out or malfunctioning components, such as valves and sensors, can result in continuous flushing or leaks, further exacerbating water wastage issues..

Solution

The proposed Smart Urinal Flush Unit presents an innovative solution to address common issues associated with traditional flush units. Utilizing hands-free technology, this smart system operates by detecting human heat signatures and autonomously flushing water at pulsating intervals. Users simply utilize the urinals as usual, and upon departure, the system seamlessly detects their presence and initiates flushing, promoting hygiene while minimizing water wastage. Notably, this advanced technology not only facilitates effective water consumption monitoring but also reduces power usage significantly, thanks to its minimal power consumption compared to existing models, all at a relatively low cost.

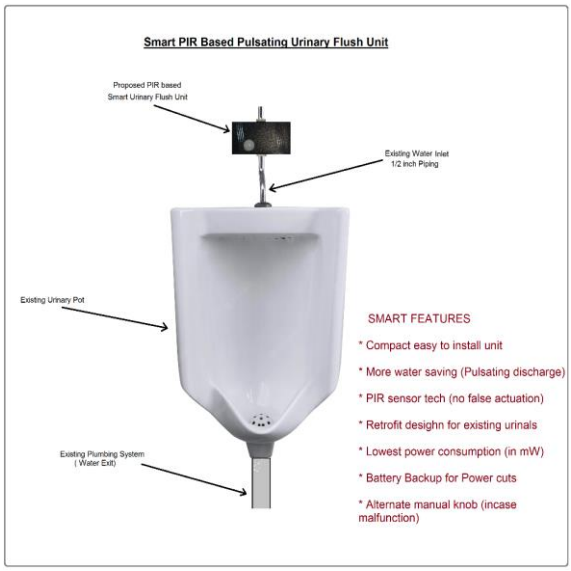
Moreover, the Smart Urinal Flush Units are designed with user convenience in mind, offering straightforward installation and maintenance processes. With only a few basic steps required, these units can be easily installed alongside existing urinals without the need for any plumbing alterations. This user-friendly approach ensures seamless integration into various restroom facilities while streamlining operational efficiency and promoting sustainable water management practices.

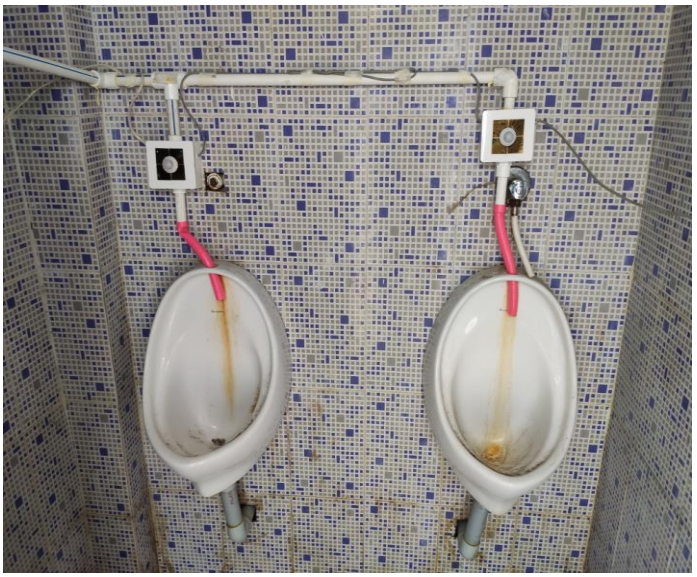
Implementation and Impact

The proposed Retrofit product with smart sensor technology reduces water wastage at public toilets and urinals. This smart urinary flush system is getting pilot tested in one of the community hall washrooms in Nagpur region. Toilets with manual flush system had been upgraded with PIR based auto systems. Demonstration of the same has been given to the owner and after installation the trials are in progress.

The initial model was tested for nearly a year at our workshop. The technology is yet to generate revenue and valuable feedback will be collected from the pilot implementation for perfecting the product. With this product there is less water conservation and energy utilization is also at its minimum since the system works on PIR sensor installed within the unit, which activates the overall circuitry only on human presence.

The contactless system helps avoids the spread of germs. It also helps to save water and provide hygiene in hospitals, government schools & offices and other public places. The product aims to provide clean and healthy public washrooms with better hygienic conditions for the persons using the public urinals and maintenance personals. Also we aim to reduce risk of people getting infections and diseases which spread through infected and contaminated public urinals.





START-UP 104

Silverynanos Innovations

Founder

Divya Rathod

Challenge

Every year 150 million people, especially women, suffer from urinary tract infections (UTI), leading to bladder cancer primarily due to controlling the urge to relieve themselves or holding back urine owing to unclean and un-hygienic public toilets. Controlling the natural desire to urinate for long periods also causes other issues like bladder problems, vaginal infections etc. However, it is also pertinent to note that cleaning these toilets after every use is impossible, as the chemicals used in cleaning toilets are harmful to the skin and the environment. Moreover, the water wasted in cleaning toilets and repeated flushing is also very high.

Solution

Silverynanos HAPITO Toilet Protector is a nanoalloy spray which needs to be applied only once on toilets to make them infection-less and easy to clean for one month, thereby mitigating the problem of UTIs and other infections affecting women's hygiene. It also saves up to 55% water and protects the environment from harmful chemicals used in toilets. The formulation used in HAPITO creates a thin transparent layer on the outside and inside of the toilet. The layer is antibacterial, antiviral, antifungal, antibiofilm, anti-scratch, and pH resistant with water and stain repellent properties. HAPITO has been accredited by ISO, approved by FDA UK, and has good manufacturing practice and CE certificates. NABL has tested it in accredited labs like equinox labs, chemotest labs, and BTS labs for seven micro-organisms, specifically for E.coli, for three months after application on public toilets. It has also been tested for SARS 2 and MS2 bacteriophage. The formula has also been seen as effective against coronavirus for one month.

Implementation and Impact

The HAPITO Toilet Protector solution has been applied in 17 stations of the Mumbai suburban railway network between Borivali and Churchgate. Every station has 4-7 platforms, and each forum has one toilet. The solution was used in Gareebrath and Rajdhani trains as a pilot and has been accepted by IRSE Officer (Railways). The startup has also conducted pilots with Navi Mumbai Municipal Corporation and Pune Municipal Corporation. During the COVID-19 pandemic, Silverynanos LLP has been supplying HAPITO Toilet Protector to distributors of the Indian Army. The product has also been tested in hospitals and clinics and used in pharma gifting. The average cost per toilet for the solution goes up to 125 INR. One bottle of 150 ml, which has to be sprayed once a month, costs 599 INR and can be used on 4-5 toilets.

8. HYDRO-INFORMATICS

START-UP 105

Supremus Developers

Founder

Praveen Kumar

Challenge

Availability, Accessibility and Affordability of safe drinking water remain a challenge. State governments have installed Water Treatment Plants (WTP) across rural and urban areas. However, the efficiency is affected due to various reasons leading to non - functionality of these systems. Therefore, harnessing this existing water treatment capacity and supervising the functioning of these WTPs using IoT technology to monitor quality, quantity, and transactional parameters in real-time is crucial.

Solution

JanaJal WOW delivers safe water to the doorstep of households sustainably and consistently. Every JanaJal WOW is fitted with indigenously developed proprietary controllers that host IoT sensors to control and monitor the quality, quantity and GPS location of every JanaJal WOW via 'JJSUITE', the Central Monitoring Platform. JJSUITE is the heart of the entire operation, securing data per parameters from all JanaJal WOWs across the nation and putting it in one place for monitoring, control and analysis. JJSUITE also hosts and plugs in with the JanaJal Mobile App, through which consumers can place orders, make payments through their e-wallets and check the quality of safe water.

JanaJal WOW delivering safe drinking water to the doorstep

Existing treatment plants are upgraded by installing JJSUITE controllers, sensors and refilling mechanisms to help JanaJal WOWs. Depending upon the capacity of WTPs, each WTP can support up to 10 JanaJal WOWs that can serve local communities by delivering safe water in up to 2 shifts per day. In addition, consumers can place orders and make payments digitally. Constant monitoring and real-time updates help control the JJWOW & WTPs as they can be turned on & off remotely in a single click via JJSUITE.

Implementation and Impact

Presently JanaJal WOWs are fully operational in the densely populated Badarpur, Bawana, Mayur Vihar in New Delhi, Ranebennur & Haveri in Karnataka, and various sectors and villages in Ghaziabad and Noida, Uttar Pradesh. The demographics of people across these areas are mainly daily wage earners and low-income groups. The custom-designed JanaJal WOW can efficiently operate through these narrow by-lanes and dense communities to deliver safe water at their doorsteps. JanaJal WOWs have already delivered approximately one million litres in 10 weeks.

Every JanaJal WOW serves 120-150 households daily, with five persons estimated per household. It can deliver safe water to 100,000 persons annually and generate employment for three persons.

JanaJal WOW delivering safe drinking water

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