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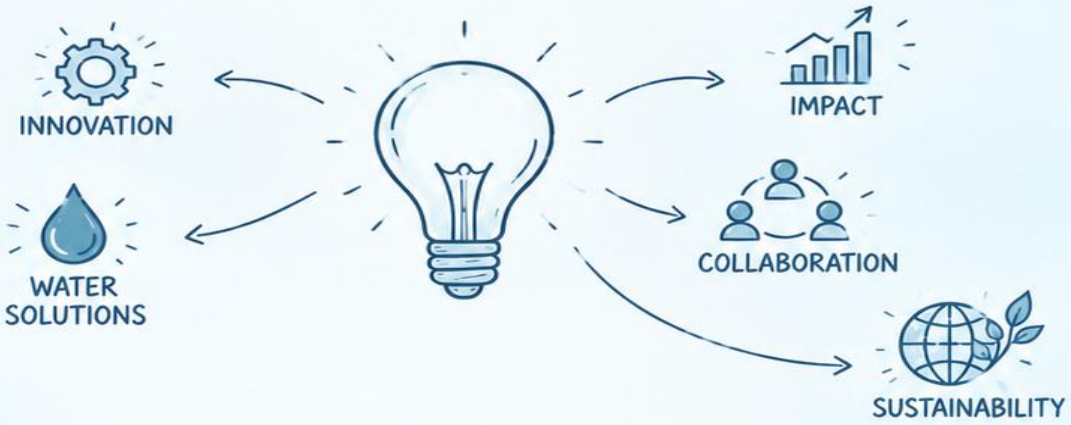
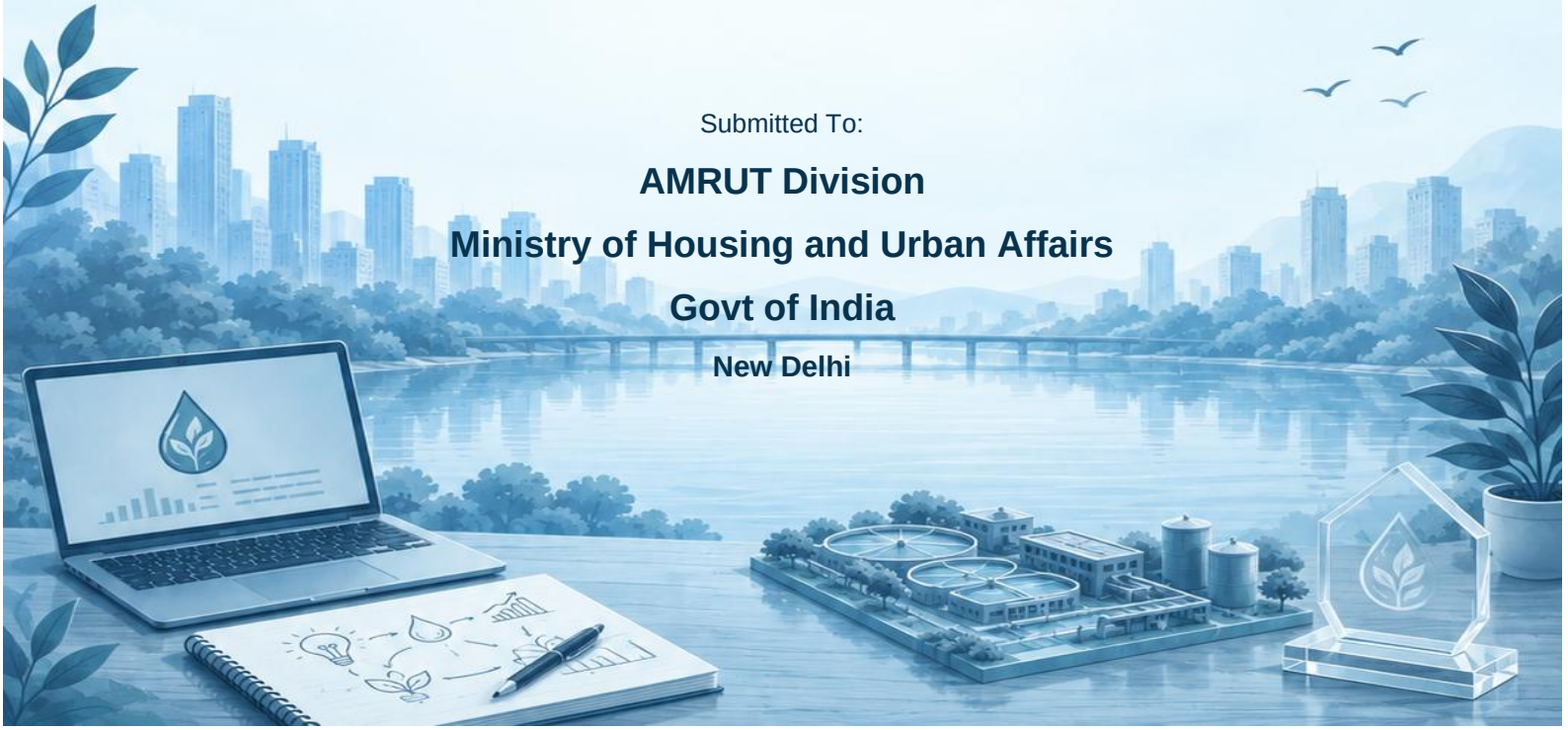


Impact Assessment of Start-up Ecosystem Programme under AMRUT-MoHUA-GoI

ADV_26_02

INCEPTION REPORT

SEPTEMBER, 2026



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Impact Assessment of Start-up Ecosystem Programme under AMRUT-MoHUA-GoI

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This Advocacy Research Inception Report has been prepared by the above-mentioned team under the 'AMRUT Centre of Urban Planning for Capacity Building' at the School of Planning and Architecture Vijayawada (ACUPCB-SPAV) as a part of its core research activities aimed at finding practical solutions to prevalent contextual urban issues. The research project has been commissioned, sanctioned, periodically reviewed, and finalized under the ACUPCB-SPAV and is fully supported and funded by the Ministry of Housing and Urban Affairs, Government of India. This inception report document is an outcome of the research project undertaken by the team. The inception report has been submitted to the AMRUT Division of the Ministry of Housing and Urban Affairs, Government of India, in September 2026.

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September, 2026

Foreword

About A-CUPCB-SPAV

The AMRUT Division of Ministry of Housing and Urban Affairs (MoHUA, Government of India) has recognised SPA Vijayawada as one of the few centres in the country, that shall undertake top-notch, cutting-edge research, projects, and training in the field of urban planning and climate sensitive development. SPA Vijayawada (Under Ministry of Education, Government of India) has entered into a MoU with MoHUA Govt of India, for setting up of the "AMRUT Funded Centre of Urban Planning for Capacity Building" at SPA Vijayawada (ACUPCB–SPAV). This Centre is a hallmark of SPAV's capability, resources and potential in leading the path of research and advocacy in the domain of Urban Planning in India.

The Centre is in the process of initiating cutting edge research and skill development, in the field of Urban Planning and Settlement Design. It has already initiated several projects and trainings in close coordination with some urban local bodies and think tanks in South India and is in the process of expanding its outreach in data driven applications and solutions for urban planning and climate sensitive design.

ABOUT SPAV

The School of Planning & Architecture, Vijayawada (SPAV) is an Institution of National Importance under the Ministry of Education, Govt. of India. It offers UG, PG, and doctoral programs in Planning and Architecture and is ranked among the top technical institutes in India. SPAV fosters quality research, innovation, and critical thinking in architectural and planning education. Its green-rated campus features state-of-the-art infrastructure, including modern labs, ICT-enabled learning, and recreational facilities. The school has 17 years of excellence in professional education offering courses of B.Arch. (5 years), B. Plan (4 years), nine master's programs, and doctoral studies, advancing knowledge in urban and regional development. It specializes in areas such as Sustainable Architecture, Urban Design, Planning, Landscape Architecture etc. With a strong focus on advanced computing and latest technologies, SPAV continues to lead in architectural and planning education.

ABOUT MoHUA

The Ministry of Housing and Urban Affairs (MoHUA) is India's apex body for urban development, influencing policies through funding, coordination, and national programs. Established in 1952 as the Ministry of Works, Housing & Supply, it became MoHUA in 2006. The ministry supports urban projects via Centrally Sponsored Schemes and financial institutions, shaping urbanization and real estate investment. A key initiative, AMRUT, enhances urban infrastructure by ensuring tap water, sewerage, green spaces, and sustainable transport in 500 cities. Through policies and programs, MoHUA drives sustainable urban growth, improving quality of life and fostering climate resilience across India.

Ministry of Housing and Urban Affairs
Government of India

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1. BACKGROUND OF THE PROJECT

The Ministry of Housing and Urban Affairs, Government of India, has entrusted the AMRUT Centre of Urban Planning for Capacity Building, School of Planning and Architecture Vijayawada (ACUPCB-SPAV), with the advocacy research of Impact Assessment of Start-up Ecosystem Programme under the AMRUT-MoHUA-GoI (ADV_26_02), in recognition of the Centre's established expertise in urban research and its continued engagement with the AMRUT 2.0 mission.

The project started with a review meeting held on 18th August 2026 between Ms. Grace P., IAS, Deputy Secretary, MoHUA, Government of India, and senior representatives of ACUPCB-SPAV, namely the Head and Deputy Head of the Centre. This meeting served as the preliminary forum in which the scope and intent of the proposed impact assessment studies were discussed, and the possibility of engaging SPAV for the research was deliberated upon as in Table 1.1. Following this deliberation, formal communication was received on 19th August 2026, when an email from the Deputy Secretary, AMRUT-MoHUA, Government of India, conveyed the official Project Order, thereby formally initiating the assignment and establishing the mandate under which ACUPCB-SPAV was to proceed.

Table 1.1 Background of the project

Date	Milestone
18th August	**Review meeting** held between Ms. Grace P., IAS, Deputy Secretary, MoHUA, Government of India, attended by the Head and Deputy Head, ACUPCB-SPA Vijayawada.
19th August	**Email received** from the Deputy Secretary, AMRUT-MoHUA, Government of India, along with the Project Order.
22nd August	**Online meeting** held with the assigned Nodal Person, Mr. Aritra Das, KPMG.
23rd August	**Project database** received from the Nodal Person, Mr. Aritra Das, KPMG.
24th August	**Team formation and Sanction** of the Advocacy Research Study on Impact Assessment, approved by the Director, SPA Vijayawada.

Subsequent to the receipt of the Project Order, coordination mechanisms were put in place to operationalise the assignment. An online meeting was convened on 22nd August 2026 with the Nodal Person designated for the study, Mr. Aritra Das from KPMG, during which the modalities of data sharing, coordination, and reporting were discussed. The following day, 23rd August 2026, the relevant database was received from the Nodal Person to commence the assessment. With the requisite inputs in hand, the **Director of ACUPCB-SPAV**, on **24th August 2026**, sanctioned the constitution of a dedicated research team and formally approved the Advocacy Research Study pertaining to the Impact Assessment.

2. ABOUT THE PROGRAMME – START-UP ECOSYSTEM

The Start-Up Ecosystem Programme is administered as the Technology Sub-Mission under AMRUT 2.0 (Atal Mission for Rejuvenation and Urban Transformation 2.0), which was launched by the Prime Minister on 1st October 2021. The Sub-Mission was conceived to harness the energy and innovation of India's start-up ecosystem in support of the Mission's overarching objective of building **"Water Secure Cities"** by sourcing practical, technology-driven solutions to the persistent challenges faced by urban local bodies in managing fresh water supply and used-water systems.

To operationalize this objective, MoHUA, working in partnership with Administrative Staff College of India (ASCI), conceived and rolled out the **AMRUT India Pitch-Pilot-Scale Start-Up Challenge**. What began as a periodic challenge has since been institutionalized as a perpetual, always-open online platform called the **Start-up Gateway**, allowing start-ups to submit proposals. Every proposal received on the platform is subjected to a rigorous two-stage evaluation: an initial Screening Committee assesses proposals for basic eligibility and relevance, after which a technical Expert Committee evaluates shortlisted entries on the strength of their innovation, usability, likely impact, scalability, replicability across different urban contexts, and ease of deployment on the ground (India Pitch Pilot Scale Startup Challenge, AMRUT 2.0, 2023).

The Challenge invites solutions across eight thematic areas under water sector. These include:

1. **Fresh water systems** - Real-time spatio-temporal mapping of groundwater quality / surface water quality; Real-time spatio-temporal monitoring of water levels/volumes in aquifers and surface water bodies; Nature-based treatment systems for ground and surface waters with least water and carbon footprints; Innovative Rainwater harvesting systems; Atmospheric water recovery systems
2. **Hydro informatics – use of water + data** for better water management in preventing floods and droughts; Creating a positive impact on the health and economic prosperity of peri-urban communities or urban slums; Estimating virtual water in the production of goods and services and thereby enabling a fair price for water
3. **Used water management** - better sewage and septage management including – On-site sanitation solution for slums; Technologies to maximise recycling of used water in industries; Innovative business models for trading in used water; Recovery of value from used water and creating a circular economy; Treatment technologies, especially for hilly regions

4. **Urban Water Management** - Decentralised circular economy solutions for communities connecting groundwater recharge, greywater management, sewage recycling and solid-waste management with real-time quality and quantity information; Decentralised water supply solutions to slums; Restoration and preservation of rivers, lakes, ponds, shallow aquifers; Urban flooding and storm water management; Mapping and Management of urban aquifer systems; Salinity ingress in urban settlements in coastal regions; Monitoring of water service delivery standards (quality, quantity & accessibility); Water metering; Desalination with Control discharge / Reject water; Efficient flow Polymer/ Metal plumbing fixtures including taps without aerators; High recovery/efficiency RO systems; Retrofitting devices for conservation of water or wastage reduction; Innovative water supply solution for hilly areas
5. **Agricultural Water Management**- Reduction of water usage per ton of crop along with reduced use of energy, fertilisers and pesticides; AI-ML based systems that help farmer reduce their dependence on monsoons
6. **Urban Sewerage Management** - Better sewerage and septage management including – On-site sanitation solution for slums; Odourless, Waterless urinals
7. **Water governance** - Reduction of non-revenue water; Secure systems for 24X7 supply of potable water on tap; Fostering education and awareness on water; Targeting net zero water and net zero waste projects; Showcasing water and energy nexus; Sustainable solution for water packaging
8. **Innovation in conventional taps and plumbing systems** - Smart taps indicating water usage, wastage, recording efficiency, IOT enabled and connected to a central database for monitoring and improvement of performance

Start-ups that clear the evaluation process are extended financial support of up to **₹20 lakhs per project**, released in three tranches that are tied to the achievement of specific implementation milestones, along with structured mentorship to help them navigate deployment within Urban Local Bodies. MoHUA further supports the scale-up of successful ventures by facilitating partnerships with industry and ULBs, and by promoting them for wider visibility, in keeping with the broader national objective of "Make in India." Since its inception, the Challenge has been rolled out across four successive phases, each admitting a fresh cohort of start-ups. As of the most recent review, **Phase I**, the largest and most mature cohort, has **47** of its start-ups completed and 22 still in process; **Phase II** has **13 completed** and 15 in process; **Phase III**, a more recent cohort, has all 14 of its start-ups currently in process; and **Phase IV**, the newest cohort, has 21 start-ups in process, none yet completed (Database received from Nodal Officer). This progression is summarized below in Table 2.1Table 1.1.

Table 2.1 Status of Start-ups

Phase	Start-ups Completed	Start-ups In Process	Total start-ups
Phase I	47	22	74
Phase II	13	15	30
Phase III	-	14	14
Phase IV	-	21	21
Total	**60**	**72**	**139**

The steady rise in completions within Phase I and Phase II, set against the still-nascent status of Phases III and IV, illustrates a programme that is simultaneously scaling up its intake of new start-ups while

consolidating the gains of earlier cohorts, a dynamic that has an important bearing on how and where the impact assessment should focus its attention.

As of the August 2026 review by MoHUA, milestone progress varies considerably across the four phases of the Challenge. In **Phase 1** (74 start-ups), the cohort has matured furthest, with 47 projects completed, 22 in process, and 5 dropouts; among those in process, **3 start-ups remain at Milestone 1**, **8 are at Milestone 2** and **8 are at Milestone 3**, with Bhungru and Dynamite expected to complete within the next month. **Phase 2** (30 start-ups) shows similarly advanced progress, with 13 projects completed, 15 in process, and no dropouts recorded; of these, **3 start-ups are at Milestone 1, 9 at Milestone 2**, and **3 at Milestone 3**, with Arms 4 Ai, Enviro Chem and Sauneer expected to complete shortly. **Phase 3** (14 start-ups) is at an **earlier stage**, having had its MoHUA–ASCI partnership finalized on 4th February 2026, with all 14 start-ups signing MoUs with their mapped AMRUT cities and receiving their first tranche of ₹5 lakhs each on 19th May 2026; as of August, **8 start-ups have advanced to Milestone 2 while 6 remain at Milestone 1**. **Phase 4** (21 start-ups), the newest cohort, had its MoU partnership finalized on 16th July 2026, with 14 MoUs signed so far, **5 start-ups already at Milestone 2, 9 at Milestone 1**, 4 still scheduled for MoU signing, and 2 start-ups are currently stuck in the process.

Table 2.2 States, cities and start-ups selected under this scheme

SL/NO	STATES/UT	CITIES	START-UPS
1	Telengana	6	21
2	Maharashtra	11	17
3	Tamil Nadu	9	15
4	Gujarat	6	12
5	Kerala	7	10
6	Karnataka	7	8
7	Uttar Pradesh	7	8
8	Odisha	4	6
9	Rajasthan	5	5
10	Delhi	2	5
11	Madhya Pradesh	4	5
12	Haryana	4	5
13	Andhra Pradesh	5	5
14	Uttarakhand	3	4
15	Goa	2	3
16	West Bengal	2	2
17	Assam	1	1
18	Jharkhand	1	1
19	Lakshadweep	1	1
20	Manipur	1	1
21	Chattisgarh	1	1
22	Bihar	1	1
23	Himachal Pradesh	1	1
24	Punjab	1	1
		92	**139**

The Start-Up Ecosystem Programme under AMRUT 2.0 has achieved extensive geographic penetration, with 139 start-ups selected across 92 cities in 24 States and Union Territories, spanning all five zones of the country, South, West, North, East, and Central as in Table 2.2.

Telangana leads with 21 start-ups across 6 cities, anchored heavily by Hyderabad, followed by Maharashtra with 17 start-ups across 11 cities, including Pune, Nagpur, and Thane. Tamil Nadu accounts for 15 start-ups across 9 cities such as Chennai, Coimbatore, and Madurai, while Gujarat contributes 12 start-ups across 6 cities led by Ahmedabad. Kerala (10 start-ups, 7 cities) and Karnataka (8 start-ups, 7 cities, with Bengaluru and Hubli-Dharwad prominent) round out the leading southern states, alongside Uttar Pradesh, which also records 8 start-ups across 7 cities including Ghaziabad, Kanpur, and Agra.

Mid-tier participation comes from Odisha (6 start-ups across 4 cities, including Bhubaneshwar and Rourkela), Rajasthan, Delhi, Madhya Pradesh, Haryana, and Andhra Pradesh, each contributing 5 start-ups apiece and Uttarakhand with 4 start-ups across 3 cities including Dehradun. A long tail of states shows more limited but geographically significant presence: Goa (3 start-ups), West Bengal (2), and single start-ups each from Assam, Jharkhand, Lakshadweep, Manipur, Chhattisgarh, Bihar, Himachal Pradesh, and Punjab, ensuring representation even from smaller states and island territories. This distribution reflects a programme that, while concentrated in a handful of high-participation states in the south and west, has nonetheless achieved a genuinely national footprint, touching nearly every region of the country.

3. SCOPE OF WORK

The aim of this research is to conduct a PAN-India quantitative review of a select set of cities in order to assess the on-ground performance of the start-ups deployed under the Start-Up Ecosystem Programme. The study is intended to surface genuine success stories that can be documented and replicated elsewhere, while equally identifying implementation gaps that may be constraining the programme's effectiveness. In doing so, the assessment aims to move beyond phase-wise completion statistics to build an evidence-based understanding of the real-world outcomes these start-up solutions have delivered for water sector.

To achieve this, the study will draw on primary and secondary data gathered from **Municipal Officers**, who can speak to institutional experience and ULB-level coordination; **Service Providers**, including the start-ups themselves and their implementation partners; **Residents**, who are the ultimate beneficiaries of these interventions; and **other Urban Stakeholders**, who may include local elected representatives, civil society actors or allied departments. Perspectives across these four groups is expected to yield a rounded, credible picture of impact that can withstand scrutiny at the national level.

3.1. Objectives

1. To establish the national-level coverage and detailed overview of the Start-up Ecosystem Programme.
2. To identify representative sample cities based on beneficiaries, physical completion, fund utilisation, and geographic representation.
3. To understand the city level urban morphology and water supply characteristics of the selected cities.
4. To assess the project performance, outcomes and impacts of Start-up interventions against the 8 indicators and 16 parameters.
5. To identify implementation gaps, success factors, and good practices across selected cities.
6. To recommend measures for improving the scalability, and replicability of Start-up interventions.

4. SELECTION OF CITIES

The assessment will necessarily be conducted through a selected set of cities and city selection is guided by broad criteria of the **physical completion status** of the pilot project in that city, so that the assessment captures start-ups that have progressed far enough to show measurable outcomes; the **number of beneficiaries** reached, to prioritize cities where the intervention has had a meaningful population-level footprint; the **extent of utilization of sanctioned funds**, as a proxy for effective on-ground execution; and the **geographic zone** in which the city is located, to ensure the final sample is not skewed toward any single region of the country.

On this basis, the choice of cities for the assessment includes **Delhi**, selected for its start-up intervention in Used Water Management, Urban Sewerage Management, Urban Water Management, Hydro informatics and Fresh water Systems; **Guwahati**, representing the north-east with a focus on Urban Water Management; **Mumbai**, selected for its work in Urban Water Management; **Hyderabad,** representing Urban Water Management, Fresh water Systems, Used Water Management and Water Governance; and **Chennai**, selected for its intervention in Fresh Water Management, Urban Water Management and Urban Sewerage Management as in Figure 4.1. This spread is designed to ensure that the assessment's findings are not disproportionately shaped by the experience of any one part of the country, and offers a genuinely PAN-India perspective on the programme's performance.

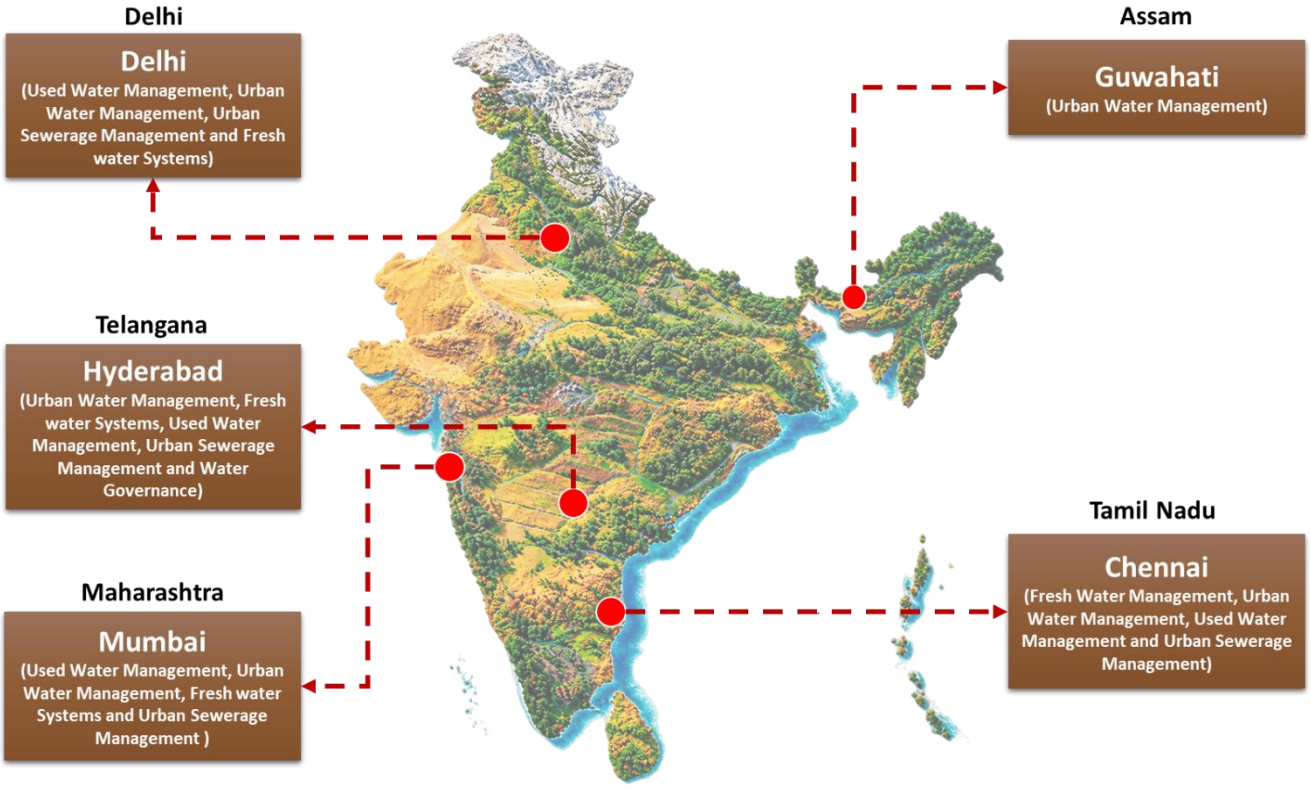


Figure 4.1 Selected Cities for impact assessment of Start-up Ecosystem

5. PROFILING OF THE CASE CITIES

The city profile, administrative structure, water-supply system, and details of the Drink from Tap (DfT) programme for each case city are presented in the following subsections. The information presented in this section has been compiled from data and documents **available in the public domain** and **will be cross-verified** and supplemented through discussions with relevant stakeholders and field visits during the site visit.

5.1. DELHI

Delhi, India's vibrant capital, is a world within itself. With its kaleidoscope of scents, sounds, and sights, Delhi never fails to captivate. From its rich history and architectural marvels to its delectable cuisine and vibrant nightlife, the city offers an unforgettable experience. One of the world's oldest continuously inhabited cities, Delhi's roots date back to the era of the ancient Mahabharata, when the city was known as Indraprastha, the legendary home of the Pandavas. Since then, the city has seen empires rise and fall, from the Delhi Sultanate and the Mughals, who left behind architectural marvels, to the British, who shaped parts of it. (Incredible India, 2026)

Source: (incredibleindia.2026)

5.1.1. City Location

Delhi, formally the National Capital Territory (NCT) of Delhi, is located in northern India on the Indo-Gangetic Plain, on the banks of the Yamuna River. It is bordered by the state of Haryana on the north, west and south, and by Uttar Pradesh on the east. As the seat of the Union Government, Delhi houses Rashtrapati Bhavan, the Parliament of India, and the Supreme Court of India in the New Delhi sub-city. The NCT covers an area of approximately 1,483 sq. km, of which the unified Municipal Corporation of Delhi (MCD) administers about **1,397.3 sq. km** (New Delhi Municipal Council (NDMC), 2026). The terrain is largely flat, part of the Yamuna floodplain, with elevation ranging between roughly 200 and 250 metres above mean sea level.

Delhi has four satellite towns bordering it, Gurugram, Noida, Ghaziabad and Faridabad, together forming the National Capital Region (NCR), one of the largest urban agglomerations in the world. The city has a semi-arid climate with hot summers, a monsoon season from July to September, and cool winters, and is served by extensive road, rail and metro networks radiating from its historic core. Delhi's layered urban

form, from the medieval core of Old Delhi to the planned colonial grid of Lutyens' New Delhi and the sprawling unplanned and resettlement colonies of its outer districts, creates markedly uneven conditions for civic infrastructure.

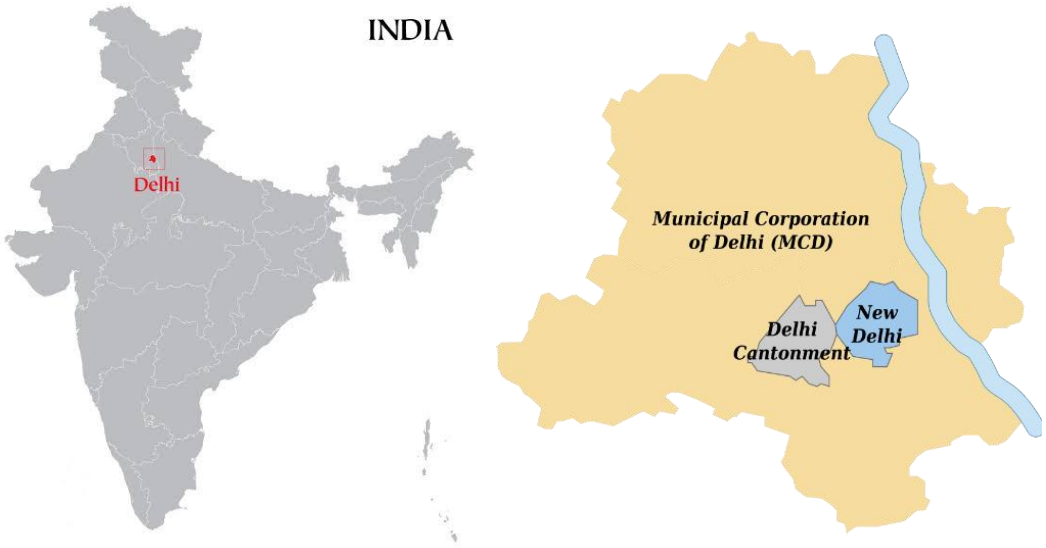


Figure 5.1 Location of Delhi in India and Municipal Corporation of Delhi
Source: (burningcompass, 2026), (wikimedia, 2026)

5.1.2. Administrative Structure

Delhi is a Union Territory with its own Legislative Assembly and Chief Minister, administered jointly with the Lieutenant Governor as the representative of the President of India. Civic administration is carried out separately from this political structure. The National Capital Territory of Delhi is spread over an area of 1483 sq. kms., its maximum length is around 51.9 km. and the maximum width is 48.48 km. Out of the total area of 1483 sq. km., 783 sq. km. is rural and 700 sq. kms. is urban. There are three local bodies viz., **Municipal Corporation of Delhi**, New Delhi Municipal Committee and Delhi Cantonment Board whose respective area is **1397.3 sq.km**., 42.7 sq.km., and 43 kms. For development purposes, the rural area is divided into five Community Development Blocks, namely Alipur, Kanjhawala (Nangloi), Najafgarh, Mehrauli and Shahdara. There are 209 villages in Delhi, of which 199 are inhabited villages and the remaining 10 are deserted (New Delhi Municipal Council (NDMC), 2026).

The Municipal Corporation of Delhi (MCD), established in 1958, is the principal urban local body and among the largest municipal bodies in the world, serving close to 20 million residents. It was trifurcated into North, South and East Delhi Municipal Corporations in 2012 and was reunified into a single MCD in May 2022. The MCD is governed by an elected Mayor and 250 elected councillors across its wards, and is headed administratively by an IAS Municipal Commissioner. Lutyens' Delhi (New Delhi) is separately administered by the New Delhi Municipal Council (NDMC), and the Delhi Cantonment area by the Delhi Cantonment Board (DCB). The Delhi Jal Board (DJB), constituted under the Delhi Jal Board Act, 1998, is responsible for treatment, bulk supply and distribution of potable water and for sewerage across the MCD, NDMC and Cantonment areas (Delhi Jal Board., 2026).

The NCT is further divided into 11 revenue districts, Central, North, North East, North West, South, South East, South West, West, East, Shahdara and New Delhi, each headed by a Deputy Commissioner, for land revenue, disaster management and general administration purposes. (Department of Revenue, Government of NCT of Delhi, 2026)

5.1.3. Demographic Profile

Delhi is one of the most populous urban regions in the world. According to the 2011 Census, **the NCT of Delhi** had a total population of **16,787,941** (approximately 1.68 crore) and a population density of 11,320 persons per sq. km. Of this population, approximately 16.37 million people lived in urban areas**,** representing about 97.5% of the total population (Census of India, 2011)

Within the jurisdiction of the **Delhi Municipal Corporation**, the 2011 Census recorded a population of approximately **11.01 million (1.10 crore)**. The MCD population had an average literacy rate of approximately **87.6%**, with male literacy at about **91.44%** and female literacy at about **83.20%** (Census of India, 2011). The NCT-wide sex ratio in 2011 was approximately **868 females per 1,000 males**. Delhi's demographic structure has also been shaped by substantial population growth and migration, contributing to the expansion of the metropolitan region and increasing pressure on urban infrastructure and services (Delhi Development Authority, 2026)

5.1.4. AMRUT Start-Up Ecosystem in Delhi

Under the AMRUT 2.0 Start-Up Programme, Delhi is one of the five cities selected for the impact assessment, on account of its start-up interventions spanning Fresh Water Systems, Urban Water Management, Used Water Management, Urban Sewerage Management and Hydro informatics. **Aryav Eco-Friendly Resource** makes atmospheric water generators that pull drinking water straight from air, with no water wastage. Its role in Delhi is specifically as a testing and validation site, the water it generates is sent to NABL-accredited laboratories in Delhi and Kolkata to confirm it meets IS-10500:2012 drinking-water standards, giving the technology third-party scientific credibility. **LivNSense Technologies** has deployed its AI/ML-based GreenOps™ platform with the Delhi Jal Nigam, where it's used to detect changes in chlorine levels caused by drain water mixing into the supply, essentially an early-warning system for contamination, alongside similar deployments in Jind, Tamil Nadu and Madhya Pradesh. **Sustainable Water Technologies** has installed its "Floating Islands", floating treatment wetlands planted with the same species used in STP gravel filters at two prominent Delhi water bodies: Hauz-i-Shamsi and Nehru Park, restoring and beautifying them naturally. **Digital EcoInnovision**, through its DigitalPaani platform, provides 24/7 lifecycle management of wastewater facilities using sensors and software. It has run pilots across Delhi-NCR covering residential complexes, offices and municipal plants. **Fluid Robotics** runs its "Fluid Ai" wastewater analytics platform combining robotics, IoT and AI with the Delhi Jal Board, monitoring wastewater infrastructure health, as part of a wider roster that includes MCGM Mumbai, Pune, and Surat. **Supremus Developers** operates JanaJal WOW, IoT-controlled water ATMs delivered by three-wheelers to provide secure, monitored doorstep drinking water. These are specifically active in the densely populated Badarpur, Bawana and Mayur Vihar areas of Delhi, alongside deployments in Ghaziabad and Noida. **EcoSTP Technologies** has developed a decentralised sewage-treatment system that works

underground without power, chemicals, or human intervention inspired by how a cow's stomach digests. **Ekam Eco Solutions**, also Delhi-based, designed a waterless, splash-proof urinal pan for women with a one-way odour-blocking mechanism. Its flagship pilot site is IIT Delhi, making the capital its primary proof-of-concept location. **Naturesani Pvt Ltd** builds waterless, odourless hydro-mechanical urinals and commodes that need no sealant liquid. In Delhi specifically, its 3-in-1 units are installed at GMR's New Udaan Bhawan**. Retas Enviro Solutions**, headquartered in Delhi, manufactures "Rainmaxx", modular, recycled-plastic rainwater-harvesting tanks for groundwater recharge, flood mitigation, and bio-swale drainage. Locally, its tanks have been installed at CPWD sites across Delhi. The table below list the start-ups mapped to Delhi under the programme. (Data received from Nodal Officer and ASCI)

Table 5.1 Start-ups, themes and work description in Delhi

Sl/no	Start-ups	Theme	Description
1	Retas Enviro Solutions Pvt Ltd	Fresh Water Systems	RETAS has developed modular rainwater harvesting tanks called Rainmaxx that help in artificial recharge of rainwater to the ground. It also helps in flood mitigation, creation of ecological channel or bio swale and replacement of open stormwater drains. The RAINMAXX Modular tank is made up of recycled plastic.
2	Aryav Eco-Friendly Resource	Fresh Water Systems	Aryav Atmospheric Water Generator is an innovative and patented technology to generate pure, clean, alkaline and mineral rich drinking water from air without any water wastage and input water. They manufacture 100LPD to 10000LPD machines to cater to the B2B market.
3	LivNSense Technologies	Urban Water Management	They have developed an AI/ML based platform GreenOps™ for monitoring water distribution network. It provides real time data analytics for identifying and prescribing network operations optimization options to the utility executives. AI algorithms can be used to provide spatial information on types and amounts of water loss.
4	Sustainable Water Technologies	Urban Water Management	They have developed a scalable product called Floating Islands (Floating Treatment Wetlands) to restore & beautify water-bodies. They use wetlands species of plants, similar to the ones used in planted gravel filters at STPs to treat the water.
5	EcoSTP Technologies Pvt. Ltd. (Delhi)	Used Water Management	They have a unique patented technology that treats sewage in a decentralized, self- sustainable way in underground chambers without power, chemicals or human intervention. Using Biomimicry, regenerative innovation inspired by nature, the ECOSTP utilizes functional principles and strategies of microorganisms and ecosystem found in a cow's stomach.
6	Ekam Eco Solutions Private Limited	Used Water Management	They have designed a urinal pan for women with contours and curves that make the device anti splashing. It has a centrally placed dome housing the waterless mechanism creating a one-way passage for the urine to flow into the drain line and stop the odor causing gases.
7	Digital EcoInnovision Digital Paani	Used Water Management	They have a lifecycle management tool, DigitalPaani, that enables every facility to be managed with leading industry

			expertise 24/7. It comprises a combination of software, sensors, and automation hardware that together do three core things of assessing the facility as per physical configuration and effluent type, managing all the workflows in the facilities automatically & recommending operational and physical improvements to improve performance.
8	Naturesani Pvt Ltd	Urban Sewerage Management	They have developed waterless, odourless urinals & commodes along with other retrofittable contraptions. Their product works on Hydro-mechanical technology, which requires no sealant liquid. The complete water repellent tech ensures that bad odour trapped in the drainage system cannot pass back into the restroom.
9	Fluid Robotics	Urban Sewerage Management	Their solution Fluid Ai, a wastewater analytics platform, combines robotics, IoT and artificial intelligence, for monitoring the health of wastewater infrastructure, waterways and public. JanaJal WOW delivers safe water to the doorstep of households in a sustainable and consistent manner. The IOT controlled three-wheelers are secured, monitored and controlled through secure cloud servers using proprietary controllers and sensors.
10	Supremus Developers	Hydro informatics	JanaJal WOW delivers safe water to the doorstep of households in a sustainable and consistent manner. The IOT controlled three-wheelers are secured, monitored and controlled through secure cloud servers using proprietary controllers and sensors.

Across the 10 AMRUT-supported interventions documented here, spanning 5 thematic areas, **2 start-ups and their project** are selected in Delhi in **2 themes** - **Supremus Developers** (Hydro informatics) and **Naturesani Pvt Ltd** (Urban Sewerage Management).

5.1.5. Start-up Firm A: Supremus Developers (Hydro informatics)

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 (Data received from ASCI).

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 (Data received from ASCI).

Figure 5.2 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 (Data received from ASCI).

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 (Data received from ASCI).

JanaJal WOW delivering safe drinking water

Figure 5.3 JanaJal WOW delivering safe drinking water

5.1.6. Start-up Firm B: Naturesani Pvt Ltd (Urban Sewerage Management)

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 (Data received from ASCI).

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 (Data received from ASCI).

Figure 5.4 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 (Data received from ASCI).

Figure 5.5 In-door units installed at various organizations

5.2. GUWAHATI

Guwahati is the most important city in North-East India in terms of its population size, transport connectivity and strategic location. It has a beautiful landscape with hills and vast Brahmaputra.

Source: (outlooktraveller, 2026)

5.2.1. City Location

Guwahati is the largest city in Assam and in Northeast India, and serves as the principal gateway to the region's six sister states. It lies on the southern bank of the Brahmaputra River at approximately 26°10' N, 91°45' E, cradled between the river to the north and the foothills of the Shillong Plateau to the south, within the Kamrup Metropolitan district.

The Guwahati Municipal Corporation (GMC) administers a core area of about 216.79 sq. km, while the planning jurisdiction of the Guwahati Metropolitan Development Authority (GMDA) extends over a considerably larger area of 262 sq. km (Guwahati Metropolitan Development Authority, 2026). The city stretches nearly 45 km from the LGB International Airport in the west to Narengi in the east, and is gradually expanding onto the northern bank of the Brahmaputra. The city is situated on an undulating plain with varying altitudes of 49.5–55.5 m above mean sea level, with several low hills interspersed through the urban area. Guwahati has a humid subtropical climate with heavy monsoon rainfall and is prone to seasonal flooding and waterlogging. The city is surrounded by eighteen hills and has eight Reserve Forests and two Wildlife Sanctuaries (Guwahati Smart City Limited, 2026).

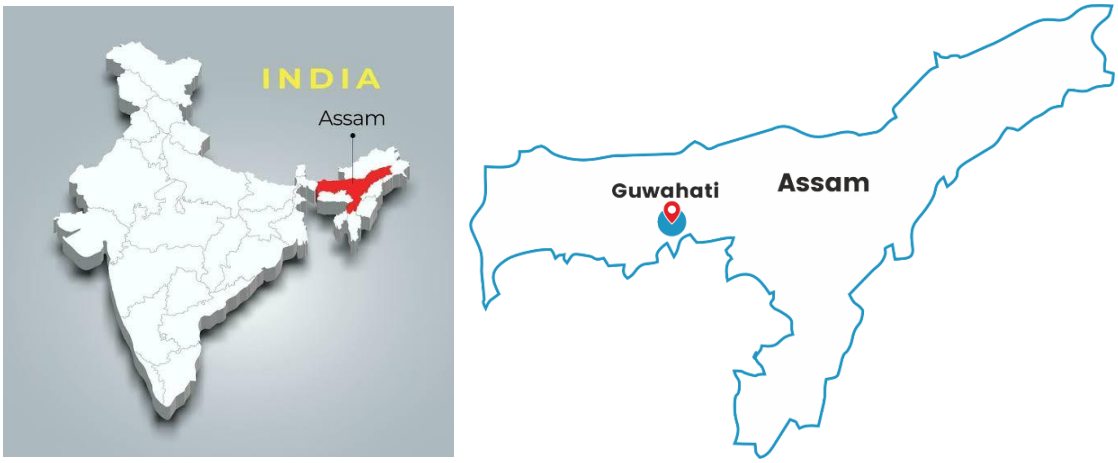


Figure 5.6 Location of Assam in India; Guwahati in Assam;
Source: (Vecteezy, 2026), (saaol, 2026)

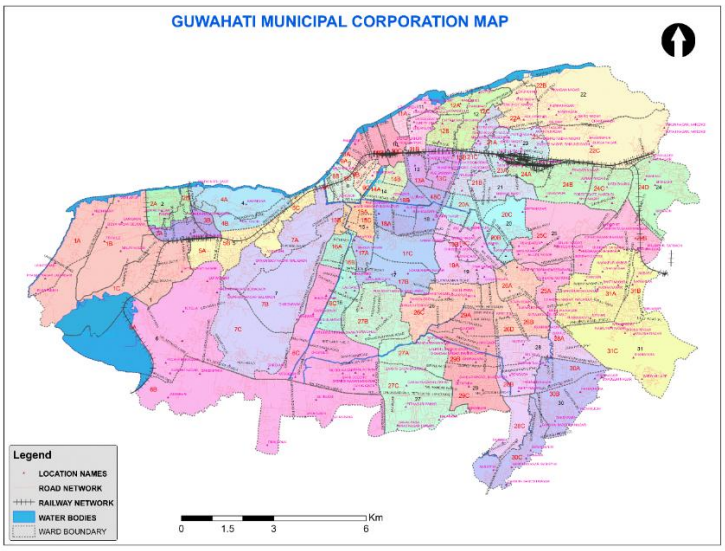


Figure 5.7 Guwahati Municipal corporation
Source: (gmc,2026)

The city is well connected by Lokopriya Gopinath Bordoloi (LGB) International Airport, by National Highways linking it to the rest of Assam and the neighbouring north-eastern states, and by rail as a key junction of the Northeast Frontier Railway. Its riverine setting on the Brahmaputra also makes it an important inland-waterways node, and its many hillocks and urban wetlands including the RAMSAR-listed Deepor Beel form an ecologically significant, though increasingly encroached-upon, green-blue network that shapes both flood risk and water-resource planning for the city.

5.2.2. Administrative Structure

Guwahati is governed at the local level by the Guwahati Municipal Corporation (GMC), functioning under the Guwahati Development Department, Government of Assam. GMC's jurisdiction is divided into 31 municipal wards, each further split into Area Sabhas for grassroots participation, and is headed by an elected Mayor supported by a Municipal Commissioner (IAS). Urban planning and metropolitan-scale infrastructure fall under the Guwahati Metropolitan Development Authority (GMDA), while large water-supply and sewerage schemes are implemented through the Guwahati Metropolitan Drinking Water and Sewerage Board, also under the state's Department of Housing & Urban Affairs. Dispur, the capital of Assam, lies within Guwahati's city limits, making it also the seat of the state government.

GMC's civic mandate spans property assessment and taxation, development and maintenance of roads, drains, markets and parks, issuance of trade licences, building permissions, and construction and upkeep of public toilets services delivered through branches and section offices spread across the city. In recent years, the Corporation has focused on modernising service delivery through online tax payment and licensing portals, doorstep tax collection via ward-level 'municipal sakhis', and partnerships with NGOs for door-to-door waste collection under the Swachh Bharat Mission, alongside long-pending municipal elections that have strengthened ward-level accountability for civic issues including drinking water and drainage.

5.2.3. Demographic Profile

The 2011 Census recorded the GMC-area population at 9,62,334, one of the fastest-growing urban populations in eastern India with a population density of 2695.43 per sq. km. Assamese is the official language, with Hindi, Bengali and English also widely spoken given the city's role as a commercial, educational and administrative hub home to institutions such as IIT Guwahati and a magnet for migration from across the north-eastern states. As the largest urban centre and primary trade, health and educational hub for a region of over 45 million people across the eight north-eastern states, Guwahati absorbs substantial in-migration each year from smaller Assamese towns and neighbouring states, placing sustained pressure on its housing, transport and most acutely its still-developing piped water and sewerage networks, many of whose service gaps this assessment examines below.

5.2.4. AMRUT Start-Up Ecosystem in Guwahati

Under the AMRUT 2.0 Start-Up Programme, Guwahati is one of the five cities selected for the impact assessment, on account of its start-up interventions in Urban Water Management. **Kumbhi Kagaz** tackles the rapid spread of water hyacinth, an invasive weed capable of doubling every nine days across India's wetlands and choking waterways, by converting the harvested weed into fully natural, chemical-free handmade paper, cutting reliance on wood pulp in the process. Its pilot project is located at **Deepor Beel**, a RAMSAR-designated wetland on Guwahati's outskirts, where the intervention directly supports ecological restoration of a critical urban water body while simultaneously creating a small circular-economy income stream from invasive-weed removal (Data received from Nodal Officer and ASCI).

Table 5.2 Start-up, theme and work description in Guwahati

Sl/no	Start-ups	Theme	Description
1	Kumbhi Kagaz	Urban Water Management	Addresses the rapid spread of water hyacinth, an invasive weed capable of duplicating every nine days across India's wetlands, by converting it into fully natural, chemical-free handmade paper, reducing dependence on wood pulp.

5.2.5. Start-up Firm: Kumbhi Kagaz (Water Governance)

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 (Data received from ASCI).

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 (Data received from ASCI).

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 (Data received from ASCI).

Figure 5.8 Products of Kumbhi Kagaz

5.3. MUMBAI

Mumbai stakes its claim as the biggest metropolitan city in India in terms of population size and economy it generates. This capital city of the state of Maharashtra was once made up of seven small islands, which over the centuries got connected through natural and man-made land reclamations (Municipal Corporation of Greater Mumbai, 2011).

Source: incredibleindia

5.3.1. City Location

Mumbai, the capital of Maharashtra and India's financial capital, is located on the Konkan coastal plain along the Arabian Sea, at approximately 18.96° N, 72.82° E. The city is bounded by water, which has historically forced its growth into a dense, linear, north-south corridor stretching from the historic island city in the south to the northern suburbs. Greater Mumbai, the jurisdiction of the Brihanmumbai Municipal Corporation (BMC) comprises the Mumbai City and Mumbai Suburban districts and is commonly cited at approximately **437.71 sq. km**. Average elevation is low (8-14 m), with a hillier northern belt reaching about 450 m (Municipal Corporation of Greater Mumbai, 2011).

Mumbai has a tropical climate dominated by the June-September south-west monsoon, which the city depends on almost entirely to replenish its drinking-water reservoirs to the north. The city is served by two international/domestic airports, an extensive suburban rail network, a growing metro system, and India's busiest container and passenger port. (Municipal Corporation of Greater Mumbai, 2011).

Figure 5.9 Location of Maharashtra in India; Mumbai in Maharashtra;
Source: (pinterest,2026), (vecteezy, 2026)

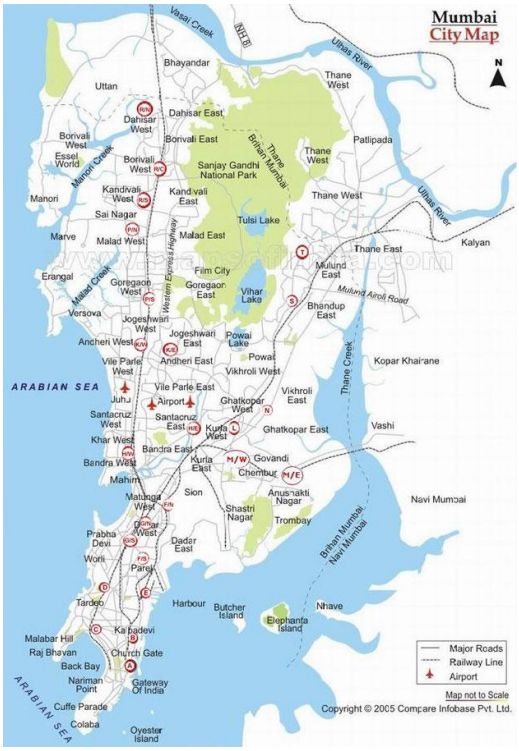


Figure 5.10 Bombay Municipal corporation;
Source:(mcgm, 2026)

5.3.2. Administrative Structure

Mumbai is governed by the Brihanmumbai Municipal Corporation (BMC), India's richest and among its largest civic bodies. As of the 2026 municipal election cycle, the city is divided into 24 administrative wards, which are further split into 227 electoral wards/constituencies for corporator elections. The Corporation is headed by an elected Mayor and a Municipal Commissioner (IAS). Beyond BMC, several state and metropolitan bodies share responsibility for Mumbai's wider infrastructure, most notably the Mumbai Metropolitan Region Development Authority (MMRDA) for regional transport and augmentation projects, and the Maharashtra Water Resources Department for the upstream reservoirs that feed the city. This multi-tier arrangement, spanning a municipal corporation, a metropolitan authority and a state water-resources department, is a recurring feature of how large Indian metros govern water and one of the reasons ward-level disparities in service delivery have proven difficult to resolve through civic action alone (MyBMC, 2026).

5.3.3. Demographic Profile

Census 2011 recorded Greater Mumbai's population at **124.42 lakhs**, with the MMR at about 235.98 lakhs, with density in parts of the island city remaining among the highest recorded anywhere in the world, exceeding **20,000-27,000 persons per sq. km.** Mumbai is highly cosmopolitan, with Marathi as the official language alongside widespread use of Hindi, Gujarati, and English, and large populations tracing

origin to nearly every Indian state. A substantial share of residents lives in informal settlements, a factor with direct bearing on the equity of water and sanitation service delivery across the city's wards (MMRDA, 2026).

The 2026 BMC election cycle itself surfaced this demographic complexity where draft voter rolls flagged over 1.1 million duplicate entries, officials attributing much of it to the city's high floating population and continuous in-migration from across Maharashtra and other states. The same mobility that drives Mumbai's economic dynamism also complicates planning for civic services, including water and sewerage network capacity, on a ward-by-ward basis.

5.3.4. AMRUT Start-Up Ecosystem in Mumbai

Under the AMRUT 2.0 Start-Up Programme, Mumbai is one of the five cities selected for the impact assessment, on account of its start-up interventions under Urban Water Management. **DBD Water Systems Private Limited**, based in Mumbai itself, has built a cloud-based, multi-protocol platform designed exclusively for water utilities. What makes it notable is that it's hardware-vendor-independent meaning it can work with meters from different manufacturers rather than locking utilities into a single vendor's ecosystem. The platform enables protocol-independent metering, detailed billing, multiple payment options, and dynamic analytics dashboards for utility operators. Its flagship deployment in the city is at Juhu Mandar, under MHADA (Maharashtra Housing and Area Development Authority) housing sites bringing smart, flexible metering infrastructure directly into public housing stock, an area where billing accuracy and leak accountability are often weak. **Faclon Labs Pvt Ltd** provides smart water network management through sensors, data, and analytics, offering remote monitoring and automation solutions that help water supply departments better manage urban water infrastructure and operations. **Avior Life Sciences s**pecialises in advanced nanobubble technology, delivering IoT-enabled, chemical-free water treatment solutions with real-time remote monitoring and optimisation across a range of industries (Data received from Nodal Officer and ASCI).

Table 5.3 Start-ups, themes and work description in Mumbai

Sl/ no	Start-ups	Theme	Description
1	DBD Water Systems Private Limited	Urban Water Management	A cloud-based, multi-protocol, meter-hardware-vendor-independent platform exclusively for water utilities, enabling protocol-independent metering, detailed billing, multiple payment options and dynamic analytics.
2	Faclon Labs Pvt Ltd	Urban Water Management	Smart Water Network Management through sensors, data and analytics. Faclon Labs provides remote monitoring and automation solutions for water supply departments, providing data for better management of water infrastructure and operations.
3	Avior Life Sciences	-	Avior Aqua specializes in advanced nanobubble technology. Their innovative product solutions provide sustainable, chemical free water treatment options tailored for a wide range of industries with state-of-the-art equipment such as nanobubble generators & nano filters. The unit is IoT enabled, which provides remote monitoring with realtime updates on various parameters as well as optimization for improved performance.

Across the 3 AMRUT-supported interventions documented here, **2 start-ups and their project** are selected in Mumbai in **1 theme** - **DBD Water Systems Private Limited** (Urban Water Management) and **Faclon Labs Pvt Ltd** (Urban Water Management)

5.3.5. Start-up Firm A: DBD Water Systems Private Limited (Urban Water Management)

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 (Data received from ASCI).

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 (Data received from ASCI).

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 (Data received from ASCI).

Figure 5.11 Installation of DBD water systems at various places

5.3.6. Start-up Firm B: Faclon Labs Pvt Ltd (Urban Water Management)

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 (Data received from ASCI).

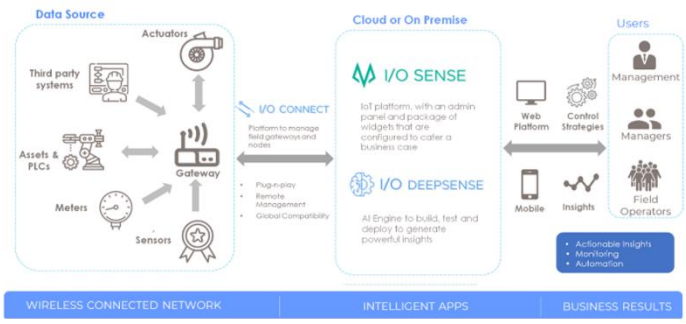


Figure 5.12 Start-up solution

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 (Data received from ASCI).

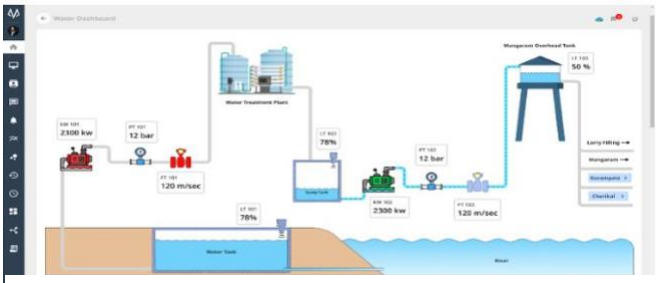


Figure 5.13 Dashboard

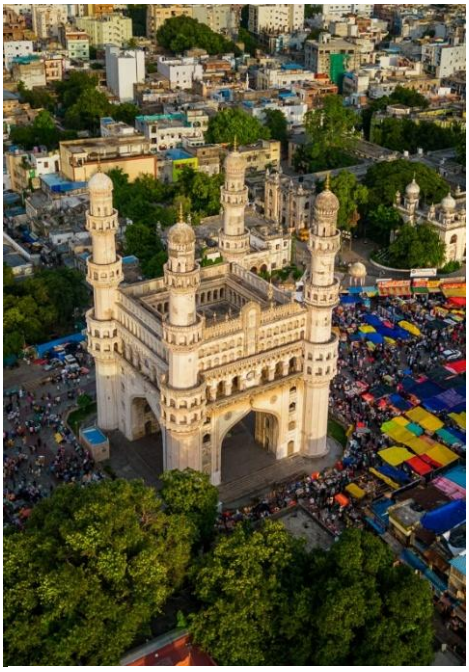
Implementation and Impact

Figure 5.14 Dashboard

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 (Data received from ASCI).

5.4. HYDERABAD

Hyderabad is the powerful capital of the youngest state of India, Telangana, and is among the most sought-after travel destinations in the country. Hyderabad today is a technology and business hub with multinational companies having their India headquarters. Hyderabad is the home to hi tech city, convention center, state of the art modern buildings, business offices and is also called as Hi-tech city of India (Incredible India, 2026).



Source: (safestay, 2026)

5.4.1. City Location

Hyderabad, the capital of Telangana, lies on the Deccan Plateau in the northern part of southern India, along the banks of the Musi River, at approximately 17.38° N, 78.48° E. The city's hilly terrain is dotted with lakes, most notably Hussain Sagar, and the historic twin reservoirs of Osman Sagar and Himayat Sagar on its outskirts (District Administration, Hyderabad, 2026).

Greater Hyderabad Municipal Corporation is a civic administrative body which looks after the administration of the Hyderabad city which is the capital city of Telangana State. It has been constituted in the year 2007 by merging surrounding 12 municipalities into the Municipal Corporation of Hyderabad which was formed in the year 1955. The Jurisdiction of the Corporation is spread over 4 districts- Hyderabad district, part of Medchal Malkajgiri, Ranga Reddy and Sangareddy districts. At present GHMC limits extend to **650 Sq. Km** with 6 zones with 30 circles which is further divided into 150 wards (Greater Hyderabad Municipal Corporation, 2026).

Figure 5.15 Location of Telangana in India; Hyderabad in Telangana
Source: (magnific,2026), (q-files, 2026)

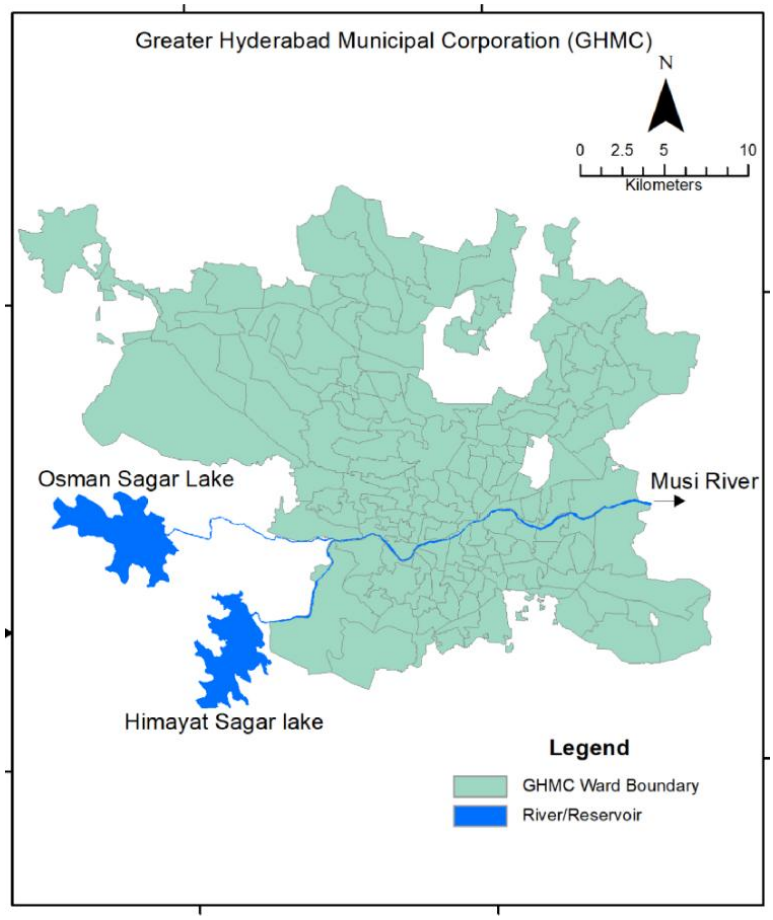


Figure 5.16 Greater Hyderabad Municipal corporation
Source: (springer, 2026)

5.4.2. Administrative Structure

. On 11 February 2026, this enlarged jurisdiction was reorganised into three separate municipal corporations - GHMC, Cyberabad Municipal Corporation and Malkajgiri Municipal Corporation reflecting the scale and pace of the city's outward growth. Following the February 2026 reorganisation, GHMC retains six zones - Khairatabad, Secunderabad, Shamshabad, Rajendra Nagar, Charminar and Golconda. Cyberabad Municipal Corporation covers the Serilingampally, Kukatpally and Quthbullapur zones, and Malkajgiri Municipal Corporation covers the Malkajgiri, Uppal and LB Nagar zones. Prior to this split, the unified GHMC administered 300 electoral divisions across 60 circles and 12 zones; each corporation is headed by a Commissioner (IAS) under the Telangana Municipal Administration and Urban Development (MA&UD) Department. Secunderabad Cantonment Board separately administers the historic cantonment area adjoining the city. The Hyderabad Metropolitan Development Authority (HMDA) oversees metropolitan-level planning across the wider urban agglomeration, spanning all three new corporations and beyond.

5.4.3. Demographic Profile

The population of GHMC, with previous boundaries stood at **6,731,790** according to Census 2011. The city is ethnically and linguistically diverse, blending Telugu, Urdu, and increasingly a large migrant, professional population drawn by its status as a global technology and pharmaceutical hub. Hyderabad has a diverse linguistic and cultural composition, with **Telugu, Urdu, Hindi and English** among the commonly used languages (District Administration, Hyderabad, 2026).

5.4.4. AMRUT Start-Up Ecosystem in Hyderabad

Under the AMRUT 2.0 Start-Up Programme, Hyderabad is one of the five cities selected for the impact assessment, on account of its start-up interventions spanning Fresh Water Systems, Urban Water Management, Used Water Management, Urban Sewerage Management and Water Governance. **Kritsnam Technologies** built "Dhaara," a battery-operated, tamper-proof ultrasonic flow meter designed for unattended, long-term pipe-flow monitoring from remote locations backed by MHRD, DST-IIT Kanpur, BIRAC, and Villgro, with Hyderabad as its development and deployment base. **Ilonnati Innovations** created "SIWaM," an IoT system that tracks both water quantity and quality (pH, TDS, chlorine, nitrate, turbidity, fluoride, hardness) from source to tap. It's anchored in Hyderabad but has actually deployed across 25 villages in Rajasthan, Manipur and Haryana. **Neerovel Innovations** uses wireless ultrasonic/LiDAR sensors to measure tank water levels precisely, alerting users to overflows and leaks via a LoRa-connected app deployed directly across Hyderabad with AMRUT/MoHUA facilitation. **Adva Enviro Solutions** runs "The Rainwater Project," a citywide rainwater-harvesting and water-resilience programme. Its Hyderabad work includes an HDFC-funded recharge pilot, well restoration at Gachibowli, a Zero Discharge Schools initiative that saved 12 lakh litres from leakages, and aquifer management in Gopinagar. **Eunoia Innovations** built "Aqua Skimmer," a radio-controlled/AI water robot that skims floating trash off water bodies piloted at Kapra Lake with support from GHMC and Telangana's municipal administration. **Techxcl India**'s "Saaf Water" is a compact IoT sensor device (TDS, turbidity, pH, temperature) that triggers water-quality data collection as water flows past it, developed from its Hyderabad base. **Smart Terra** offers AI analytics software that detects water losses using a utility's existing billing or SCADA data no new hardware needed piloted in Kolkata, Coimbatore, Pune and Bangalore from its Hyderabad operating base. **Liqsure** developed cavitation-based wastewater treatment, where pressure-driven micro-bubbles collapse to kill microorganisms and destroy pollutants backed by Indian Oil, NMDC, and IIT Hyderabad's incubator. **Trans Water System**'s "BOSON White Water System" recovers potable-grade water from partially treated sewage at existing treatment plants operational at 8 Bangalore locations, producing 0.6 million litres daily, from its Hyderabad base. **Digital EcoInnovision**'s "DigitalPaani" the same lifecycle wastewater-management tool noted in Delhi is headquartered here, with demonstrated results across Sikkim, Delhi-NCR and Aurangabad. **Geo Climate Risk Solutions** built "LAMAS," a lake-health monitoring system, and used it to assess and prioritise degraded lakes for restoration on behalf of the Hyderabad Metropolitan Development Authority. **Kephi Innovations** uses Spirulina algae instead of lime to neutralise aquaculture water, incubated at Hyderabad's HIIC centre. **Inphlox Water Systems** trialled its patented "Indra" decentralised wastewater treatment technology on cleaning Kudikunta Lake, supervised by the Telangana Water Resource Development Corporation.

Naturesani installed its waterless, odourless urinal fixtures at Hyderabad Metro Rail stations (Data received from Nodal Officer and ASCI).

Table 5.4 Start-ups, themes and work description in Hyderabad

Sl/no	Start-ups	Theme	Description
1	Kritsnam Technologies Private Limited	Urban Water Management	"Dhaara" Smart Ultrasonic Flow Meter, a battery-operated, tamper-proof, IoT-enabled flow meter built for water-governance and long-term unattended pipe-flow monitoring from remote locations.
2	Ilonnati Innovations Pvt. Ltd.	Urban Water Management	"SIWaM" (Smart Ideal Water Meter), an IoT-based solution measuring and monitoring water quantity, pressure, and quality parameters (pH, TDS, chlorine, nitrate, turbidity, fluoride, hardness) across the full supply chain from source to tap.
3	Neerovel Innovations Pvt Ltd	Urban Water Management	Wireless ultrasonic/LiDAR sensors that measure precise water-tank capacities and alert users to overflows and leaks via LoRa-connected servers and a mobile application, cutting domestic water wastage.
4	Adva Enviro Solutions Pvt Ltd.	Fresh Water Systems	"The Rainwater Project", a citywide rainwater-harvesting and water-resilience programme offering end-to-end design and execution for harvesting, wastewater reuse and integrated water management, including restoration of natural and man-made water bodies.
5	Eunoia Innovations Pvt. Ltd.	Fresh Water Systems	"Aqua Skimmer", a catamaran-hulled, radio-controlled/AI-operated water robot that skims floating trash (plastic, organic waste) from water bodies.
6	Techxcl India Pvt Ltd	Fresh Water Systems	"Saaf Water", a compact IoT device with sensors for TDS, turbidity, pH and temperature that intelligently senses flowing water to trigger water-quality data collection.
7	Smart Terra Urban Water Management	Water Governance	AI-powered analytics software "MeterCity" and "NetCity" that helps water utilities detect water-loss issues using existing billing or SCADA data, without new hardware investment.
8	Liqsure	Used Water Management	Cavitation-based wastewater treatment systems, where micro-bubbles generated by pressure differentials grow and collapse to release energy that kills micro-organisms and destroys organic pollutants.
9	Trans Water System Pvt	Used Water Management	"BOSON White Water System", a decentralised system that recovers potable-grade water from partially treated wastewater at existing Sewage Treatment Plants.
10	Digital EcoInnovision Private Limited	Used Water Management	"DigitalPaani" lifecycle facility-management tool combining software, sensors and automation for 24/7 wastewater facility assessment, workflow management and performance improvement.

Across the 10 AMRUT-supported interventions documented here, spanning 5 thematic areas, **2 start-ups and their project** are selected in Hyderabad in **2 themes** - **Adva Enviro Solutions Pvt Ltd.** (Fresh water systems) and **Smart Terra Urban Water Management** (Water governance)

5.4.5. Start-up Firm A: Adva Enviro Solutions Pvt Ltd. (Fresh water systems)

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 (Data received from ASCI).

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 (Data received from ASCI).

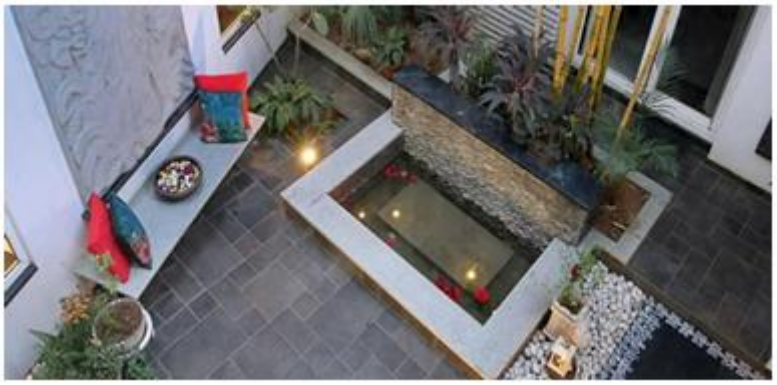


Figure 5.17 Rainwater sump at household

Figure 5.18 Well restoration project, before (left) and after (right)

Implementation and Impact

Figure 5.19 Citizen engagement

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. (Data received from ASCI).

Figure 5.20 Community gathering at a stepwell

5.4.6. Start-up Firm B: SmartTerra Urban Water Management (Water governance)

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 (Data received from ASCI).

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:

- 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.;

- 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 (Data received from ASCI).

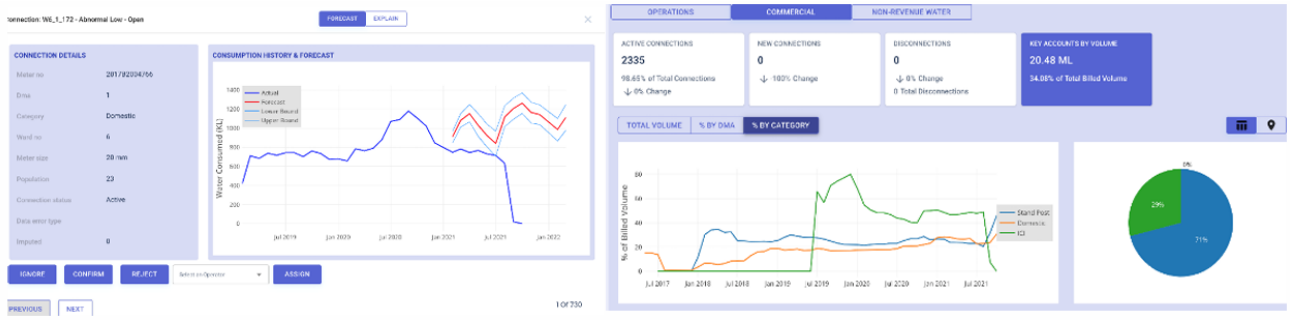


Figure 5.21 AI-powered analytics software

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 (Data received from ASCI).

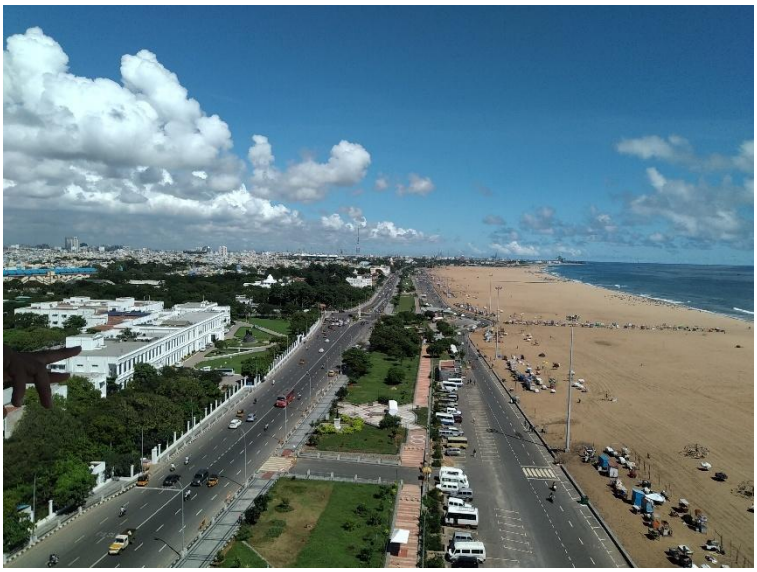
Implementation and Impact

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 (Data received from ASCI).

Figure 5.22 AI-powered analytics software

5.5. CHENNAI

Chennai, formerly known as Madras, is a city of contrasts, where ancient temples stand tall amidst skyscrapers and traditional dance forms share the stage with contemporary art. A beautiful blend of South Indian traditions and modernity, Chennai, the capital of Tamil Nadu is one of the important metro cities of India. Be its cuisine, culture or development, Chennai is a cultural hot spot and a leader in modern India (Incredible India, 2026).



Source: (Wikipedia, 2026)

5.5.1. City Location

Chennai, the capital of Tamil Nadu, lies on the Coromandel Coast of the Bay of Bengal in south-eastern India, at approximately 13.08° N, 80.27° E. The city occupies a low-lying coastal plain with an average elevation of only about 7 metres, drained by the Cooum and Adyar rivers and the Buckingham Canal, and is periodically vulnerable to both cyclones/floods and drought given its dependence on monsoon rainfall.

The Greater Chennai Corporation (GCC) administers an area of **426 sq. km**, expanded in 2011 from an earlier 174 sq. km through the merger of five municipalities (Ambattur, Alandur, Maduravoyal, Manali and Tiruvottiyur), eight town panchayats and 25 village panchayats. The wider Chennai Metropolitan Area (CMA), the planning jurisdiction of the Chennai Metropolitan Development Authority (CMDA) spans approximately 5,904 sq. km and has been under further review for expansion, making Chennai the fourth-largest urban agglomeration in India.

Figure 5.23 Location of Tamil Nadu in India; Chennai in Tamil Nadu
Source: (vecteezy, 2026)

Chennai is a major gateway city, served by an international airport, one of India's oldest and busiest ports, and a dense road and suburban rail network connecting the city to its industrial corridors to the south and north. Its distinctive dual vulnerability to both cyclonic flooding from the north-east monsoon and to acute pre-monsoon drought has made water security a recurring feature of the city's development planning for over two decades.

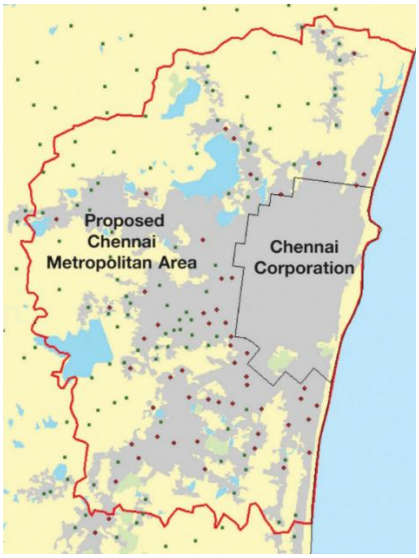


Figure 5.24 Chennai Municipal corporation
Source: (madrasmusings, 2026)

5.5.2. Administrative Structure

The Greater Chennai Corporation, established in 1688, is the oldest municipal corporation in India and the second-oldest in the world after the City of London Corporation. It is headed by an elected Mayor and a Commissioner (IAS. Following the 2011 expansion, the Corporation was organised into 15 zones and 200 wards; by March 2025 this had been further reorganised into 20 zones.

Water and sewerage services are handled by the Chennai Metropolitan Water Supply and Sewerage Board established in 1978, functioning alongside the GCC and the CMDA under the Tamil Nadu Municipal Administration and Water Supply Department. The Corporation's 20-zone structure, and the mandated presence of ward committees under the state's Model Nagar Raj Bill framework, are together intended to devolve civic decision-making closer to residents, though coverage of functioning ward committees has historically remained partial. Zonal officers coordinate directly with CMWSSB's area engineers on drinking-water complaints, storm-water drain maintenance, and monsoon-preparedness works.

5.5.3. Demographic Profile

The pre-expansion 2011 Census recorded Chennai's population at about **46.5 lakh**, while the wider Chennai Metropolitan Area is estimated at 8.7 to nearly 11 million, making it India's fourth-largest urban agglomeration. Population Density as per Census 2011 was **26,553 persons per sq. km**.

Chennai's population is predominantly Hindu, with Tamil as the primary language alongside English. The city hosts a substantial migrant population, reflecting its status as "India's health capital" for medical tourism and a major IT/manufacturing hub, and was ranked the second-safest city in India by the NCRB in 2023. This rapid, migration-driven population growth concentrated particularly in the IT/ITES corridors of south Chennai that were only brought under Corporation limits in 2011, has consistently outpaced piped water and sewerage network expansion in these newer zones, making them a particular focus for the private tanker market and decentralised treatment solutions.

5.5.4. AMRUT Start-Up Ecosystem in Chennai

Under the AMRUT 2.0 Start-Up Programme, Chennai is one of the five cities selected for the impact assessment, on account of its start-up interventions spanning Fresh Water Systems, Urban Water Management, Used Water Management, Urban Sewerage Management and Water Governance. **KarIoT Solutions** built an IoT-enabled intelligent gateway that integrates flow meters, level sensors, and water-quality sensors (pH, TDS, chlorine) with AI-based remote monitoring. It gives utility operators a mobile/web dashboard for automated, remote operation and prediction providing robust monitoring infrastructure for water utility operations in and around Chennai. **WEGot Utility Solutions** developed a water-source management system that tracks water entering a property to catch pilferage, theft, and leakage, while also monitoring source-level quality and optimising usage against demand and cost. Its flagship deployment is at Landmark Vertica, an upscale Chennai residential community, where it replaced old-style flat-rate billing with a resident-facing app for consumption-based billing giving residents direct visibility into their actual water use for the first time. **Samudhyoga Waste Chakra** created "EcoFert," self-sustainable modular toilets that reduce carbon and water footprint while extracting valuable reusable chemicals and water from human urine closing the nutrient loop for circular sanitation. It's deployed with South Chennai Corporation. **Aryav Ecofriendly Resources** manufactures atmospheric water generators that pull pure, mineral-rich drinking water from air, in sizes from 100 to 10,000 LPD for B2B use. **Thales Cleantech** built proprietary "STAME" atmospheric moisture-extraction technology with minimal moving parts and a 20+ year design life. Its Chennai footprint is extensive installed at ICMR, the Chennai Coast Guard's Officers' Mess, over 60 Chennai corporation schools, and a 500-apartment gated community, making it one of the most widely deployed solutions in the city. **VayuJal Technologies** offers atmospheric water generators using bio-inspired condensation surfaces that cut power use per litre by 5-20%, achieving 0.27 kWh/litre through seven-stage filtration serving institutional and community drinking-water needs from its Chennai base. **Sustainable Water Technologies** has installed its "Floating Islands", floating treatment wetlands planted with the same species used in STP gravel filters at two prominent Delhi water bodies: Hauz-i-Shamsi and Nehru Park, restoring and beautifying them naturally. **Wenalytics IoT Solutions** monitors water-service delivery standards and public washroom conditions. Its notable Chennai deployments include the First Space Industrial Park, the Oberoi Exquisite residential complex, and Apollo Hospitals, a mix of industrial, residential and healthcare settings. **Humus Biosystems** built an earthworm bio-reactor for nature-based, IoT-integrated onsite wastewater treatment aimed at small colonies and slums. Near Chennai, it implemented a similar system for a food-processing unit (20 KLD capacity). **Naturesani** installed its waterless, odourless urinal and commode fixtures at Chennai Central Railway Station, saving significant water with low maintenance and no odour issues (Data received from Nodal Officer and ASCI).

Table 5.5 Start-ups, themes and work description in Chennai

Sl/no	Start-ups	Theme	Description
1	KarIoT Solutions	Urban Water Management	"KarIoT" - an IoT-enabled intelligent gateway that integrates flow meters, level sensors and water-quality sensors (pH, TDS, chlorine) with AI-based remote monitoring, operation and prediction via mobile and web dashboards.
2	WEGot Utility Solutions Pvt Ltd	Urban Water Management	A water-source management system that tracks water entering a property to prevent pilferage, theft and leakage, while monitoring source-level quality and optimising usage against demand, availability, cost and quality.
3	Samudhyoga Waste Chakra	Urban Sewerage Management	"EcoFert" self-sustainable modular toilets that reduce carbon and water footprint and generate valuable chemicals and reusable water from human urine, closing the nutrient loop for a circular sanitation economy.
4	Aryav Ecofriendly Resources Pvt Ltd	Fresh Water Systems	Patented atmospheric water generator producing pure, alkaline, mineral-rich drinking water from ambient air, in 100-10,000 LPD units for the B2B market.
5	Thales Cleantech	Fresh Water Systems	Proprietary "STAME" Atmospheric Moisture Extraction technology delivering potable water with minimal moving parts, a design life of over 20 years, and negligible operating cost.
6	VayuJal Technologies Pvt Ltd (Chennai)	Fresh Water Systems	A range of atmospheric water generators using bio-inspired condensation surfaces to cut power consumption per litre of drinking water by 5-20%, with a seven-stage filtration system achieving 0.27 kWh/litre.
7	Sustainable Water Technologies	Urban Water Management	Scalable floating treatment wetlands ("Floating Islands") that restore and beautify water bodies using wetland plant species similar to STP gravel filters.
8	Wenalytics IoT Solutions	Urban Water Management	IoT-based monitoring system for water-service delivery standards (quality, quantity and accessibility) and for public and community washrooms.
9	Humus Biosystems	Used Water Management	Earthworm bio-reactor (EBR) - a nature-based, IoT-integrated onsite used-water treatment system for small colonies and slums, achieving low-cost nutrient removal.
10	Naturesani Pvt Ltd	Urban Sewerage Management	Waterless, odourless hydro-mechanical urinals and commodes with retrofittable washroom fixtures.

Across the 10 AMRUT-supported interventions documented here, spanning 4 thematic areas, **2 start-ups and their project** are selected in Chennai in **2 themes** - **Thales Cleantech** (Fresh water systems) and **WEGot Utility Solutions Pvt Ltd** (Urban Water Management)

5.5.5. Start-up Firm A: Thales Cleantech (Fresh water systems)

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 (Data received from ASCI).

Solution

Figure 5.25 Community drinking water systems

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 (Data received from ASCI).

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 (Data received from ASCI).

5.5.6. Start-up Firm B: WEGot Utility Solutions Pvt Ltd (Urban Water Management)

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 (Data received from ASCI).

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 (Data received from ASCI).

Figure 5.26 WEGoT Aqua's ultrasonic sensor and a dash board

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 (Data received from ASCI).

6. ANALYTIC FRAMEWORK FOR SUE IMPACT ASSESSMENT

Under the AMRUT-MoHUA Start-Up Ecosystem Programme, for the impact assessment, start-ups are selected from five case cities - Delhi, Guwahati, Mumbai, Hyderabad, and Chennai which are chosen through criteria of physical completion status, number of beneficiaries reached, extent of fund utilisation, and geographic zone, so that the final sample offered a genuinely PAN-India spread rather than a picture skewed toward any single region. Each city's selected start-ups were mapped against specific urban water themes reflecting the nature of their interventions:

For every start-up, the assessment framework, indicators and parameters are custom-built around the specific nature of that start-up's solution, and then further differentiated by the stakeholder being served. For the Operator (the start-up or implementing agency), indicators focus on coverage and deployment, output and delivery performance, technical reliability and maintenance, and cost and financial performance.

For the Authority or Urban Local Body (ULB), indicators shift toward independently verifiable, outcomes such as change in groundwater level, change in water quality, and reduction in urban flooding or waterlogging incidents, providing a credibility check that goes beyond the start-up's own self-reported figures.

For the Consumer, the framework centres on directly felt, household-level benefits such as economic gains from reduced water expenditure and reduced tanker dependency, translating technical infrastructure into a tangible improvement in water security and affordability for residents. By tailoring indicators and parameters to each start-up's technology while also considering Operator, Authority and Consumer’s perspectives, the assessment framework is designed to capture a complete, credible, and stakeholder-balanced picture of on-ground impact across all five selected cities.

Theme 1: Fresh Water Systems

6.1. ADVA ENVIRO (Hyderabad) - The Rainwater Project

Adva Enviro operates under The Rainwater Project, a citywide rainwater-harvesting and water-resilience initiative in Hyderabad. It delivers scientific, site-specific solutions for rooftop rainwater harvesting (RWH), groundwater recharge pits, and restoration of natural and man-made water bodies, alongside end-to-end wastewater reuse and integrated water management services.

6.1.1. Indicators & Parameters to Operator

These are the indicators and parameters for the Operator for ADVA ENVIRO (Hyderabad) - The Rainwater Project.

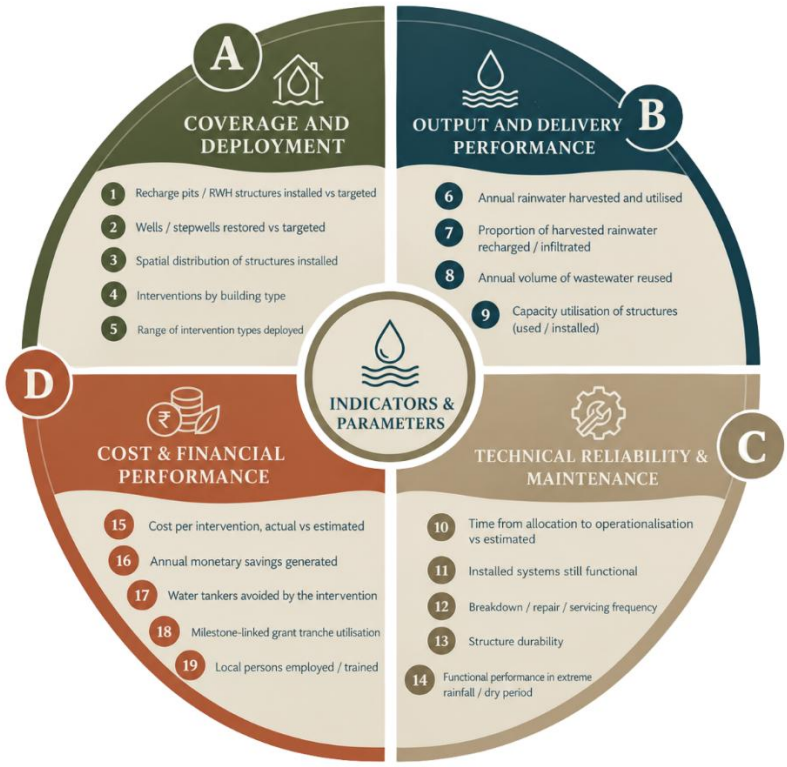


Figure 6.1 Indicators and Parameters for the operator - ADVA ENVIRO

Indicator A: Coverage and Deployment

This indicator captures the range, scale, and spatial spread of RWH and recharge interventions Adva Enviro deploys across Hyderabad, comparing targeted versus actually installed structures by location and building type. It establishes whether delivery is broad-based and equitable, and forms the baseline against which every downstream technical and impact indicator is interpreted.

Parameter 1: Recharge pits / RWH structures installed vs targeted

This parameter records the categories number of interventions Adva Enviro deploys like rooftop RWH systems, recharge pits, and water-body restoration works. Expressed as a percentage of count versus target, this is the headline delivery-pace metric for the intervention, comparing how many recharge pits and RWH structures have actually been built against the number originally committed. Hyderabad's water stress stems from both surface-runoff loss and depleted aquifers, so a diversified intervention helps the start-up's capacity to address multiple failure points in the urban water cycle rather than a single narrow fix. Tracking the range also helps funders and the ULB understand whether the start-up is matching intervention type to site conditions like rocky terrain, built-up density, proximity to water bodies, rather than applying a one-size-fits-all model.

Parameter 2: Wells / stepwells restored vs targeted

This parameter tracks restoration completion against target specifically for traditional water bodies such as wells and stepwells, expressed as a percentage of count versus target. Restoring heritage or community water assets carries added complexity like land-title issues, structural conservation requirements, and community negotiation that new-build recharge pits do not face, so shortfalls here often reflect different bottlenecks.

Parameter 3: Spatial distribution of structures installed

This parameter maps where installed structures actually sit across the city rather than simply how many exist. Hyderabad's groundwater stress is unevenly distributed across its geology, and a spatially skewed portfolio clustered in easier-to-access or better-resourced localities delivers less citywide resilience than an evenly or strategically spread one, even if the raw installation count looks strong. This parameter is also central to equity assessment by the ULB, which needs ward-level visibility to plan complementary municipal interventions.

Parameter 4: Interventions by building type

This parameter classifies completed interventions by the type of building they serve like government buildings, individual houses, commercial/institutional buildings, or resorts recorded as a count per type. Each building type carries different visibility, footfall, and civic value as government-building installations are easy to showcase publicly, while household-level coverage spreads benefit more broadly but is harder to monitor and scale. Understanding this mix tells the ULB and funders whether delivery is tilted toward high-visibility institutional work or genuine grassroots household reach.

Parameter 5: Range of intervention types deployed

This parameter counts how many distinct intervention types like rooftop RWH, recharge pits, restoration have actually been deployed on the ground, expressed as a count of types. It is a signal of technical versatility where a start-up applying only one intervention type regardless of site conditions suggests limited engineering adaptability, whereas breadth of deployed solutions indicates the ability to match design to varied terrain, density, and water-body proximity across Hyderabad.

Indicator B: Output and Delivery Performance

This indicator measures the resource outcomes of the interventions that are annual rainwater harvested, proportion infiltrated, wastewater reused, and capacity utilisation. This indicator group is most directly tied to Hyderabad's water-security goals, translating built infrastructure into measurable, quantified supply and recharge benefit.

Parameter 1: Annual rainwater harvested and utilised

This parameter translates built infrastructure into an actual water-security gain. It directly quantifies how much pressure the intervention takes off tankers, borewells, and piped supply across Hyderabad that ultimately justifies the capital and effort invested in installation.

Parameter 2: Proportion of harvested rainwater recharged / infiltrated

This parameter measures how much of the harvested rainwater actually reaches and recharges the aquifer rather than being lost to evaporation, overflow, or poor percolation. Harvesting volume alone can overstate impact as a structure capturing large volumes but infiltrating little is failing at its core purpose, making this the key technical-quality parameter distinguishing well-engineered structures from poorly sited or maintained ones.

Parameter 3: Annual volume of wastewater reused

This parameter tracks wastewater treated and reused through Adva Enviro's integrated water management work, separate from rainwater harvesting. It demonstrates a contribution to closing the water loop by reducing both freshwater withdrawal and untreated discharge into Hyderabad's water bodies and sewer network extending the intervention's relevance beyond pure rainwater capture.

Parameter 4: Capacity utilisation of structures (used / installed)

This parameter shows how much of the built infrastructure's potential is actually being used in practice. Installed capacity sitting idle represents wasted capital and a mismatch between design assumptions and real site demand or conditions; persistently low utilisation across the portfolio would flag oversized design, poor siting, or operational neglect.

Indicator C: Technical Reliability & Maintenance

This indicator assesses delivery timeliness, functional longevity, breakdown frequency, durability, and performance under rainfall extremes. It distinguishes structures that merely exist from those that reliably perform over their intended lifetime, and is the strongest predictor of whether installation numbers translate into lasting impact.

Parameter 1: Time from allocation to operationalisation vs estimated

This parameter compares the actual time taken from a site being handed over to the structure becoming operational, against the originally estimated timeline. Delays can cascade into cost overruns and, critically, missed monsoon windows. RWH structures ideally need to be ready before the rains to capture the season's harvest, so timeline slippage can cost an entire year's worth of impact rather than just money.

Parameter 2: Installed systems still functional

This parameter measures how many installed structures remain operational at a given point after commissioning rather than falling into disuse. Rainwater-harvesting infrastructure nationally has a well-documented pattern of high build rates but poor post-installation upkeep, meaning a low functional-retention figure here would mean the installation counts elsewhere in the framework substantially overstate real, ongoing impact.

Parameter 3: Breakdown / repair / servicing frequency

This parameter tracks how often installed structures require repair or servicing. It is a leading parameter of both build quality and maintenance-model adequacy with frequent breakdowns strain budgets and community goodwill, and often foreshadow the functional decline captured, while also revealing the true cost of ownership beyond initial capital outlay.

Parameter 4: Structure durability

This parameter tracks how long installed structures remain structurally sound before requiring major repair or replacement. Durability directly determines the lifetime value delivered per rupee invested where short-lived structures undermine the entire economic and resilience case for RWH as a citywide strategy, regardless of how impressive the initial installation numbers look.

Parameter 5: Functional performance in extreme rainfall / dry period

This parameter tracks how well interventions perform during rainfall extremes, both intense storm events and prolonged dry spells. Climate variability is increasing in Hyderabad, and structures that only perform well under average conditions will underdeliver precisely when resilience is needed most.

Indicator D: Cost & Financial Performance

This indicator tracks cost discipline and economic value generated with budgeted versus actual spend, monetary savings for beneficiaries, tankers avoided, grant-tranche utilisation, and local employment created. This indicator group links technical delivery to financial accountability and to Hyderabad's broader tanker-dependence and livelihood concerns.

Parameter 1: Cost per intervention, actual vs estimated

This parameter compares budgeted and actual expenditure for each intervention. It matters for financial accountability to funders and the ULB as cost overruns can show design or execution issues, while significant underspend could indicate corner-cutting on quality and it is a basic prerequisite for any credible cost-benefit assessment of the programme.

Parameter 2: Annual monetary savings generated

This parameter estimates the value of water-related savings such as avoided tanker purchases, reduced utility bills generated annually for beneficiaries as a result of the intervention. It translates technical

outcomes into an economic argument that resonates with non-technical stakeholders and directly justifies continued investment in the model to funders and the ULB.

Parameter 3: Water tankers avoided by the intervention

This parameter estimates how many tanker trips are displaced annually because of reduced reliance on tanker-supplied water at intervention sites. Tanker dependence is both a cost and an environmental burden in Hyderabad, so this parameter connects the intervention to a widely felt pain point in the city's water economy in a way that is intuitively understood beyond technical audiences.

Parameter 4: Milestone-linked grant tranche utilisation

This parameter tracks how grant funding released in milestone-linked tranches is actually drawn down and spent against each intervention. It matters for grant governance, ensuring funds are used for their intended purpose and released only as physical or outcome milestones are genuinely achieved, protecting both the funder's and the ULB's interest in disciplined, verifiable disbursement rather than calendar-based release.

Parameter 5: Local persons employed / trained

This parameter counts local jobs created or skills imparted through project implementation. It is a socio-economic co-benefit beyond the core water outcome, supporting local livelihoods in Hyderabad and building a skilled workforce base that can sustain future maintenance demand for the growing stock of installed structures.

6.1.2. Indicators & Parameters to Authority/ULB

These are the indicators and parameters for the Authority for ADVA ENVIRO (Hyderabad) - The Rainwater Project.

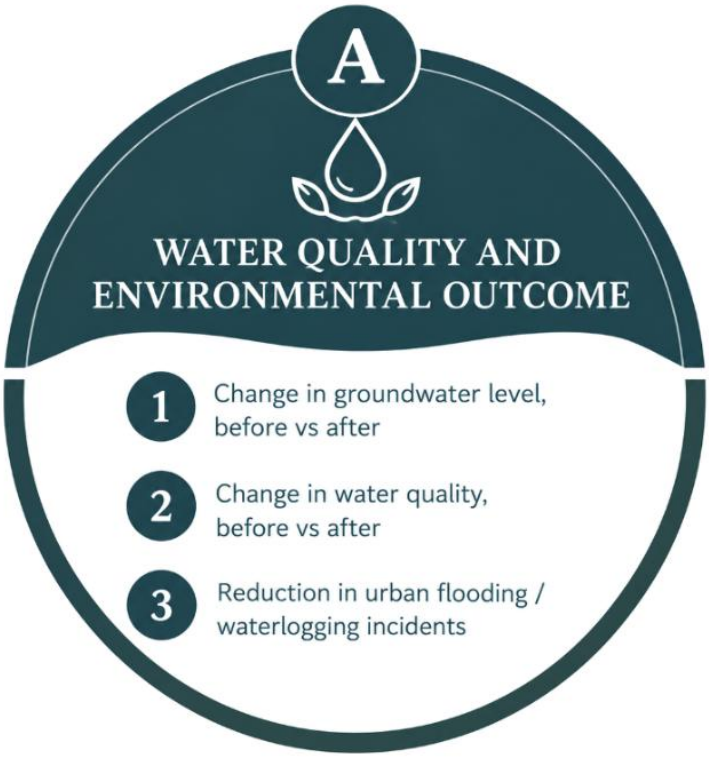


Figure 6.2 Indicators and Parameters for the Authority - ADVA ENVIRO

Indicator A: Water Quality and Environmental Outcome

This indicator independently verifies groundwater-level and water-quality change, and flooding reduction, using joint Start-up/ULB monitoring rather than the start-up's own reporting alone. It provides a credibility check on start-up outcomes.

Parameter 1: Change in groundwater level, before vs after

This parameter tracks groundwater-level change at or near intervention sites before and after implementation, sourced jointly through Start-up and ULB monitoring. It is the most credible proof of aquifer-level impact, reflecting a real physical outcome rather than an input or output proxy, which is particularly important in Hyderabad's rocky, fast-draining hydrogeology where recharge gains can be quickly offset by extraction elsewhere.

Parameter 2: Change in water quality, before vs after

This parameter tracks water-quality change at or near intervention sites before and after implementation. It validates whether restoration and recharge activity are genuinely improving or at minimum not

degrading local water quality, guarding against the risk that recharge structures inadvertently introduce contamination if silt traps or filtration are poorly designed.

Parameter 3: Reduction in urban flooding / waterlogging incidents

This parameter compares flooding or waterlogging occurrences at or near intervention sites before and after implementation. RWH and recharge structures, by capturing runoff at source, can meaningfully reduce localised flooding which is a growing concern in rapidly urbanising Hyderabad neighbourhoods with reduced natural permeability and this ULB-anchored figure is generally more complete and less subject to selective reporting than a start-up self-report alone.

6.1.3. Indicators & Parameters to Consumer

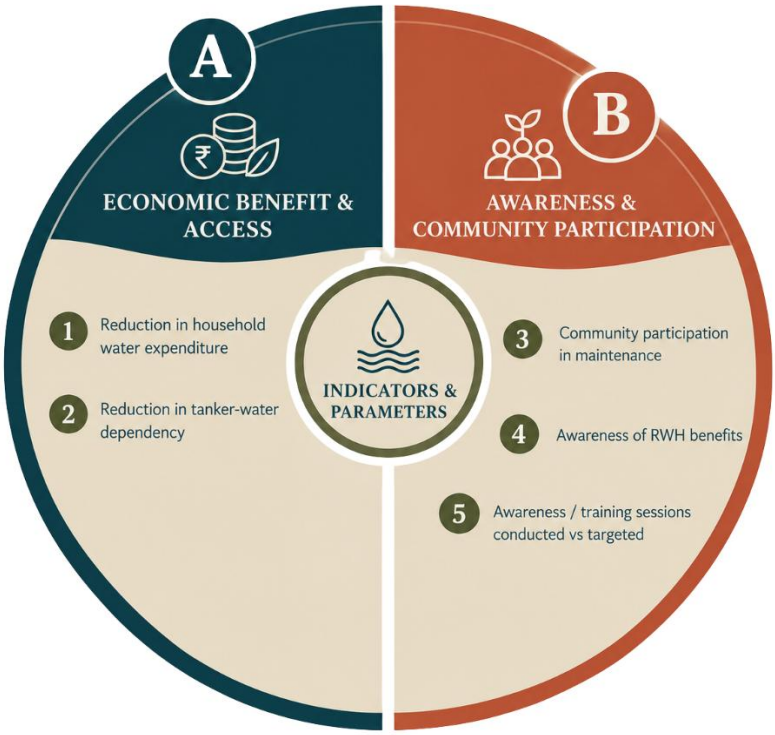


Figure 6.3 Indicators and Parameters for the Consumer - ADVA ENVIRO

Indicator A: Economic Benefit & Access

This indicator captures the direct financial benefit felt by households with reduced water expenditure and reduced tanker dependency after adoption. This indicator translates technical infrastructure into a tangible, felt improvement in household water security and cost, the ultimate test of relevance to residents.

Parameter 1: Reduction in household water expenditure

This parameter tracks how much fewer beneficiary households spend on water tankers, purchased water, pumping costs after adopting Adva Enviro's intervention. It is the most direct financial benefit visible to

the end user and is central to demonstrating the intervention's value proposition to future adopters, translating technical infrastructure into a felt household-level outcome.

Parameter 2: Reduction in tanker-water dependency

This parameter tracks the shift in water-sourcing behaviour following adoption. Tanker dependence is often both expensive and unreliable, and a meaningful shift away from it is a strong proof for genuine improvement in household water security rather than a marginal, symbolic change in habits.

Indicator B: Awareness & Community Participation

This indicator measures whether communities are trained and engaged in maintaining installed structures, how aware they are of RWH benefits, and outreach delivered versus planned. Strong performance here is closely linked to the long-term functional survival tracked under the operator's technical-reliability indicators.

Parameter 1: Community participation in maintenance

This parameter tracks whether the community has been engaged and equipped to participate in the upkeep of installed structures. Community ownership is strongly correlated with the long-term functional retention tracked under the operator's technical-reliability indicators structures maintained collectively tend to outlast those left solely to an external operator's periodic visits, especially given the scale of the citywide rollout.

Parameter 2: Awareness of RWH benefits

This parameter measures how well the public understands the purpose and benefits of rainwater harvesting in their area. Low awareness limits both community participation and broader public buy-in for water-conservation behaviour beyond the specific installed structures, ultimately capping the programme's citywide multiplier effect regardless of installation numbers.

Parameter 3: Awareness / training sessions conducted vs targeted

This parameter compares the number of planned awareness or training sessions delivered against those actually conducted, recorded as a count. It is a straightforward delivery-accountability metric for the community-engagement component of the project, which is often under-resourced relative to physical construction activity despite being essential to sustaining functional and behavioural impact over the long run.

6.2. THALES CLEANTECH (Chennai)

Thales Cleantech provides potable water through Atmospheric Moisture Extraction (AME) using its proprietary STAME technology. The system uses fewer moving parts, which is intended to deliver a minimum 20-year operating life with negligible running cost in a city where groundwater and surface sources are heavily stressed.

6.2.1. Indicators & Parameters to Operator

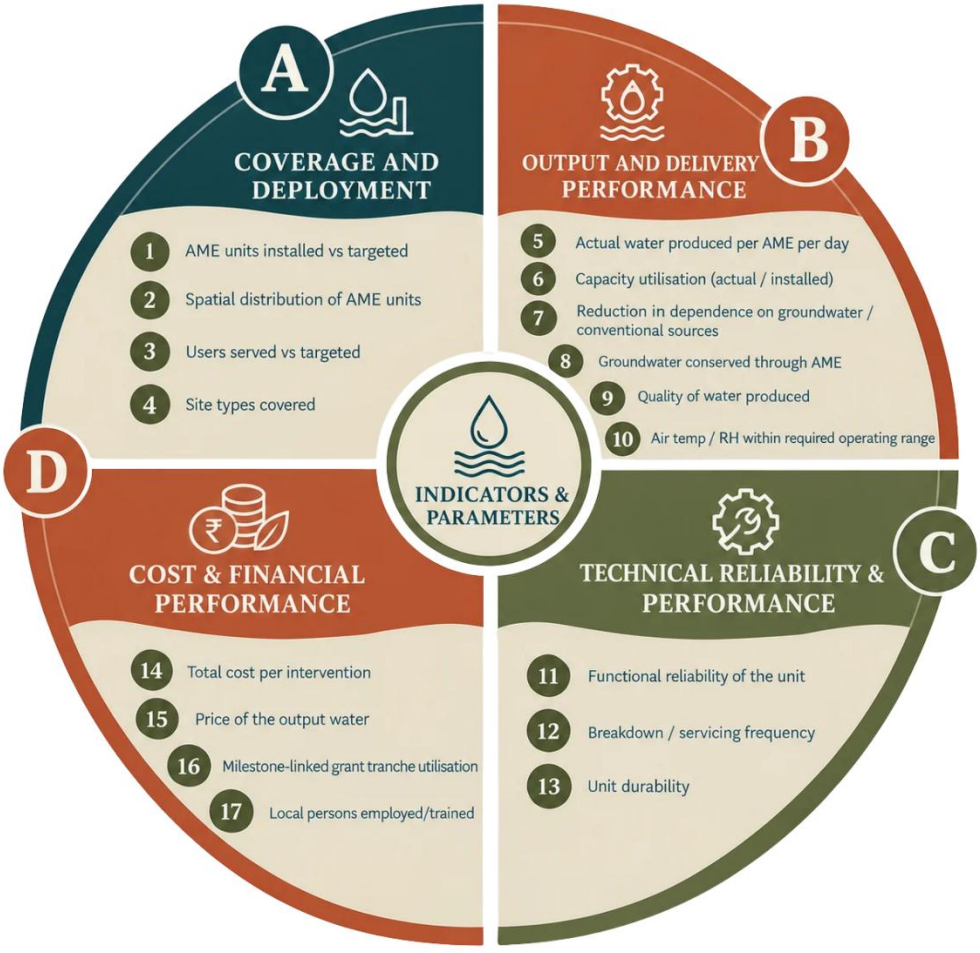


Figure 6.4 Indicators and Parameters for the Operator - Thales Cleantech

Indicator A: Coverage and Deployment

This indicator tracks how many AME units are installed against target, where they are sited, how many users are served, and which site types are prioritised. It reveals whether Chennai's rollout favours climatically favourable or high-footfall locations versus broader, more equitable coverage.

Parameter 1: AME units installed vs targeted

This parameter tracks how many AME units have been deployed relative to the rollout plan. It is the primary delivery-pace parameter for a hardware-based, unit-by-unit deployment model, where each unit represents a discrete piece of capital equipment rather than a construction project.

Parameter 2: Spatial distribution of AME units

This parameter records the count and location of installed units across Chennai. Atmospheric water generation performance is sensitive to ambient humidity and temperature, so distribution reveals whether units are being placed in climatically favourable zones or spread to serve underserved areas regardless of yield trade-offs.

Parameter 3: Users served vs targeted

This parameter compares the actual number of beneficiaries served against the original target, expressed as a percentage. Unit count alone does not capture reach where a unit placed at a high-footfall public site serves far more people than one at a low-traffic private location.

Parameter 4: Site types covered

This parameter records the count of installations by site type such as public institutions, residential complexes, commercial sites. It shows whether the start-up's rollout is prioritising public-good access points or higher-revenue private placements, which has implications for both social impact and commercial sustainability of the model.

Indicator B: Output and Delivery Performance

This indicator measures actual daily water yield per unit, capacity utilisation, groundwater displaced, water quality, and ambient operating conditions. This is the core productivity and substitution indicator, showing how much real water AME technology delivers in Chennai's specific climate versus its rated potential.

Parameter 1: Actual water produced per AME per day

This parameter is the core output metric for each unit. AME yield is highly sensitive to ambient conditions, so actual daily output as opposed to rated capacity is the true measure of what the technology delivers in Chennai's specific climate.

Parameter 2: Capacity utilisation (actual / installed)

This parameter compares actual output against each unit's installed/rated capacity. It matters as a direct efficiency parameter, distinguishing units performing near their engineering potential from those underperforming due to humidity conditions or technical faults.

Parameter 3: Reduction in dependence on groundwater / conventional sources

This parameter estimates how much conventional water sourcing from groundwater extraction, piped supply, tankers is displaced by AME-produced water at served sites. It connects the start-up's technology directly to the groundwater-stress, positioning atmospheric water as a genuine substitution.

Parameter 4: Groundwater conserved through AME

This parameter is a more specific quantification of the groundwater-conservation component, isolating the aquifer-relevant portion of displaced demand. It matters for regulatory and environmental reporting purposes, particularly in a city where groundwater extraction is increasingly regulated.

Parameter 5: Quality of water produced

This parameter tracks the potability and quality standard of water generated by the AME units. Atmospheric water generation is a relatively novel technology for many users, and consistent quality verification is essential to building trust and regulatory acceptance.

Parameter 6: Air temp / RH within required operating range

This parameter tracks, in degrees Celsius and percentage relative humidity, whether ambient conditions at each site, fall within the range the STAME technology requires for efficient operation, comparing achieved against required conditions. It directly explains variance in output and utilisation, a unit sited in consistently unfavourable conditions cannot be fairly judged on output alone.

Indicator C: Technical Reliability & Performance

This indicator assesses unit uptime, servicing frequency, and durability, directly testing STAME's claim of minimal moving parts and a 20-year service life. Reliability here is critical to consumer trust, since atmospheric water generation remains an unfamiliar technology to most users.

Parameter 1: Functional reliability of the unit

This parameter tracks the proportion of time or the proportion of units operating without fault. Reliability underpins user trust in a technology that is still unfamiliar to most consumers, and any perception of frequent failure could disproportionately damage adoption compared to more established water solutions.

Parameter 2: Breakdown / servicing frequency

This parameter tracks how often each unit requires repair or servicing. It matters as a proof for both build quality and the real cost of ownership, particularly important given the start-up's claim of minimal moving parts and low maintenance need.

Parameter 3: Unit durability

This parameter tracks how long units operate before a major failure. It matters because it validates the technology's headline claim of a 20-year service life, which is central to its long-term cost-effectiveness argument.

Indicator D: Cost & Financial Performance

This indicator covers per-unit deployment cost, water pricing, grant-tranche utilisation, and local employment generated. This indicator group determines whether AME technology is financially viable and accessible at scale, balancing capital intensity against affordability for target beneficiaries.

Parameter 1: Total cost per intervention

This parameter records the cost of deploying each AME unit including installation. It matters for comparing the capital intensity of AME technology against alternative water solutions and for funder cost-benefit assessment.

Parameter 2: Price of the output water

This parameter tracks the price charged for AME-produced water. It determines affordability and accessibility for target beneficiaries, and also the commercial viability of the model where water is sold rather than provided free.

Parameter 3: Milestone-linked grant tranch utilisation

This parameter tracks drawdown of grant funding, against agreed milestones. It matters for grant-governance, ensuring funds are released only as verified progress is made.

Parameter 4: Local persons employed/trained

This parameter counts local jobs created or skills imparted through installation and maintenance activity. It is a socio-economic co-benefit and also builds local servicing capacity, which is particularly relevant for a technology requiring specialised maintenance knowledge.

6.2.2. Indicators & Parameters to Consumer

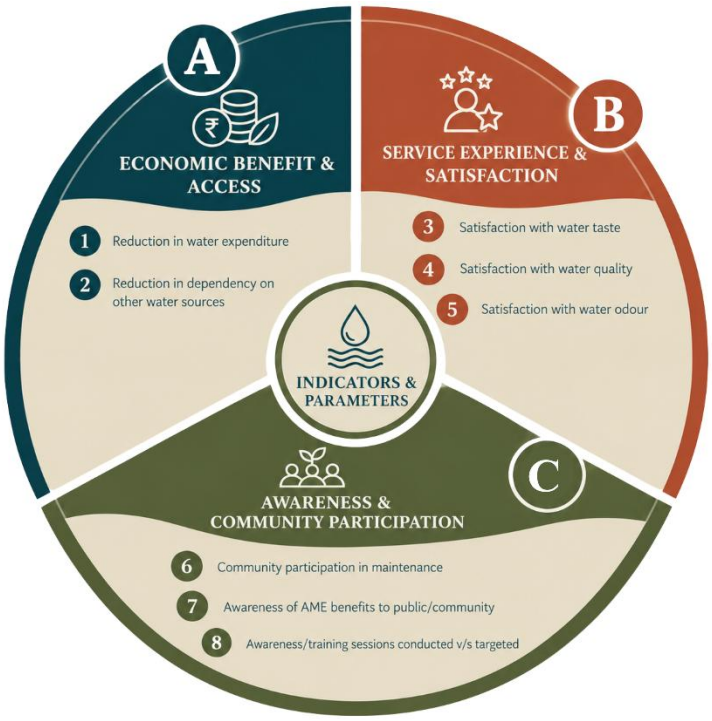


Figure 6.5 Indicators and Parameters for the Consumer - Thales Cleantech

Indicator A: Economic Benefit & Access

This indicator captures household savings and reduced dependency on other water sources after adopting AME-produced water. It demonstrates genuine substitution rather than marginal supplementation, showing whether the technology meaningfully displaces tanker or bottled-water spending for served households.

Parameter 1: Reduction in water expenditure

This parameter tracks how much less beneficiaries spend on water after gaining access to AME-produced water. It is the primary economic value proposition for consumers, especially where AME substitutes for expensive tanker or bottled water purchases.

Parameter 2: Reduction in dependency on other water sources

This parameter tracks the shift away from alternative sources such as tankers, bottled water, unreliable piped supply following AME adoption. It matters because it shows genuine behavioural substitution rather than AME water being used only as a marginal supplement.

Indicator B: Service Experience & Satisfaction

This indicator measures subjective satisfaction with taste, quality, and odour of AME water on a scale of 0 to 5. This indicator captures the sensory trust barrier that determines whether users continue using it long term because atmospheric water can differ perceptibly from conventional sources.

Parameter 1: Satisfaction with water taste

This parameter captures user perception of AME water's taste, which can differ from conventional groundwater or piped supply due to the different generation process. Taste is often the first and most persistent factor influencing whether users continue using a novel water source, regardless of its measured quality.

Parameter 2: Satisfaction with water quality

This parameter captures users' subjective confidence in the water's safety and cleanliness. Perceived quality drives sustained adoption even when objective quality is high, and gaps between perception and lab results can highlight a communication or trust issue worth addressing.

Parameter 3: Satisfaction with water odour

This parameter specifically isolates odour perception, which for atmospheric water can be affected by ambient air quality at the extraction site. Odour is a fast, visceral trigger for consumer rejection of a water source even when it is objectively safe.

Indicator C: Awareness & Community Participation

This indicator tracks community involvement in unit upkeep, public awareness of AME benefits, and outreach sessions delivered versus planned. This underpins adoption and trust for an unfamiliar technology, and supports the functional reliability tracked at the operator level.

Parameter 1: Community participation in maintenance

This parameter tracks whether the community has been trained to support basic unit upkeep. Community involvement extends functional life between professional servicing visits.

Parameter 2: Awareness of AME benefits to public/community

This parameter measures public understanding of what AME technology is and why it benefits them, which is especially important given how unfamiliar atmospheric water generation is compared to conventional water sources.

Parameter 3: Awareness/training sessions conducted v/s targeted

This parameter compares the count of planned versus delivered awareness or training sessions. It is an accountability check on the community-engagement component of the rollout.

Theme 2: Hydro Informatics

6.3. SUPREMUS DEVELOPERS (Delhi) - JanaJal WOW

Supremus Developers operates JanaJal WOW, a doorstep water-delivery service using IoT-controlled three-wheelers. The fleet is secured, monitored, and controlled through secure cloud servers with proprietary controllers and sensors, delivering safe drinking water directly to Delhi households in a consistent, trackable manner.

6.3.1. Indicators & Parameters to Operator

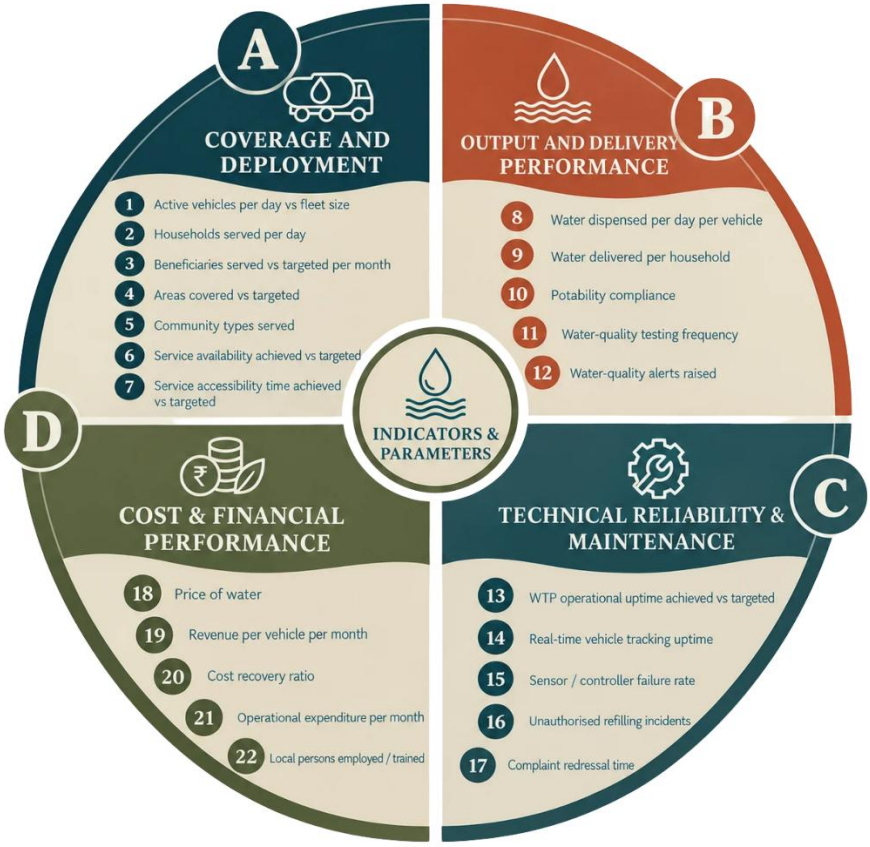


Figure 6.6 Indicators and Parameters for the Operator - Supremus Developers

Indicator A: Coverage and Deployment

This indicator tracks active fleet size, households and areas served versus targeted, income-group mix reached, and service timing achieved. This indicator group shows whether JanaJal WOW's doorstep delivery genuinely reaches underserved, low-income areas of Delhi or concentrates in easier-to-service localities.

Parameter 1: Active vehicles per day vs fleet size

This parameter tracks how many of the total fleet vehicles are actually operational on a given day. Idle vehicles represent both lost delivery capacity and a signal of underlying fleet-maintenance or driver-availability issues, directly affecting how many households can be served that day.

Parameter 2: Households served per day

This parameter counts the daily number of households receiving water deliveries. It is the core service-reach metric for a household-doorstep delivery model, analogous to footfall for a retail service, and is the base figure from which most downstream volume and revenue metrics are derived.

Parameter 3: Beneficiaries served vs targeted per month

This parameter compares monthly service delivery against the plan. It is the primary delivery-accountability metric to funders and the ULB, and consistent shortfalls would flag either fleet capacity constraints or demand-generation issues.

Parameter 4: Areas covered vs targeted

This parameter tracks geographic coverage such as count and location of areas served versus those originally planned. Delhi's water access disparities are highly localised, and coverage that lags in the most underserved areas undermines the equity rationale for the service even if overall household numbers look strong.

Parameter 5: Community types served

This parameter classifies beneficiaries by income category of HIG, MIG, or LIG. It reveals whether JanaJal WOW is genuinely reaching the water-insecure LIG segment it is often positioned to serve, or is concentrated in wealthier, easier-to-service areas.

Parameter 6: Service availability achieved vs targeted

This parameter compares actual service window against the planned availability. Reliability of timing is often as important to households as the water itself, particularly for those without storage capacity to buffer irregular deliveries.

Parameter 7: Service accessibility time achieved vs targeted

This parameter tracks how quickly a household can access water once a vehicle arrives, or the response time for on-demand requests, against the targeted benchmark. Excessive wait or access time erodes the convenience advantage that doorstep delivery is meant to offer over traditional water collection.

Indicator B: Output and Delivery Performance

This indicator measures water dispensed per vehicle and per household, plus potability compliance, testing frequency, and quality alerts. This is the core safety and productivity indicator, confirming that delivered volumes meet household need and that water quality is consistently verified, not merely assumed.

Parameter 1: Water dispensed per day per vehicle

This parameter tracks average dispensing volume, a core productivity metric for the fleet. It is for assessing operational efficiency and comparing vehicle-level performance to identify underperforming routes or units.

Parameter 2: Water delivered per household

This parameter tracks the average quantity received by each served household. It indicates whether delivered volume genuinely meets a household's daily drinking-water needs or only partially supplements other sources.

Parameter 3: Potability compliance

This parameter tracks how consistently delivered water meets potability standards. It is the safety parameter for a drinking-water delivery service, directly bearing on public health outcomes.

Parameter 4: Water-quality testing frequency

This parameter tracks how often quality testing is actually conducted. It is the credibility of the potability-compliance that depends entirely on adequate and consistent testing frequency where infrequent testing risks missing contamination events between test dates.

Parameter 5: Water-quality alerts raised

This parameter tracks how many quality issues are flagged, whether through testing or complaints. It is an early-warning indicator that allows rapid response to contamination or system faults before they cause wider harm.

Indicator C: Technical Reliability & Maintenance

This indicator assesses treatment-plant uptime, IoT tracking system reliability, sensor/controller failures, unauthorised refilling incidents, and complaint response time. Since JanaJal WOW's core value proposition is secure, monitored delivery, this indicator group tests whether that technological promise holds up operationally.

Parameter 1: WTP operational uptime achieved vs targeted

This parameter tracks uptime of the water treatment plant supplying the delivery fleet, against target. The entire delivery operation depends on a reliably functioning treatment source; downtime here cascades into missed deliveries across the whole fleet.

Parameter 2: Real-time vehicle tracking uptime

This parameter tracks how reliably the IoT tracking system itself functions. The service's core value proposition of secure, monitored, cloud-controlled delivery depends on this system working consistently; tracking downtime undermines both operational oversight and the safety/security assurance offered to customers.

Parameter 3: Sensor / controller failure rate

This parameter tracks how often the proprietary sensors and controllers fail. It is a direct technology-reliability metric specific to JanaJal WOW's IoT-dependent model, distinguishing it from conventional delivery services with no comparable dependency.

Parameter 4: Unauthorised refilling incidents

This parameter tracks instances where vehicles are refilled from unauthorised or unverified sources, undermining the controlled, secure model the service is built on. It is for water-safety assurance, since unauthorised refilling bypasses the quality controls applied at the sanctioned treatment plant.

Parameter 5: Complaint redressal time

This parameter tracks how quickly customer complaints are resolved. It is for customer trust and retention in a subscription or purchase-based delivery service, where slow complaint handling can quickly erode user confidence.

Indicator D: Cost & Financial Performance

This indicator covers water pricing, revenue per vehicle, cost-recovery ratio, monthly operating expenditure, and local employment. This is the headline financial-sustainability indicator, showing how close the fleet-based delivery model is to covering its own costs without continued subsidy.

Parameter 1: Price of water

This parameter tracks the price charged to customers. It is for affordability assessment, particularly for LIG households, and for benchmarking against alternative water sources such as tankers or bottled water.

Parameter 2: Revenue per vehicle per month

This parameter tracks the commercial productivity of each fleet unit. It is for assessing the financial sustainability of the delivery model at the unit-economics level, to whether the service can scale without continued subsidy.

Parameter 3: Cost recovery ratio

This parameter compares revenue against operating costs. It is the financial-sustainability parameter, showing how close the service is to covering its own costs versus depending on continued grant or subsidy support.

Parameter 4: Operational expenditure per month

This parameter tracks total running costs. It is the cost side of the cost-recovery calculation and helps identify which cost categories are driving overall expenditure, informing efficiency improvements.

Parameter 5: Local persons employed / trained

This parameter counts jobs created through the operation. It is a socio-economic co-benefit, and given the operation's reliance on a distributed fleet, local employment is operationally necessary.

6.3.2. Indicators & Parameters to Consumer

Figure 6.7 Indicators and Parameters for the Consumer - Supremus Developers

Indicator A: Economic Benefit & Access

This indicator captures household savings and order frequency, showing whether families genuinely substitute JanaJal WOW for costlier alternatives and rely on it repeatedly rather than as a one-off trial. Purchase frequency in particular signals real, sustained demand for the service.

Parameter 1: Reduction in household water expenditure

This parameter tracks savings, households achieve after switching to JanaJal WOW deliveries, relative to tanker purchases or bottled water. It is the primary economic case for adopting the service over existing alternatives.

Parameter 2: Purchase frequency

This parameter tracks how often households order deliveries. It is a parameter of genuine, repeated reliance on the service rather than one-off trial usage, and also feeds directly into revenue and demand-planning for the operator.

Indicator B: Service Experience & Satisfaction

This indicator reduction in waterborne disease incidence and overall user satisfaction on a scale of 0 to 5. This indicator connects the service to public-health outcomes as well as day-to-day customer experience, forming the strongest consumer-side justification for quality-controlled doorstep delivery.

Parameter 1: Reduction in waterborne disease incidences

This parameter tracks health outcomes among served households following adoption. It is the ultimate public-health justification for investing in verified, quality-controlled drinking water delivery, connecting the service to outcomes beyond convenience or cost.

Parameter 2: User satisfaction

This parameter captures overall customer satisfaction with the service. It is a composite parameter of service quality, reliability, and value that complements the more specific operational metrics tracked elsewhere.

Indicator C: Awareness & Community Participation

This indicator tracks community involvement in unit upkeep at shared points, public awareness of the JanaJal WOW service, and outreach delivered versus planned. Since awareness directly caps adoption, this indicator group underpins how effectively the service can grow its reach in target Delhi communities.

Parameter 1: Community participation in maintenance

This parameter tracks whether communities are engaged in supporting the service's upkeep.

Parameter 2: Awareness of JanaJal WOW

This parameter measures how well the target population knows the service exists and understands how to access it. Low awareness directly caps adoption regardless of how good the underlying service is.

Parameter 3: Awareness/training programs conducted v/s targeted

This parameter compares planned versus delivered outreach sessions. It is an accountability check on the community-engagement effort supporting adoption and trust-building for the service.

Theme 3: Urban Water Management

6.4. WEGOT UTILITY SOLUTIONS (Chennai)

WeGOT's system tracks water entering a property to prevent pilferage, theft, or leakage, while monitoring source-level quality so only clean water enters the property. It enables optimisation of water usage against demand, availability, cost, and quality at each connected source.

6.4.1. Indicators & Parameters to Operator

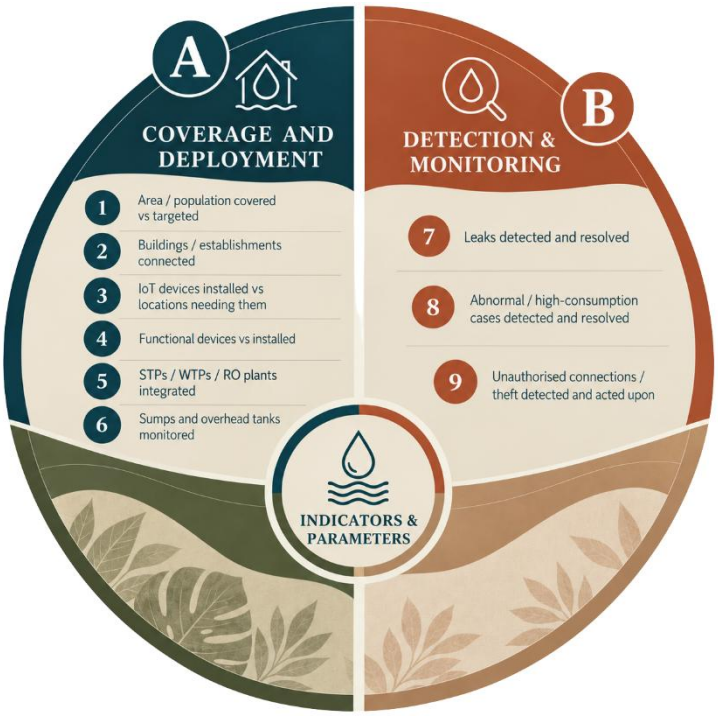


Figure 6.8 Indicators and Parameters for the Operator - WeGOT's Utility Solutions

Indicator A: Coverage and Deployment

This indicator captures the scale of WeGOT's rollout of area/population covered, buildings connected, IoT devices installed and functional, treatment plants and storage points integrated. It establishes whether monitoring coverage is broad and technically sound enough for downstream detection and efficiency indicators to be meaningful across the service area.

Parameter 1: Area / population covered vs targeted

This parameter is the headline rollout-scale metric, showing how much of the intended service area or population, the start-up's monitoring system actually reaches. Every downstream detection and efficiency

indicator is only meaningful within covered territory, a technically excellent system with narrow coverage delivers limited citywide value regardless of its per-site performance.

Parameter 2: Buildings / establishments connected

This parameter counts the number of individual buildings or establishments onboarded onto the monitoring system. It is a more granular adoption metric than area coverage alone, since a covered zone can still have low actual building-level uptake if property owners are slow to connect, this figure reveals real penetration versus nominal service-area coverage.

Parameter 3: IoT devices installed vs locations needing them

This parameter compares the number of IoT sensors installed against the total number of monitoring points identified as necessary. It matters because partial device coverage within a connected building can leave blind spots where leakage or theft goes undetected, undermining the system's core promise.

Parameter 4: Functional devices vs installed

This parameter tracks how many installed IoT devices are actually operational at a given time, as opposed to offline, faulty, or disconnected. A device that is installed but non-functional provides false assurance. The system appears to have coverage while actually leaving a gap identical to no installation at all, making this parameter essential to the credibility of every detection metric that depends on live device data.

Parameter 5: STPs / WTPs / RO plants integrated

This parameter counts the number of sewage treatment plants, water treatment plants, or RO plants brought into the start-up's monitoring network. Integrating treatment infrastructure, not just distribution points, allows the system to track water quality and volume from source through to consumption, closing a critical gap that pure distribution-network monitoring would miss.

Parameter 6: Sumps and overhead tanks monitored

This parameter counts storage infrastructure such as sumps and overhead tanks, brought under monitoring. Storage points are common sites of unmetered loss, overflow waste, and contamination risk, and monitoring them closes the loop between treated-water output and what actually reaches the end user's tap.

Indicator B: Detection & Monitoring

This indicator tracks leaks, abnormal consumption, and unauthorised connections detected and resolved each month. This is WeGOT's core functional proof point, testing whether the system's central promise preventing loss, waste, and theft actually translates into detected issues being fixed rather than merely flagged.

Parameter 1: Leaks detected and resolved

This parameter tracks how many leaks the system identifies and how many are subsequently fixed. It is the most direct proof of the start-up's core value proposition, preventing water loss and the gap between

detected and resolved is itself informative, revealing whether alerts translate into actual on-ground remediation or simply generate unactioned notifications.

Parameter 2: Abnormal / high-consumption cases detected and resolved

This parameter tracks instances of unusual consumption patterns, potentially indicating hidden leaks, wastage, or metering errors, identified and subsequently addressed. Abnormal consumption often precedes visible leakage or signals inefficient usage that would otherwise go unnoticed until it appears as a large bill or supply shortfall.

Parameter 3: Unauthorised connections / theft detected and acted upon

This parameter tracks instances of pilferage or unauthorised tapping identified by the system and subsequently acted upon. It matters directly for revenue protection and equitable water distribution, since theft both costs the utility and deprives legitimate downstream users of supply, addressing the start-up's stated core purpose of preventing pilferage.

6.4.2. Indicators & Parameters to Authority/ULB

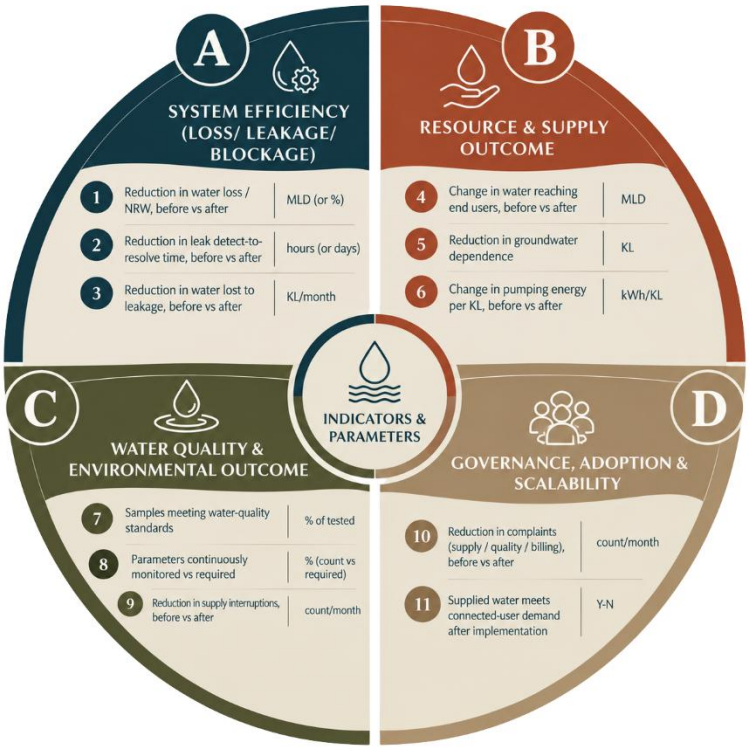


Figure 6.9 Indicators and Parameters for the Authority - WeGOT's Utility Solutions

Indicator A: System Efficiency (Loss/ Leakage/ Blockage)

This indicator tracks measures reduction in non-revenue water, faster leak detect-to-resolve time, and volume of water saved from leakage. This indicator group captures the single most consequential utility-

level outcome of the system, directly affecting both revenue protection and water available for legitimate distribution.

Parameter 1: Reduction in water loss / NRW, before vs after

This parameter tracks the change in non-revenue water (NRW), following the start-up's deployment. NRW reduction is the single most consequential utility-level outcome of a leak-and-theft detection system, directly affecting both the utility's revenue and the volume of water available for legitimate distribution.

Parameter 2: Reduction in leak detect-to-resolve time, before vs after

This parameter compares how quickly leaks are identified and fixed before versus after the start-up's system was introduced. Faster resolution directly limits cumulative water loss per incident. A leak detected in hours wastes far less water than one discovered weeks later through visible surface damage or complaints.

Parameter 3: Reduction in water lost to leakage, before vs after

This parameter quantifies the actual volume of water saved through leak reduction. It is a more granular, volume-specific outcome measure, which can be directly compared against the cost of deploying and operating the start-up's system, supporting a clear return-on-investment case for the ULB.

Indicator B: Resource & Supply Outcome

This indicator tracks whether reduced losses translate into more water reaching end users, less groundwater dependence, and lower pumping energy per kilolitre. This indicator group validates that upstream efficiency gains produce real downstream and environmental benefit, not just improved internal utility metrics.

Parameter 1: Change in water reaching end users, before vs after

This parameter tracks whether the volume of water actually reaching connected users increases following the reduction in losses upstream. Loss reduction is only meaningful if the saved water translates into more supply reaching consumers rather than being absorbed elsewhere in the system.

Parameter 2: Reduction in groundwater dependence

This parameter tracks how much less groundwater extraction is needed to meet demand once network losses are reduced and supply efficiency improves. For Chennai specifically, where groundwater over-extraction is a chronic and worsening problem, any efficiency gain that reduces the dependency on aquifers has direct environmental significance.

Parameter 3: Change in pumping energy per KL, before vs after

This parameter tracks whether energy required to pump and distribute each kilolitre of water changes following deployment. Reduced leakage and improved system efficiency also reduce the energy needed to deliver the same volume of usable water to consumers, giving the intervention a secondary sustainability benefit alongside its primary water-conservation impact.

Indicator C: Water Quality & Environmental Outcome

This indicator assesses compliance with water-quality standards, breadth of continuous parameter monitoring, and reduction in supply interruptions. This verifies WeGOT's quality-assurance function specifically, complementing the loss-prevention indicators with direct evidence that only clean, reliable water is being delivered.

Parameter 1: Samples meeting water-quality standards

This parameter tracks compliance of monitored water sources with applicable water-quality standards. The start-up's system explicitly claims to ensure only clean water enters the property, so this parameter is the direct verification of the quality-assurance function.

Parameter 2: Parameters continuously monitored vs required

This parameter compares how many water-quality parameters are actually being continuously monitored against the full set of parameters regulators or the ULB require. Partial parameter monitoring can create a false sense of comprehensive quality assurance while leaving specific contamination unchecked.

Parameter 3: Reduction in supply interruptions, before vs after

This parameter tracks the change in frequency of supply interruptions following deployment. Leak and system-health monitoring often allows preventive intervention before a failure causes a full supply outage, so a reduction here is an indirect but meaningful proof of the system's predictive value.

Indicator D: Governance, Adoption & Scalability

This indicator tracks reduction in consumer complaints and whether supplied water meets connected-user demand after implementation. This indicator group is the administrative-level sufficiency and satisfaction check, capturing service quality as experienced through formal grievance channels and demand-fulfilment assessment.

Parameter 1: Reduction in complaints (supply / quality / billing), before vs after

This parameter tracks the change in consumer complaints across supply, quality, and billing categories. It is a composite indicator of overall service improvement as perceived by users and administered through the ULB's grievance system, capturing issues that technical metrics alone might miss, such as billing accuracy improvements from better metering.

Parameter 2: Supplied water meets connected-user demand after implementation

This parameter is a binary assessment of whether the system, after full implementation, is meeting the actual demand of connected users. It matters as a simple, high-level sufficiency check that complements the more granular efficiency and quality metrics. A system can show strong percentage improvements while still falling short of absolute demand.

6.4.3. Indicators & Parameters to Consumer

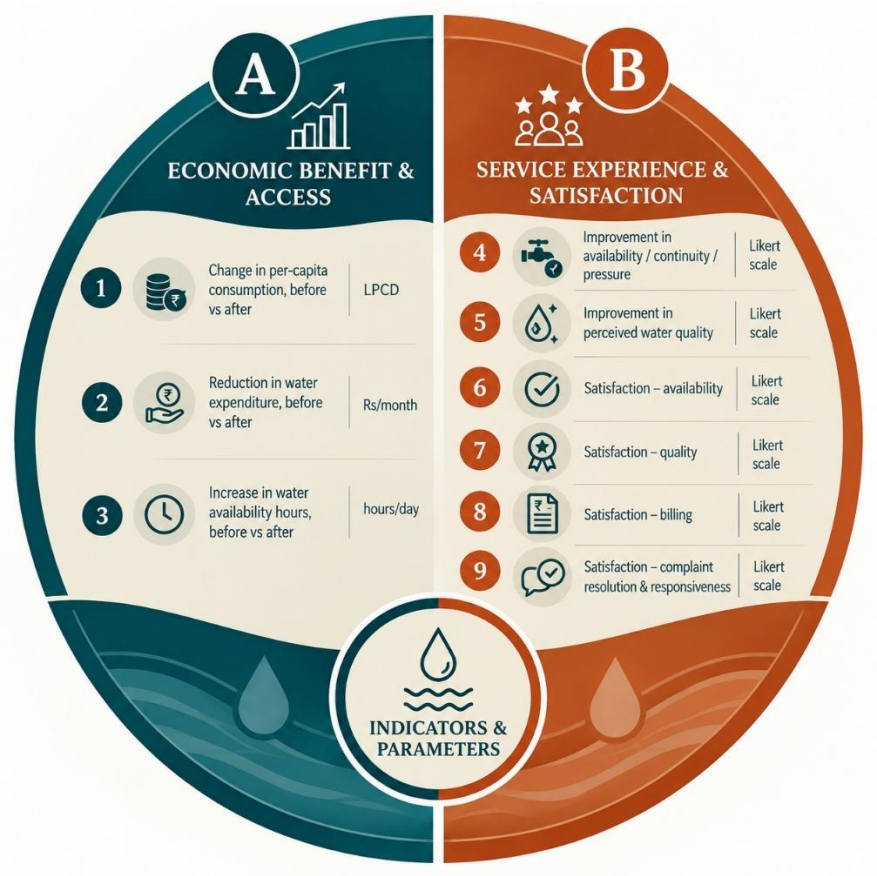


Figure 6.10 Indicators and Parameters for the Consumer - WeGOT's Utility Solutions

Indicator A: Economic Benefit & Access

This indicator measures change in per-capita consumption, reduction in water expenditure, and increase in daily availability hours. This indicator group captures the tangible, felt improvement in household water access and cost, translating technical loss-reduction into benefits consumers directly experience.

Parameter 1: Change in per-capita consumption, before vs after

This parameter tracks how individual water consumption changes following the start-up's deployment. It can reveal whether efficiency gains translate into more water available per person, or whether reduced waste changes usage behaviour, both being relevant signals of the intervention's effect at the household level.

Parameter 2: Reduction in water expenditure, before vs after

This parameter tracks household-level water cost savings following deployment, likely arising from reduced billing errors, leak-related waste, or improved supply reliability reducing the need for supplementary purchased water. It is the clearest financial benefit visible to consumers, directly relevant to their willingness to support or pay for the system.

Parameter 3: Increase in water availability hours, before vs after

This parameter tracks whether the duration of daily water supply improves following deployment. Availability duration is often a more immediately felt benefit for consumers than abstract loss-reduction percentages, directly affecting daily routines and reducing reliance on storage or alternative sourcing.

Indicator B: Service Experience & Satisfaction

This indicator captures consumer-perceived improvement and satisfaction across availability, quality, billing, and complaint responsiveness using Likert-scale ratings. This indicator group reveals whether technical improvements are actually felt and appreciated by users, which sustains public support for the system's continued operation.

Parameter 1: Improvement in availability / continuity / pressure

This parameter captures consumer perception of how much supply availability, continuity, and pressure have improved. Perceived improvement drives ongoing consumer support for the system even where objective metrics are incremental.

Parameter 2: Improvement in perceived water quality

This parameter captures consumer confidence in water quality following deployment, distinct from the objective lab-tested compliance. A gap between perceived and objectively measured quality can highlight a trust or communication issue worth addressing, even where technical quality metrics are strong.

Parameter 3: Satisfaction - availability

This parameter measures overall consumer satisfaction specifically with water availability.

Parameter 4: Satisfaction - quality

This parameter measures consumer satisfaction specifically with water quality.

Parameter 5: Satisfaction - billing

This parameter measures consumer satisfaction with billing accuracy and processes. Improved metering accuracy from the start-up's system should reduce billing disputes and errors, so this parameter tests whether that technical improvement is actually appreciated by consumers.

Parameter 6: Satisfaction - complaint resolution & responsiveness

This parameter measures consumer satisfaction with how their complaints are handled and how responsive the system/utility is. It matters because responsiveness often shapes overall trust in the service more than the underlying technical performance itself, making this a key driver of sustained public support for continued deployment.

6.5. KUMBHI KAGAZ (Guwahati)

Kumbhi Kagaz runs a "water-hyacinth management project" that clears invasive weed growth from water bodies and converts the harvested biomass into handmade paper and paper-based products. Its Guwahati deployment, carried out with the local Urban Local Body, has removed water hyacinth from targeted waterways and wetlands, set up collection and processing units, and engaged local communities in harvesting, paper-making and the sale of finished products, reducing manual clearing effort and creating additional livelihood income for those involved.

6.5.1. Indicators & Parameters to Operator

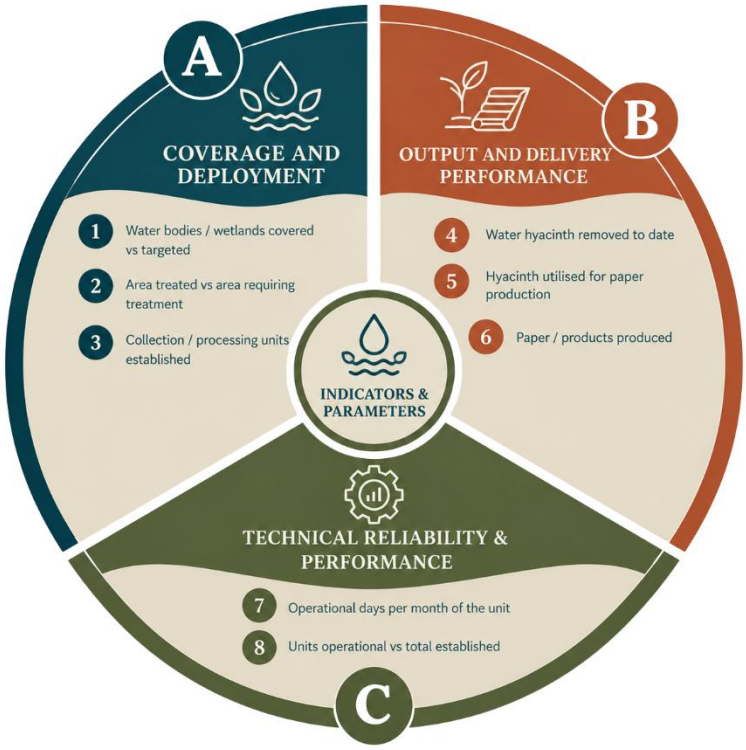


Figure 6.11 Indicators and Parameters for the Operator - Kumbhi Kagaz

Indicator A: Coverage and Deployment

This indicator captures how widely the fixture has been rolled out against its intended target, covering facility coverage, beneficiaries reached, spatial spread and units installed.

Parameter 1: Water bodies / wetlands covered vs targeted

This parameter compares the number of water bodies or wetlands where hyacinth clearing has been carried out against the number originally targeted. It shows whether the rollout has matched the intended coverage or remains concentrated on a limited set of sites.

Parameter 2: Area treated vs area requiring treatment

This parameter compares the area cleared of hyacinth, against the total area identified as requiring treatment. It shows how much of the affected water surface has actually been addressed relative to the full extent of the problem.

Parameter 3: Collection / processing units established

This parameter records the number of collection or processing units set up to handle harvested hyacinth, expressed as a count by location. It reflects the operational infrastructure built to support ongoing removal and conversion of the material into paper.

Indicator B: Output and Delivery Performance

Output and delivery performance tracks how much hyacinth has been removed and converted into usable material. It is the core evidence for the programme's clearing and production claims.

Parameter 1: Water hyacinth removed to date

This parameter records the cumulative quantity of water hyacinth removed since the programme began, expressed in tonnes. It gives a running total of the biomass cleared from targeted waterways and forms the base figure from which processing rates are calculated.

Parameter 2: Hyacinth utilised for paper production

This parameter measures the quantity of harvested hyacinth actually used in paper production each month, expressed in tonnes. It shows how much of the removed material is converted into a usable input rather than left unprocessed after collection.

Parameter 3: Paper / products produced

This parameter records the quantity of paper or related products manufactured each month from processed hyacinth, expressed in kilograms. It converts raw material utilisation into a finished output figure, showing the programme's actual production capacity in practice.

Indicator C: Technical Reliability & Performance

Technical reliability and performance looks at how consistently the processing units function over time. It covers operating days and the share of units actively running.

Parameter 1: Operational days per month of the unit

This parameter records the number of days per month a processing unit is actively in operation. It reflects how consistently the unit runs relative to a full working month and points to any recurring downtime affecting production.

Parameter 2: Units operational vs total established

This parameter compares the number of units currently operational against the total number established, expressed as a count. It shows what share of the built infrastructure is actively contributing to output, distinct from units temporarily out of use.

6.5.2. Indicators & Parameters to ULB / Authority

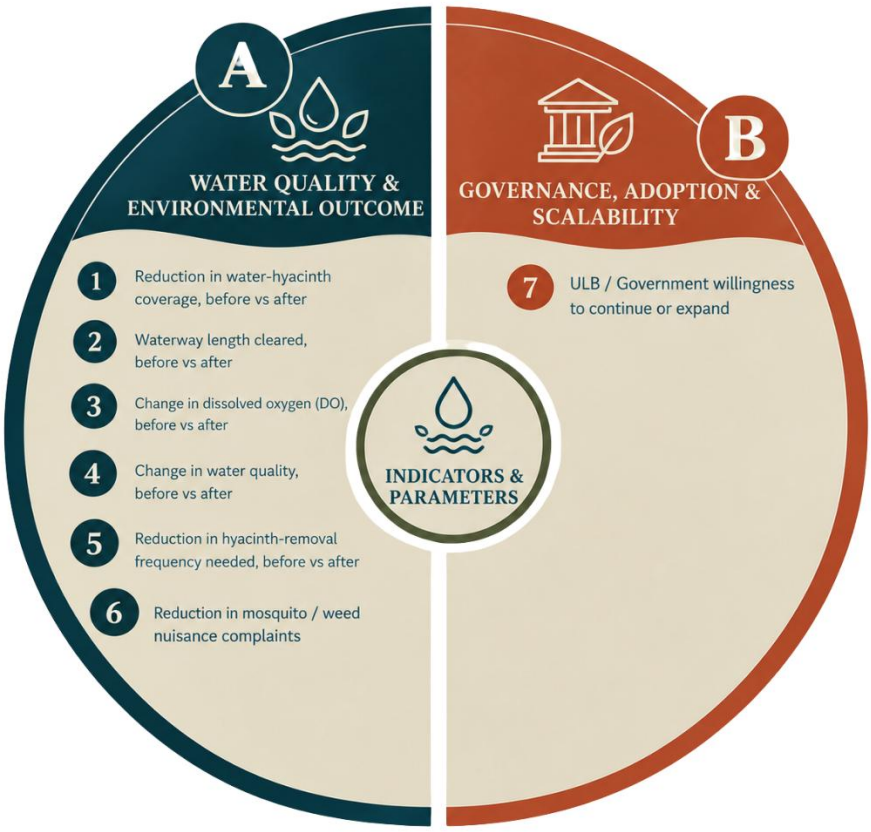


Figure 6.12 Indicators and Parameters for the Authority - Kumbhi Kagaz

Indicator A: Water Quality & Environmental Outcome

This indicator helps to understand the water quality and environmental outcome captures the ecological change in the water bodies where hyacinth has been cleared. It links clearing activity to measurable improvements in the waterway.

Parameter 1: Reduction in water-hyacinth coverage, before vs after

This parameter compares the area covered by water hyacinth, before and after the clearing programme. It provides a direct, ground-level measure of how much invasive growth has actually been removed from the water body.

Parameter 2: Waterway length cleared, before vs after

This parameter compares the length of waterway cleared of hyacinth, before and after the intervention. It captures the linear extent of the clearing effort along channels or rivers rather than total surface area treated.

Parameter 3: Change in dissolved oxygen (DO), before vs after

This parameter compares dissolved oxygen levels in the water before and after hyacinth clearing. It tests whether removing the weed cover has improved oxygen exchange at the water surface, a key indicator of aquatic health.

Parameter 4: Change in water quality, before vs after

This parameter compares an overall water quality index recorded before and after the clearing programme. It draws together multiple water parameters into a single comparative score, showing the combined ecological benefit of hyacinth removal on the water body.

Parameter 5: Reduction in hyacinth-removal frequency needed, before vs after

This parameter compares how often manual hyacinth removal was needed before the programme against the frequency required afterward, expressed as a count per year. It shows whether the intervention has reduced the ongoing clearing burden previously carried by the authority.

Parameter 6: Reduction in mosquito / weed nuisance complaints

This parameter tracks the change in complaints received about mosquito breeding or weed nuisance around the water body, expressed as a count per month. It reflects whether clearing hyacinth has reduced a recognised public-health and nuisance concern.

Indicator B: Governance, Adoption & Scalability

This indicator explains governance, adoption and scalability captures the authority's own decision on whether to continue or expand the programme. It reflects institutional judgement on the intervention's overall value.

Parameter 1: ULB / Government willingness to continue or expand

This parameter records whether the authority intends to continue the current programme or expand it further. It serves as the concluding indicator of institutional endorsement, drawing together the environmental and nuisance-reduction findings into a single adoption decision.

6.5.3. Indicators & Parameters to Consumer

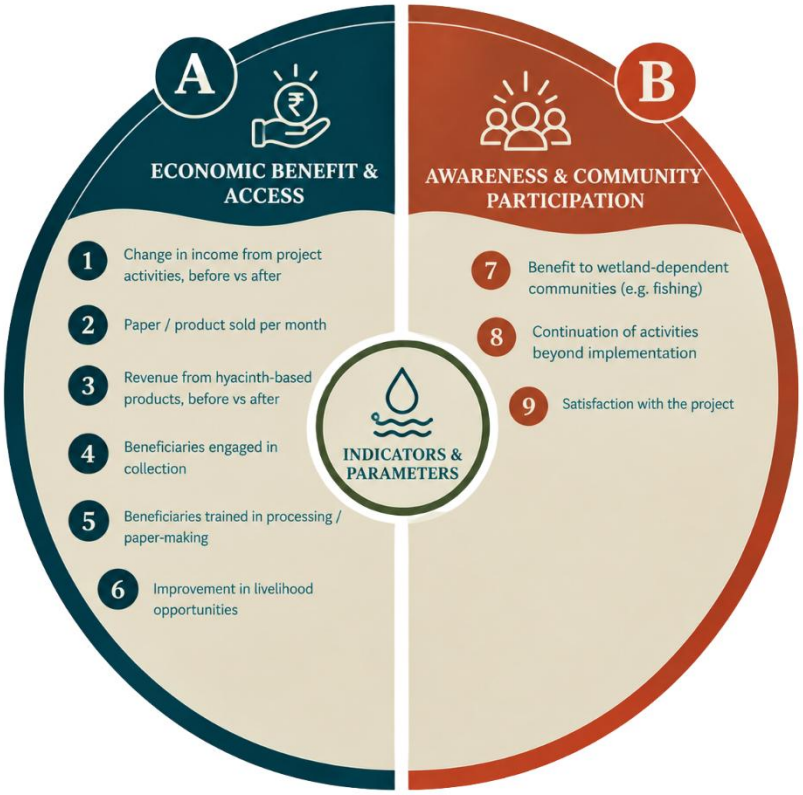


Figure 6.13 Indicators and Parameters for the Consumer - Kumbhi Kagaz

Indicator A: Economic Benefit & Access

This indicator used to understand economic benefit and access captures the income and livelihood gains experienced by people engaged in hyacinth collection and paper production. It tests whether the programme delivers a tangible financial benefit

Parameter 1: Change in income from project activities, before vs after

This parameter compares participants' income from project-related activities before and after their involvement. It measures the direct financial benefit generated by engagement in hyacinth collection or processing work.

Parameter 2: Paper / product sold per month

This parameter records the quantity of paper or related products sold each month. It shows whether production output is actually reaching a market rather than remaining unsold, linking processing activity to real economic return.

Parameter 3: Revenue from hyacinth-based products, before vs after

This parameter compares revenue earned from hyacinth-based products per month, before and after the programme began. It isolates the specific income contribution of these products from other sources of household earning.

Parameter 4: Beneficiaries engaged in collection

This parameter records the number of people currently engaged in hyacinth collection activities. It shows the scale of direct participation in the harvesting stage of the programme among the local population.

Parameter 5: Beneficiaries trained in processing / paper-making

This parameter records the number of people trained in processing or paper-making skills. It reflects the extent to which the programme has built local capacity beyond the collection stage of the value chain.

Parameter 6: Improvement in livelihood opportunities

This parameter captures participant's rating of improvement in their livelihood opportunities. It reflects a broader, self-assessed sense of economic opportunity beyond the specific income and revenue figures recorded separately.

Indicator B: Awareness & Community Participation

This indicator explains awareness and community participation captures whether the programme benefits wider community groups and continues without ongoing external support. It reflects the intervention's community-level reach and durability.

Parameter 1: Benefit to wetland-dependent communities (e.g. fishing)

This parameter records whether communities dependent on the wetland, such as fishing groups, have experienced a benefit from the programme. It extends the assessment beyond direct participants to other affected groups to understand how people get benefited.

Parameter 2: Continuation of activities beyond implementation

This parameter records whether collection and processing activities have continued after the programme's initial implementation period. It tests whether the intervention has become self-sustaining rather than dependent on continued external support.

Parameter 3: Satisfaction with the project

This parameter captures participant's overall satisfaction with the project. It serves as the headline consumer-facing figure for this assessment, summarising their combined experience of income, training and community benefit.

6.6. DBD WATER SYSTEMS PRIVATE LIMITED (Mumbai)

DBD Water Systems Private Limited is a cloud-based platform exclusively for water utility. It is a multi-protocol convergent platform which is multilingual, meter hardware-vendor independent. The platform will enable water management control by providing the users with protocol independent metering, detailed billing, multiple payment options and dynamic analytic view.

6.6.1. Indicators & Parameters to Operator

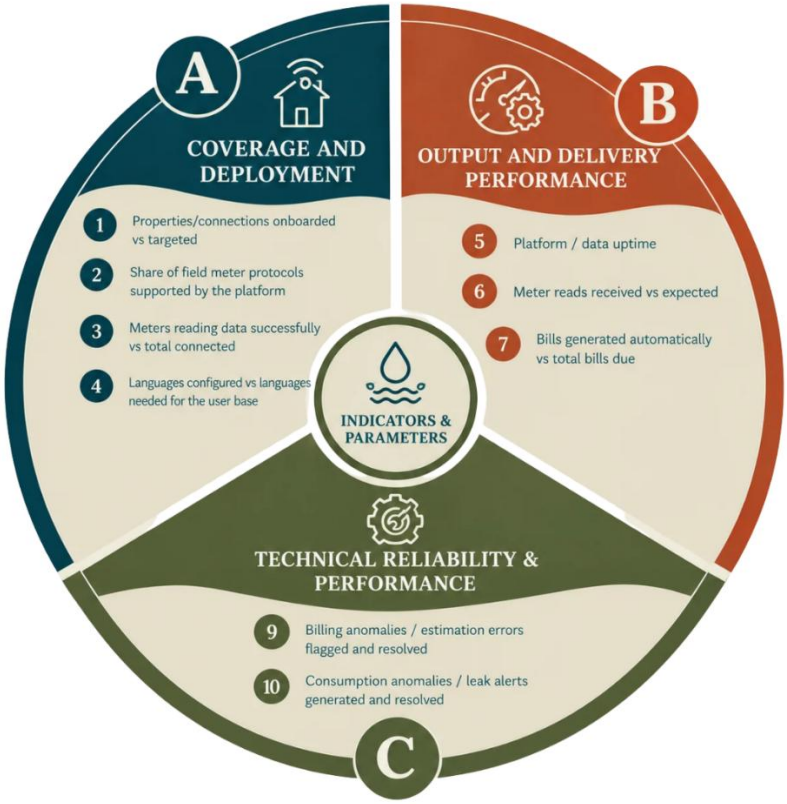


Figure 6.14 Indicators and Parameters for the Operator – DBD Water Systems

Indicator A: Coverage and Deployment

This indicator measures how widely the platform has been rolled out across target properties. It establishes the technical and linguistic reach of the deployment before performance can be assessed.

Parameter 1: Properties / connections onboarded vs targeted

This parameter records the number of properties or connections onboarded onto the platform against the total number targeted. It shows how much of the planned rollout has actually been achieved at a given point in time.

Parameter 2: Share of field meter protocols supported by the platform

This parameter records the share of meter brands or communication protocols present in the field that the platform is able to read. It indicates how hardware-agnostic the platform is across the existing meter base.

Parameter 3: Meters reading data successfully vs total connected

This parameter records the number of connected meters that are successfully transmitting reading data to the platform. It reflects the functional reliability of the onboarded meter base rather than just the count of connections made.

Parameter 4: Languages configured vs languages needed for the user base

This parameter records the languages required by the local user base that have actually been configured on the platform. It indicates how accessible the platform's interface is to the consumers and staff using it.

Indicator B: Output and Delivery Performance

This indicator measures how consistently the platform delivers its core data and billing functions once deployed. It tracks uptime, meter-read receipt, and automated bill generation.

Parameter 1: Platform / data uptime

This parameter records the scheduled time during which the platform is operational and able to process data. It establishes the baseline reliability on which all other output and delivery functions depend.

Parameter 2: Meter reads received vs expected

This parameter records the meter readings actually received by the platform against the number expected in a given billing cycle. It shows how completely the platform is capturing consumption data from the field.

Parameter 3: Bills generated automatically vs total bills due

This parameter captures the total bills due in a cycle that are generated automatically by the platform without manual intervention. It indicates how far billing has moved from manual processing to automation.

Indicator C: Technical Reliability & Performance

This indicator assesses the platform's ability to detect and resolve billing and consumption anomalies. It reflects the accuracy safeguards built into the system beyond basic data collection.

Parameter 1: Billing anomalies / estimation errors flagged and resolved

This parameter records the share of billing anomalies or estimation errors flagged by the platform that have subsequently been resolved as a monthly count. It shows whether detected errors are corrected before reaching the consumer.

Parameter 2: Consumption anomalies / leak alerts generated and resolved

This parameter records the share of consumption anomalies or leak alerts generated by the platform that have been resolved. It indicates how effectively unusual consumption patterns are investigated and addressed.

6.6.1. Indicators & Parameters to ULB / Authority

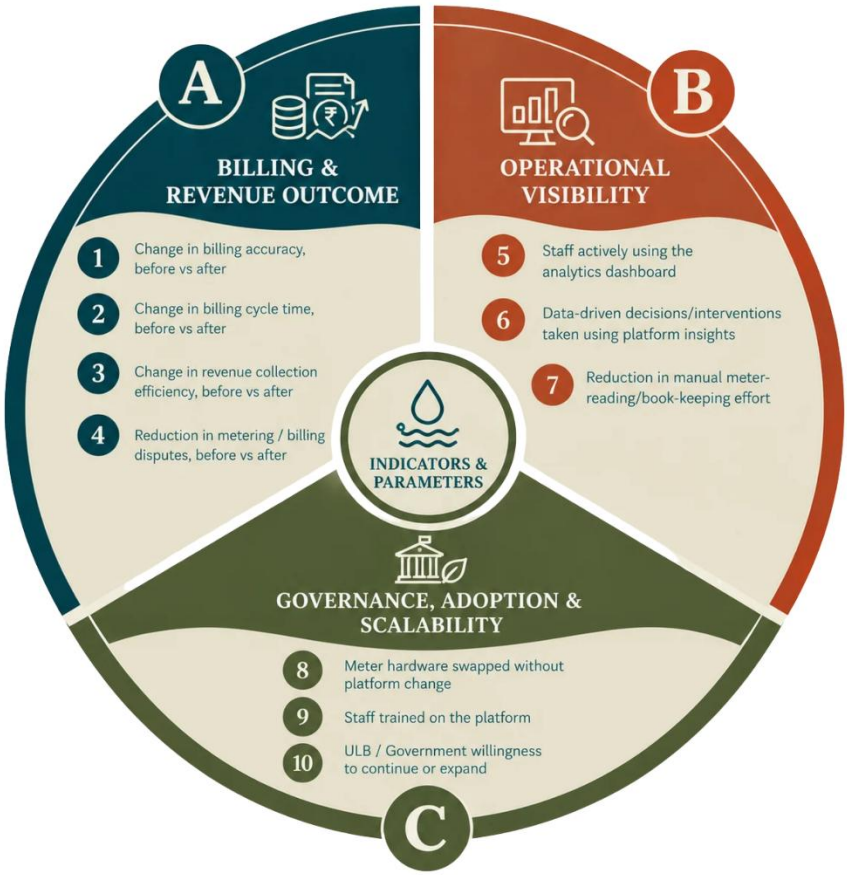


Figure 6.15 Indicators and Parameters for the Authority – DBD Water Systems

Indicator A: Billing & Revenue Outcome

This indicator measures the change in billing accuracy, speed, and revenue collection resulting from the platform's introduction. It reflects the financial and administrative benefit delivered to the authority.

Parameter 1: Change in billing accuracy, before vs after

This parameter records the change in billing accuracy, comparing the position before and after the platform's introduction. It shows whether automated, meter-based billing has reduced estimation and calculation errors.

Parameter 2: Change in billing cycle time, before vs after

This parameter records the change in the number of days taken to complete a billing cycle, before and after the platform's introduction. It indicates whether automation has shortened the time between meter reading and bill issuance.

Parameter 3: Change in revenue collection efficiency, before vs after

This parameter records the change in billed revenue actually collected, comparing the period before and after the platform's introduction. It reflects whether improved billing accuracy and transparency are translating into better collection outcomes.

Parameter 4: Reduction in metering / billing disputes, before vs after

This parameter records the reduction in the number of metering or billing disputes raised, before and after the platform's introduction. It shows whether billing accuracy improvements are reducing consumer grievances.

Indicator B: Operational Visibility

This indicator measures how actively the authority's staff use the platform's data and dashboards in daily operations.

Parameter 1: Staff actively using the analytics dashboard

This parameter records the assigned staff who actively use the platform's analytics dashboard. It shows whether access to the dashboard has translated into actual, regular use by the intended staff.

Parameter 2: Data-driven decisions / interventions taken using platform insights

This parameter notes the number of decisions or interventions taken each month that are based on insights generated by the platform. It indicates whether the data is informing real operational action rather than remaining unused.

Parameter 3: Reduction in manual meter-reading / book-keeping effort

This parameter records the reduction in manual meter-reading or book-keeping effort, expressed in man-hours per month. It reflects the direct labour saving achieved through automation of these functions.

Indicator C: Governance, Adoption & Scalability

This indicator assesses the institutional readiness and commitment behind the platform's continued use. It covers hardware flexibility, staff training, and willingness to expand the deployment.

Parameter 1: Meter hardware swapped without platform change

This parameter records the number of successful instances where meter hardware was replaced without requiring a change to the platform itself. It demonstrates the platform's hardware independence and resilience to vendor changes over time.

Parameter 2: Staff trained on the platform

This parameter records the number of staff who have been trained to use the platform. It indicates the extent of institutional capacity built to sustain the platform's operation independently.

Parameter 3: ULB / Government willingness to continue or expand

This parameter records whether the ULB or government is willing to continue or expand use of the platform. It serves as a summary indicator of institutional confidence in the platform's value.

6.6.2. Indicators & Parameters to Consumer

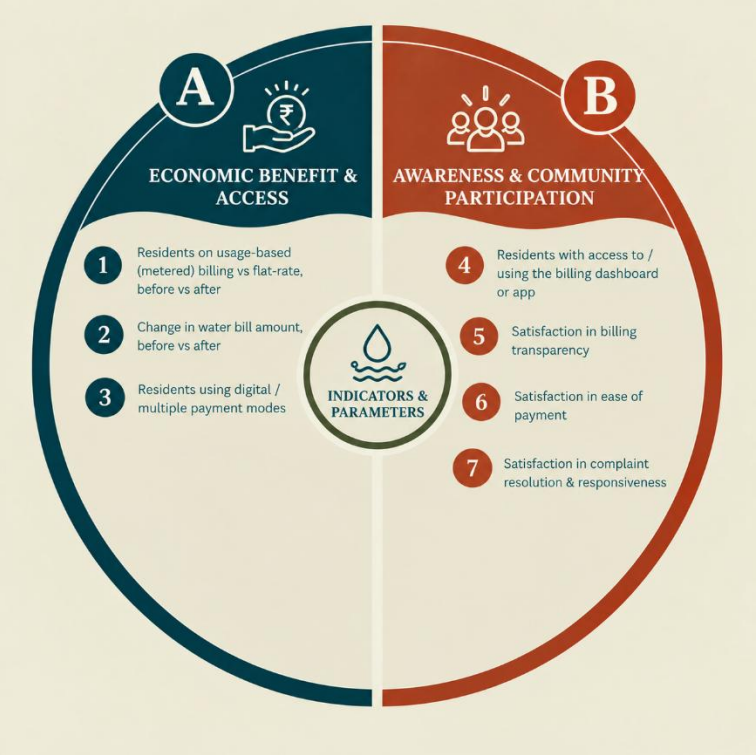


Figure 6.16 Indicators and Parameters for the Consumer – DBD Water Systems

Indicator A: Economic Benefit & Access

This indicator measures the direct financial and access-related changes experienced by consumers following the platform's introduction.

Parameter 1: Residents on usage-based (metered) billing vs flat-rate, before vs after

This parameter records the percentage of residents billed on a usage-based, metered basis rather than a flat rate, comparing the position before and after the platform's introduction. It shows how far billing has shifted towards actual consumption.

Parameter 2: Change in water bill amount, before vs after

This parameter records the change in the average monthly water bill amount paid by residents, before and after the platform's introduction. It reflects the direct financial impact of the shift to metered, accurate billing.

Parameter 3: Residents using digital / multiple payment modes

This parameter records the residents using digital or multiple payment modes to pay their water bills. It indicates how far the platform's payment options have been adopted in place of traditional, single-channel payment.

Indicator B: Awareness & Community Participation

This indicator captures how aware and engaged consumers are with the platform's billing tools, and how satisfied they are with transparency, payment, and complaint handling.

Parameter 1: Residents with access to / using the billing dashboard or app

This parameter records the residents who have access to, and actually use, the billing dashboard or app. It shows whether the consumer-facing tools of the platform are being adopted in practice.

Parameter 2: Satisfaction with billing transparency

This parameter records a rating of resident satisfaction with the transparency of billing under the platform. It reflects how clearly consumers feel their bills are explained and justified.

Parameter 3: Satisfaction with ease of payment

This parameter records a Likert-scale rating of resident satisfaction with the ease of making bill payments through the platform. It reflects the practical convenience of the payment options offered to consumers.

Parameter 4: Satisfaction with complaint resolution & responsiveness

This parameter records the resident satisfaction with how billing-related complaints are resolved and responded to. It reflects consumer confidence in the grievance-handling process linked to the platform.

6.7. FACLON LABS PVT LTD (Mumbai)

Faclon Labs is a Mumbai-based IoT start-up providing end-to-end remote monitoring and automation of urban water infrastructure, using connected sensors and cloud-based predictive analytics to detect leaks, track supply, and optimise pumping and consumption across the distribution network.

6.7.1. Indicators & Parameters to Operator

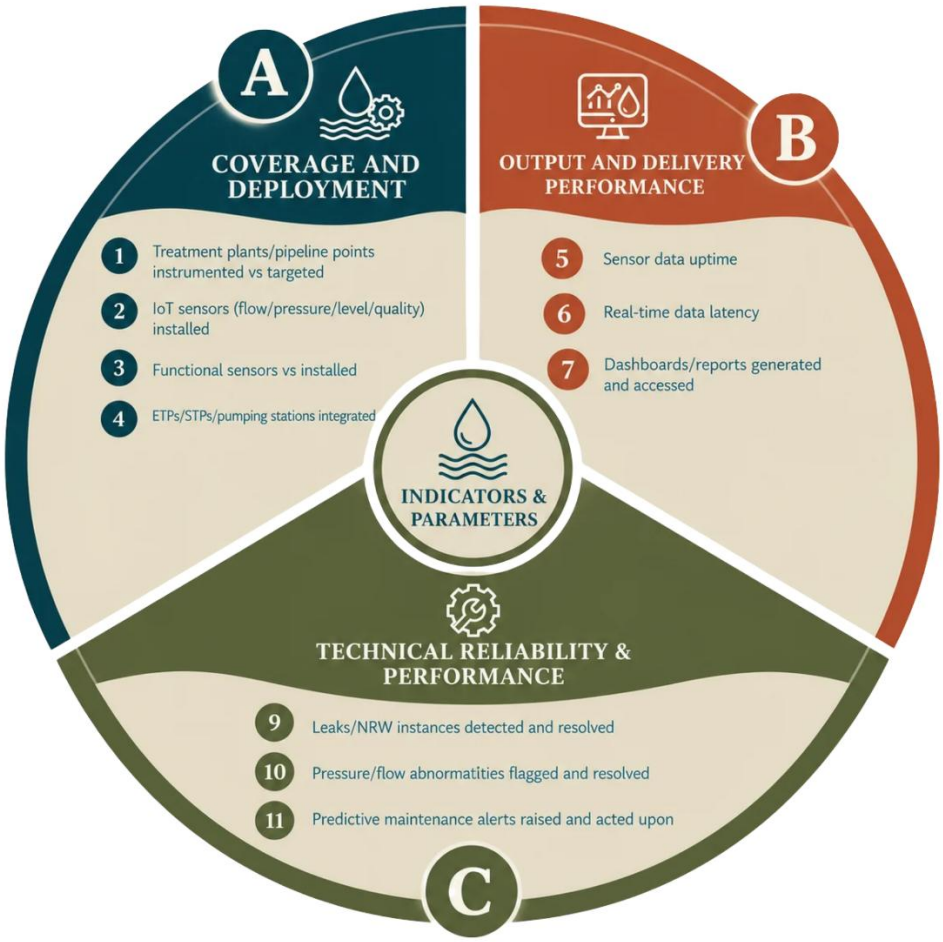


Figure 6.17 Indicators and Parameters for the Operator – Faclon Labs

Indicator A: Coverage and Deployment

This indicator measures the extent of physical infrastructure instrumented with sensors under the platform.

Parameter 1: Treatment plants / pipeline points instrumented vs targeted

This parameter records the treatment plants or pipeline points instrumented with sensors against the number targeted. It shows how much of the planned infrastructure coverage has been achieved

Parameter 2: IoT sensors (flow / pressure / level / quality) installed

This parameter records the total number of IoT sensors installed to measure flow, pressure, level, or quality across the network. It establishes the physical scale of the sensing infrastructure deployed.

Parameter 3: Functional sensors vs installed

This parameter records the percentage of installed sensors that are currently functional and transmitting usable data. It distinguishes genuine operational coverage from the total hardware installed in the field.

Parameter 4: ETPs / STPs / pumping stations integrated

This parameter records the number of effluent treatment plants, sewage treatment plants, or pumping stations integrated with the platform. It indicates how much of the critical water infrastructure is now under digital monitoring.

Indicator B: Output and Delivery Performance

This indicator measures how reliably and quickly the platform delivers sensor data and reports to users. It reflects the day-to-day usability of the monitoring system.

Parameter 1: Sensor data uptime

This parameter records the scheduled time during which sensors are functioning and delivering usable data. It establishes the baseline reliability of the monitoring infrastructure.

Parameter 2: Real-time data latency

This parameter records the time taken, in minutes, for sensor data to reach the platform and become available to users. It reflects how close to real time the platform's monitoring actually.

Parameter 3: Dashboards / reports generated and accessed

This parameter records the number of dashboards or reports generated and accessed by users each month. It indicates how actively the platform's outputs are being consulted for operational use.

Indicator C: Detection & Monitoring

This indicator captures the platform's ability to detect and support resolution of leaks, abnormalities, and maintenance needs.

Parameter 1: Leaks / NRW instances detected and resolved

This parameter records the share of leak or Non-Revenue Water instances detected by the platform that have been resolved. It shows whether detection is translating into actual repair action.

Parameter 2: Pressure / flow abnormalities flagged and resolved

This parameter records the share of pressure or flow abnormalities flagged by the platform that have been resolved. It shows the responsiveness of the network to detected irregularities.

Parameter 3: Predictive-maintenance alerts raised and acted upon

This parameter records the share of predictive-maintenance alerts raised by the platform that have been acted upon. It indicates whether early-warning signals are used to prevent failures before they occur.

6.7.1. Indicators & Parameters to ULB / Authority

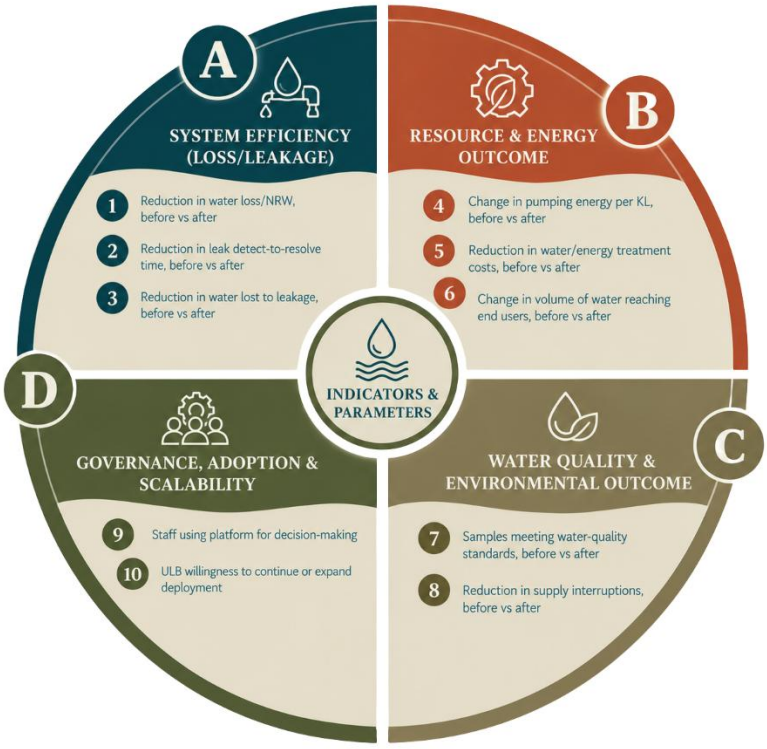


Figure 6.18 Indicators and Parameters for the Authority – Faclon Labs

Indicator A: System Efficiency (Loss/Leakage)

This indicator measures the reduction in water loss and the speed of leak resolution achieved through the platform.

Parameter 1: Reduction in water loss / NRW, before vs after

This parameter records the reduction in water loss or Non-Revenue Water, comparing the position before and after the platform's introduction. It indicates the core efficiency gain achieved through improved monitoring.

Parameter 2: Reduction in leak detect-to-resolve time, before vs after

This parameter records the reduction in the time taken to detect and resolve a leak, before and after the platform's introduction. It shows whether faster detection is translating into faster repair.

Parameter 3: Reduction in water lost to leakage, before vs after

This parameter records the reduction in the volume of water lost to leakage, before and after the platform's introduction. It quantifies the direct physical water saving achieved through the platform.

Indicator B: Resource & Energy Outcome

This indicator measures the change in energy use, treatment cost, and water reaching end users resulting from improved network management.

Parameter 1: Change in pumping energy per KL, before vs after

This parameter records the change in pumping energy consumed per kilolitre of water supplied, before and after the platform's introduction. It reflects whether reduced losses and better network management have lowered the energy cost of supply.

Parameter 2: Reduction in water / energy treatment costs, before vs after

This parameter records the reduction in water or energy treatment costs, before and after the platform's introduction. It translates efficiency gains into a direct financial outcome.

Parameter 3: Change in volume of water reaching end users, before vs after

This parameter records the change in the volume of water, that actually reaches end users, before and after the platform's introduction. It reflects whether reduced losses are increasing the effective supply delivered.

Indicator C: Water Quality & Environmental Outcome

This indicator measures the change in water-quality compliance and the frequency of supply interruptions.

Parameter 1: Samples meeting water-quality standards, before vs after

This parameter records the water samples meeting prescribed quality standards, before and after the platform's introduction. It shows whether improved network monitoring has supported better water-quality compliance.

Parameter 2: Reduction in supply interruptions, before vs after

This parameter records the reduction in the number of supply interruptions, before and after the platform's introduction. It reflects whether better monitoring and faster response are reducing service disruptions.

Indicator D: Governance, Adoption & Scalability

This indicator assesses institutional uptake of the platform for decision-making and the authority's willingness to continue or expand its use.

Parameter 1: Staff using the platform for decision-making

This parameter records the percentage of assigned staff who use the platform for decision-making. It shows whether the platform has become embedded in routine operational practice.

Parameter 2: ULB willingness to continue or expand deployment

This parameter records whether the ULB is willing to continue or expand deployment of the platform. It serves as a summary indicator of institutional confidence in the platform's value.

6.7.2. Indicators & Parameters to Consumer

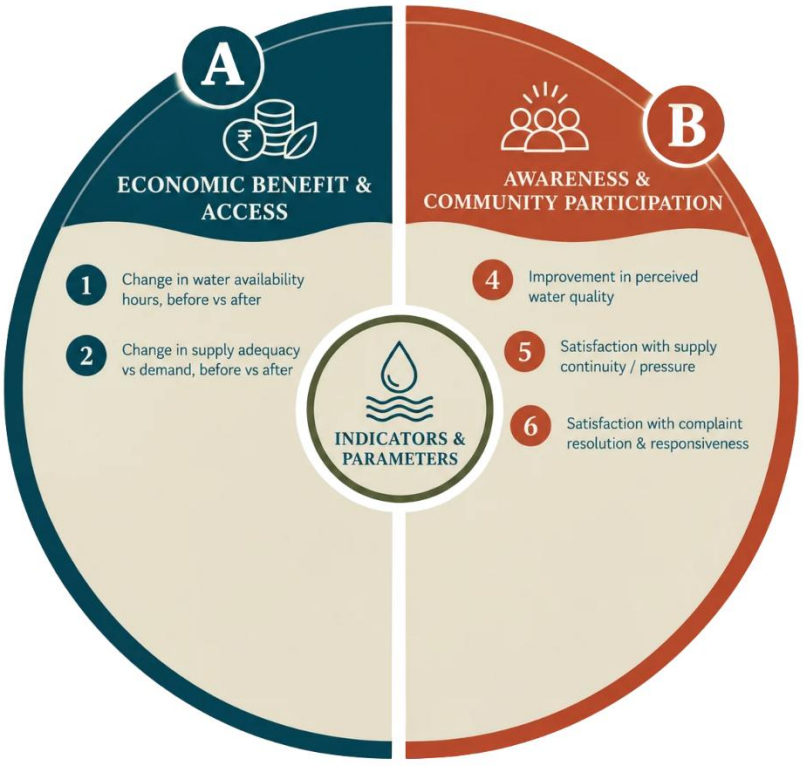


Figure 6.19 Indicators and Parameters for the Consumer – Faclon Labs

Indicator A: Economic Benefit & Access

This indicator measures the change in water availability and supply adequacy as experienced directly by consumers.

Parameter 1: Change in water availability hours, before vs after

This parameter records the change in the number of hours of water availability reported by consumers, before and after the platform's introduction. It reflects the household-level continuity benefit of improved network management.

Parameter 2: Change in supply adequacy vs demand, before vs after

This parameter records the change in perceived supply adequacy relative to household demand, before and after the platform's introduction. It shows whether consumers feel supply now meets their actual needs.

Indicator B: Awareness & Community Participation

This indicator captures consumer perception of water quality and satisfaction with supply continuity and complaint handling.

Parameter 1: Improvement in perceived water quality

This parameter records how much consumers perceive water quality to have improved. It reflects whether technical water-quality gains are being noticed at the household level.

Parameter 2: Satisfaction with supply continuity / pressure

This parameter records the rating of consumer satisfaction with the continuity and pressure of water supply. It reflects the household-level experience of reliability improvements achieved through the platform.

Parameter 3: Satisfaction with complaint resolution & responsiveness

This parameter records the consumer satisfaction with how water-supply complaints are resolved and responded to. It reflects consumer confidence in the grievance-handling process linked to the platform.

Theme 4: Urban Sewerage

6.8. NATURESANI (Delhi)

Naturesani runs "The Waterless Sanitation Project," a retrofit sanitation programme built around waterless, odourless urinals and commodes that use hydro-mechanical technology requiring no sealant liquid. Its Delhi deployment has installed these water-repellent fixtures across target public facilities, blocking bad odour trapped in the drainage system from passing back into the restroom while cutting water use and wastewater generation at each retrofitted unit.

6.8.1. Indicators & Parameters to Operator

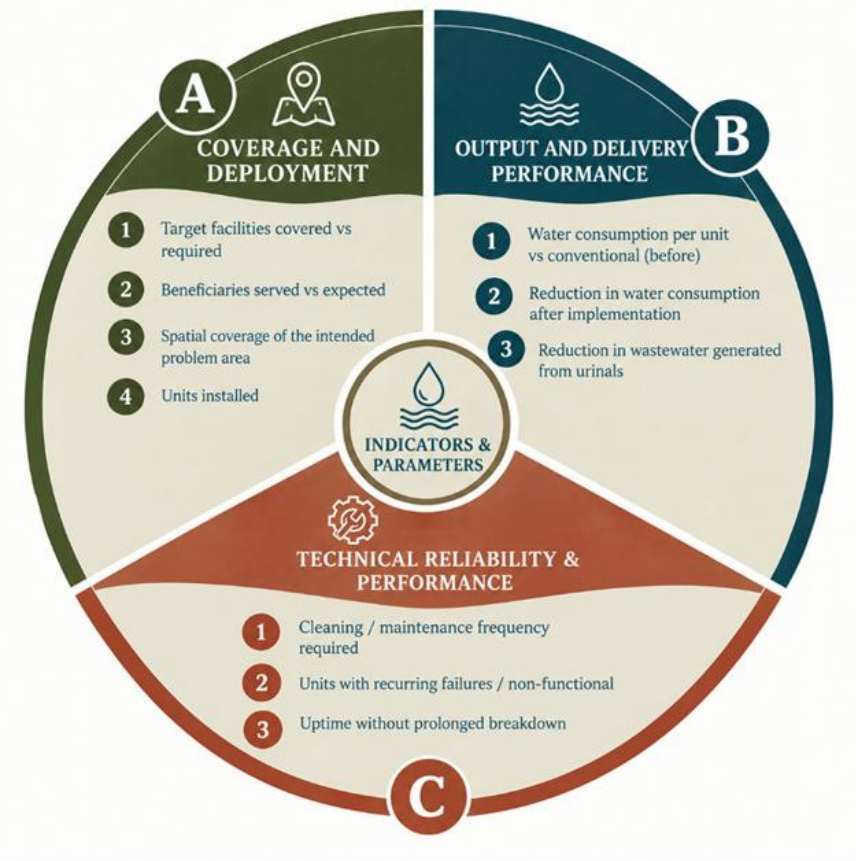


Figure 6.20 Indicators and Parameters for the Operator - Naturesani

Indicator A: Coverage and Deployment

This indicator captures how widely the fixture has been rolled out against its intended target, covering facility coverage, beneficiaries reached, spatial spread and units installed.

Parameter 1: Target facilities covered vs required

This parameter records the share of intended facilities actually covered against the number originally required. It shows how much of the planned rollout has been completed.

Parameter 2: Beneficiaries served vs expected

This parameter compares the number of people actually served by the installed units against the number originally expected to benefit. It reflects how closely actual reach matches the planned target population. This figure indicates whether deployment has reached its intended scale of impact.

Parameter 3: Spatial coverage of the intended problem area

This parameter captures how much of the area facing the underlying sanitation problem is now covered by the installed units. It shows whether deployment is concentrated or spread across affected locations. This is used to judge how representative the coverage is of the wider problem area.

Parameter 4: Units installed

This parameter notes the total number of waterless urinal or commode units physically installed to date. It is the simplest measure of deployment scale, distinct from coverage or beneficiary reach.

Indicator B: Output and Delivery Performance

This indicator measures the direct water-saving and wastewater-reduction performance of the installed units against conventional fixtures.

Parameter 1: Water consumption per unit vs conventional (before)

This parameter compares water used per use on the waterless fixture, effectively zero, against a conventional flush fixture's consumption. This is the most direct test of the product's core water-saving design. It anchors every downstream saving calculation in this assessment.

Parameter 2: Reduction in water consumption after implementation

This parameter records the daily volume of water saved once the waterless units replace conventional fixtures. It translates the per-flush saving into an aggregate daily figure. This is used to estimate the cumulative water-conservation benefit of the deployment.

Parameter 3: Reduction in wastewater generated from urinals

This parameter tracks the daily reduction in wastewater volume flowing from urinals into the drainage system after installation. It reflects the downstream effect of eliminating flush water at source.

Indicator c: Technical Reliability & Performance

This indicator tracks how dependably the installed units function over time, covering maintenance needs, failure rates and continuous uptime. It shifts focus from water savings to operational durability.

Parameter 1: Cleaning / maintenance frequency required

This parameter records how many maintenances visits each unit requires per month to stay functional. It reflects the ongoing upkeep burden the fixture places on facility staff. A high frequency would point to a design or installation issue needing attention.

Parameter 2: Units with recurring failures / non-functional

This parameter records the number or share of installed units experiencing repeat failures or currently non-functional. This is a direct measure of the fixture's structural dependability under real conditions. A high figure signals a need for design or component improvement.

Parameter 3: Uptime without prolonged breakdown

Measures the average number of days a unit runs without a prolonged breakdown. It captures sustained operational reliability rather than isolated faults. Longer uptime periods indicate stronger day-to-day dependability of the installed fixtures.

6.8.2. Indicators & Parameters to ULB / Authority

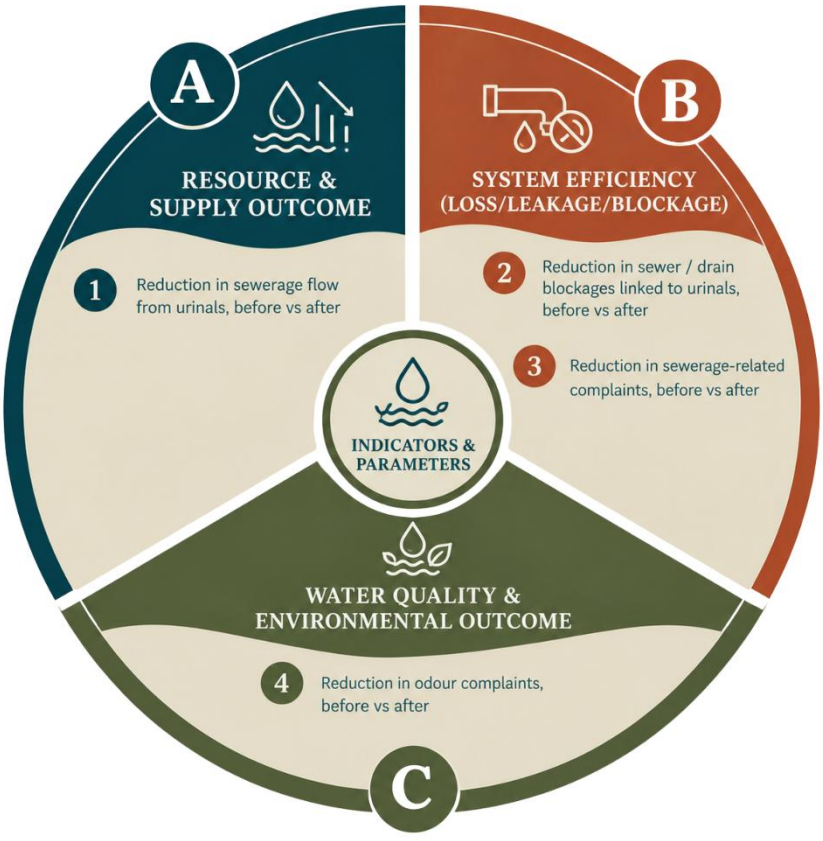


Figure 6.21 Indicators and Parameters for the Authority - Naturesani

Indicator A: Resource & Supply Outcome

This indicator measures the direct reduction in sewerage flow reaching the network from urinals after installation.

Parameter 1: Reduction in sewerage flow from urinals, before vs after

This parameter compares the volume of sewerage flow originating from urinals before and after the waterless units were installed. It shows how much load has been removed from the drainage network at source.

Indicator B: System Efficiency (Loss / Leakage / Blockage)

This indicator captures how blockage incidents and related complaints have changed since installation. It links reduced flow to fewer downstream network problems.

Parameter 1: Reduction in sewer / drain blockages linked to urinals, before vs after

This parameter records the change in monthly blockage incidents traced to urinal-connected drainage, comparing before and after installation. Lower flush volume typically reduces solid build-up in connected pipes.

Parameter 2: Reduction in sewerage-related complaints, before vs after

This parameter tracks the monthly change in complaints related to sewerage issues at the covered facilities. It reflects whether network-level improvements are being felt by users and reported less often. This is read alongside the blockage-incident figure recorded separately.

Indicator C: Water Quality & Environmental Outcome

This indicator captures the change in odour-related complaints received about the facilities after installation. It tests whether the fixture's odour-blocking design shows up in fewer reported issues.

Parameter 1: Reduction in odour complaints, before vs after

This parameter records the monthly change in odour-related complaints about the covered facilities since installation. It provides a complaint-based check on the fixture's odour-blocking claim. A sustained reduction supports the case that the design is working as intended.

6.8.3. Indicators & Parameters to Consumer

Figure 6.22 Indicators and Parameters for the Consumer – Naturesani

Indicator A: Service Experience & Satisfaction

This indicator captures how users experience the waterless fixture directly, covering actual use, hygiene, usability, odour and overall satisfaction. It tests whether the design benefits are genuinely felt by users.

Parameter 1: Intended users actually using the waterless urinal

This parameter records the number of intended users who are actually using the installed waterless urinal. It tests real uptake rather than assumed usage based on installation alone. Low use despite installation would point to an acceptance or awareness gap that needs attention.

Parameter 2: Satisfaction with hygiene

This parameter captures user-rated satisfaction with the hygiene of the fixture. It reflects the user's own judgement of cleanliness rather than a technical assessment. This is a core driver of continued willingness to use the fixture regularly.

Parameter 3: Satisfaction with usability

This parameter notes user-rated ease of using the fixture. It reflects whether the design's practical operation feels natural and comfortable to users in daily use. Low usability would point to a design aspect needing refinement.

Parameter 4: Satisfaction with odour

This parameter tracks user-rated satisfaction with odour at the point of use. It is the user-experienced counterpart to the facility's own odour-complaint figures recorded separately. This checks whether odour control is felt consistently by users themselves.

Parameter 5: Satisfaction with overall experience

This parameter captures a single overall satisfaction rating for the fixture. It draws together hygiene, usability and odour into one composite user judgement of the experience

Parameter 6: Change in perceived odour / cleanliness, before vs after

This parameter notes how much users perceive odour and cleanliness to have changed since installation. It is a before-after comparison drawn from the user's own perspective, not a technical reading. This shows whether users credit the fixture with a felt improvement.

Parameter 7: Actual benefits achieved vs expected

This parameter records in the user's own words, the actual benefits experienced compared with what was expected before installation. It captures benefits that structured rating questions may not fully surface on their own. This provides qualitative context to the numeric satisfaction scores recorded above.

Theme 5: Water Governance

6.9. SMART TERRA URBAN WATER MANAGEMENT (Hyderabad)

Smart Terra Urban Water Management runs "The NRW Intelligence Project," an AI-powered analytics programme that helps water utilities detect water-loss issues using data the utility already collects, such as billing records and SCADA readings. Its Hyderabad deployment applies this analytics layer across the utility's existing meters and monitoring infrastructure to flag leaks, bursts and apparent losses such as theft or meter error, without requiring new field hardware.

6.9.1. Indicators & Parameters to Operator

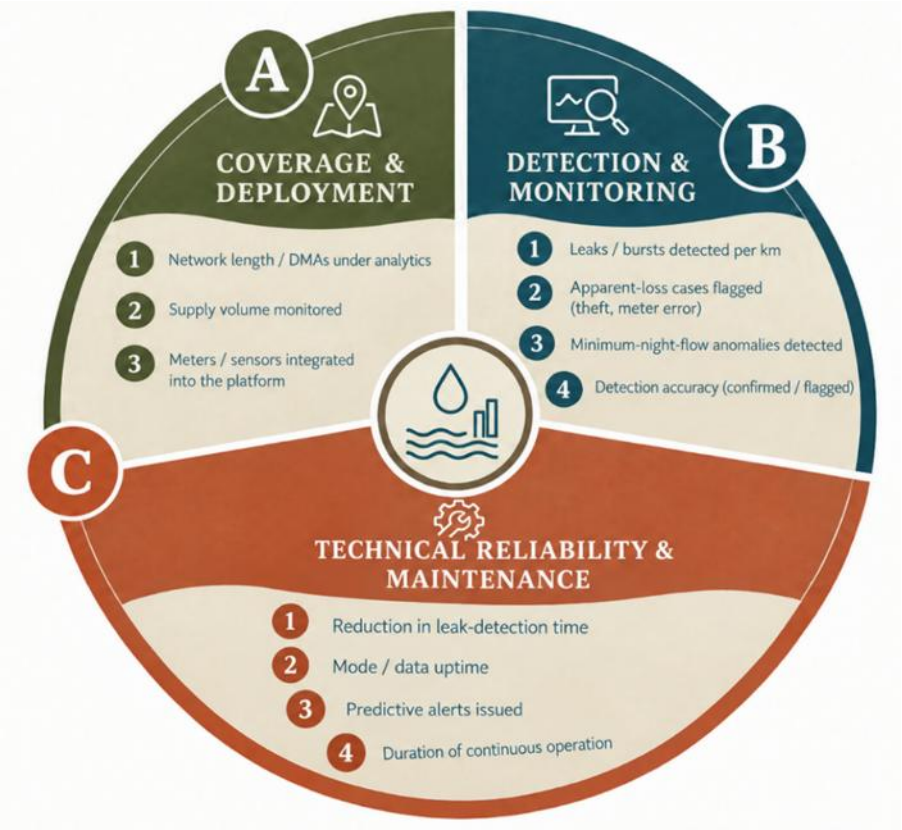


Figure 6.23 Indicators and Parameters for the Operator - Smart Terra Urban Water Management

Indicator A: Coverage and Deployment

This indicator establishes how much of the utility's network and metering infrastructure has been brought under the platform's analytics, covering network length or district metered areas covered, supply volume monitored, and the number of meters or sensors integrated.

Parameter 1: Network length / DMAs under analytics

This parameter records the length of network, or the number of district metered areas, brought under the platform's analytics coverage. It reflects how much of the utility's distribution system has moved from unanalysed billing and SCADA records to active, software-driven scrutiny. Tracking this figure over time also shows how quickly analytics coverage is expanding across the utility's network.

Parameter 2: Supply volume monitored

This parameter captures the volume of water supply, flowing through network sections analysed by the platform. This complements the network-length figure by measuring analytics reach in terms of volume rather than distance, since a smaller area with high supply volume can carry more significance than a larger, low-volume one. The figure is used to prioritise which parts of the network matter most for loss reduction, and provides the volumetric baseline against which the detection and loss-related parameters recorded elsewhere are interpreted.

Parameter 3: Meters / sensors integrated into the platform

This parameter notes the number of meters or sensors whose readings feed into the platform's analytics engine. This measures the data infrastructure underpinning the platform, distinct from the physical network length or volume it covers, since analytics quality depends heavily on how many measurement points are actually feeding usable data.

Indicator B: Detection & Monitoring

This indicator measures what the analytics platform actually finds within the existing billing and SCADA data, covering leaks, apparent losses such as meter error, unusual night-flow patterns, and how accurate its flagged findings turn out to be.

Parameter 1: Leaks / bursts detected per km

This parameter measures the number of leaks or pipe bursts identified per kilometre of analysed network. This is showing how effectively it surfaces physical losses purely from existing billing and SCADA data, without new field sensors. The figure is used to prioritise repair crews toward the sections with the highest detected event density, and a high detection rate per kilometre indicates both the scale of the underlying leakage problem and the sensitivity of the analytics in identifying it from indirect data.

Parameter 2: Apparent-loss cases flagged (theft, meter error)

This parameter tracks the number of apparent-loss cases, such as suspected theft or meter inaccuracy, flagged by the platform. This is distinct from physical leak detection and instead targets commercial losses, where water is consumed but not properly billed.

Parameter 3: Minimum-night-flow anomalies detected

This parameter documents the number of unusual minimum-night-flow patterns identified by the platform. Night flow, when legitimate consumption is at its lowest, is one of the most reliable indirect signals of hidden leakage in a network, so anomalies here often point to losses not yet visible through any other means.

Parameter 4: Detection accuracy (confirmed / flagged)

This parameter compares the number of flagged cases subsequently confirmed as genuine against the total number flagged by the platform. This tests the reliability of the analytics itself, distinct from how many cases it identifies in the first place, since a high flagging volume has limited value if most flagged cases turn out to be false positives.

Indicator C: Technical Reliability & Maintenance

This indicator tracks how dependably the platform itself operates, covering the speed at which leaks are now identified, system uptime, the volume of predictive alerts issued, and how long the deployment has run continuously. It shifts focus from what the platform detects to how reliably it keeps working.

Parameter 1: Reduction in leak-detection time

This parameter measures the reduction in the time taken to identify a leak since the platform was introduced. This captures the platform's core time-saving benefit, comparing analytics-driven detection against the utility's previous approach, which typically relied on customer complaints or periodic manual surveys.

Parameter 2: Model / data uptime

This parameter records the proportion of time the platform's underlying model and data feeds are operating and producing usable output. This is the platform's operational dependability, since gaps in uptime create blind spots in monitoring regardless of how accurate the analytics are when functioning. The figure is used to judge whether the system is reliable enough to be accepted as a continuous monitoring tool, and sustained high uptime is a precondition for the detection and accuracy parameters recorded elsewhere to be considered dependable.

Parameter 3: Predictive alerts issued

This parameter notes the number of predictive alerts the platform issues each year, flagging likely leaks, bursts or anomalies before they are otherwise noticed. This tests the platform's forward-looking capability, distinct from the confirmed detection figures recorded separately, since a predictive alert allows intervention ahead of a visible failure rather than only after one occurs.

Parameter 4: Duration of continuous operation

This parameter documents the length of time, in months, that the platform has operated continuously within the utility without a significant interruption in service. This reflects the platform's operational track record, distinct from the shorter-term uptime percentage recorded separately, since sustained operation over many months demonstrates durability beyond an initial trial period.

6.9.2. Indicators & Parameters to ULB / Authority

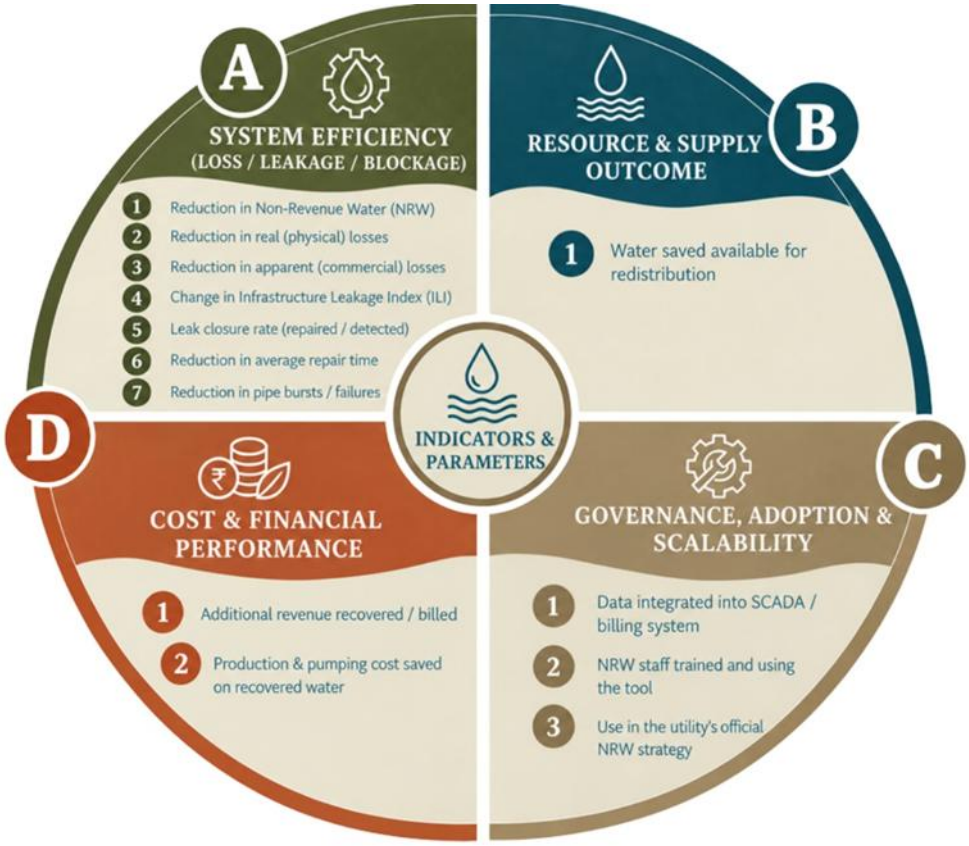


Figure 6.24 Indicators and Parameters for the Authority- Smart Terra Urban Water Management

Indicator A: System Efficiency (Loss / Leakage / Blockage)

This indicator captures the utility's own loss-reduction outcomes since adopting the platform, covering non-revenue water, the physical and commercial components of that loss, network condition, and how quickly detected leaks are closed out. It connects the platform's detection capability to measurable improvement in network performance.

Parameter 1: Reduction in Non-Revenue Water (NRW)

This parameter records the reduction in Non-Revenue Water, the share of supplied water that is lost or unbilled, expressed litres per day. This is the headline efficiency measure for any water-loss reduction effort, combining both physical and commercial losses into a single figure.

Parameter 2: Reduction in real (physical) losses

This parameter measures the reduction in real, or physical losses, meaning water that leaks from the network before reaching any consumer. This isolates the leakage component of Non-Revenue Water from the commercial losses recorded separately, since the two require different corrective approaches.

Parameter 3: Reduction in apparent (commercial) losses

This parameter tracks the reduction in apparent, or commercial losses, meaning water that is consumed but not properly billed due to theft, meter error or data handling issues. This isolates the billing-side component of Non-Revenue Water from the physical leakage recorded separately. The figure is used to assess how effectively the platform's apparent-loss flagging is being converted into corrected billing and recovered revenue.

Parameter 4: Change in Infrastructure Leakage Index (ILI)

This parameter notes the change in the Infrastructure Leakage Index, a standardised measure comparing actual physical losses against a technically achievable minimum for a network of similar characteristics, before and after the platform's deployment. Unlike a raw loss figure, the ILI adjusts for network size, pressure and connection density, allowing loss performance to be benchmarked fairly against other utilities.

Parameter 5: Leak closure rate (repaired / detected)

This parameter compares the number of leaks that have been repaired against the number detected by the platform. This tests whether detection is being followed through to actual physical correction, rather than remaining as an open finding in the system.

Parameter 6: Reduction in average repair time

This parameter records the reduction in the average time taken to repair a detected leak in hours. This measures how much faster the utility's field response has become since adopting the platform, distinct from how quickly a leak is first identified, which is captured under the start-up's own reliability parameters.

Parameter 7: Reduction in pipe bursts / failures

This parameter tracks the change in the number of pipe bursts or failures occurring across the network each year. This is an outcome measure of whether earlier detection and faster repair are translating into fewer catastrophic failures, rather than only better information about the network's condition.

Indicator B: Resource & Supply Outcome

This indicator translates the utility's loss reduction into an available water resource, measuring how much water saved through reduced losses becomes available for redistribution elsewhere in the network.

Parameter 1: Water saved available for redistribution

This parameter records the volume of water, saved through reduced losses and made available for redistribution to other parts of the network or to previously under-served areas. This translates the loss-reduction figures recorded separately into a usable supply-side resource, rather than treating loss reduction only as an efficiency statistic.

Indicator C: Cost & Financial Performance

This indicator captures the direct financial return generated by the platform, covering revenue recovered from previously unbilled consumption and the production and pumping costs avoided on water no longer lost.

Parameter 1: Additional revenue recovered / billed

This parameter captures the additional revenue recovered or newly billed each year as a result of correcting apparent losses identified by the platform, such as theft or meter error. This translates the apparent-loss detection figures recorded separately into a direct financial outcome for the utility.

Parameter 2: Production & pumping cost saved on recovered water

This parameter notes the production and pumping cost saved each year on water that no longer needs to be produced or pumped because it is no longer being lost. This captures the cost side of loss reduction, distinct from the revenue recovered on apparent losses, since real losses saved reduce the utility's own operating expenditure rather than generating new billing revenue.

Indicator D: Governance, Adoption & Scalability

This indicator captures how far the platform has been embedded into the utility's own systems, staffing and official strategy, rather than remaining a standalone analytical tool.

Parameter 1: Data integrated into SCADA / billing system

This parameter assesses how far the platform's analytics have been integrated into the utility's own SCADA and billing systems. This tests whether the platform functions as a connected part of the utility's core operating systems or remains a separate tool run alongside them.

Parameter 2: NRW staff trained and using the tool

This parameter records the number of the utility's Non-Revenue Water staff who have been trained on the platform and are actively using it in their work. This measures human, rather than technical, adoption

of the platform, since even a well-integrated system delivers limited value if staff are not equipped or willing to use its outputs.

Parameter 3: Use in the utility's official NRW strategy

This parameter notes whether the platform has been formally incorporated into the utility's official Non-Revenue Water reduction strategy. This is the clearest institutional test of adoption, since formal inclusion in strategy documents indicates the utility's own leadership recognises the platform as a core tool rather than a pilot experiment.

6.9.3. Indicators & Parameters to Consumer

Figure 6.25 Indicators and Parameters for the Consumer - Smart Terra Urban Water Management

Indicator A: Service Experience & Satisfaction

This indicator captures how consumers experience the reliability of their water supply, based on their own observation of supply hours, interruptions and overall service quality.

Parameter 1: Increase in supply hours

This parameter records the increase in daily water supply hours experienced by consumers since the platform's deployment per day. Reduced losses free up water that can be redirected toward extending

supply duration, so this figure tests whether that technical gain has translated into a tangible service improvement at the household level and a limited increase despite strong loss reduction would suggest the recovered water is being applied elsewhere rather than toward supply-hour extension.

Parameter 2: Reduction in supply interruptions

This parameter captures the change in the number of supply interruptions experienced by consumers. Fewer pipe bursts and faster repairs, driven by the platform's detection and the utility's response, would be expected to reduce the frequency of unplanned outages felt by households.

Parameter 3: Consumers perceiving more reliable supply

This parameter notes the share of consumers who report perceiving their water supply as more reliable since the platform's deployment. This is a broader, subjective measure of service confidence, distinct from the specific supply-hours and interruption figures recorded separately, capturing overall consumer sentiment about the service rather than a single measurable aspect of it

Parameter 4: Overall satisfaction with supply

This parameter captures a single overall satisfaction rating for the water supply service, given directly by the consumer. This serves as a summary measure that draws together individual experiences of supply hours, interruption frequency and perceived reliability into one composite judgement.

7. TIMELINE

The study is proposed to be carried out over a **four-month period**, commencing on **25th August** with the formal start of the project and culminating in the submission of the Final Report on **24th December**. The work has been structured into **nine sequential milestones** so as to allow adequate time for scoping, fieldwork, analysis and iterative reporting as in Figure 7.1.

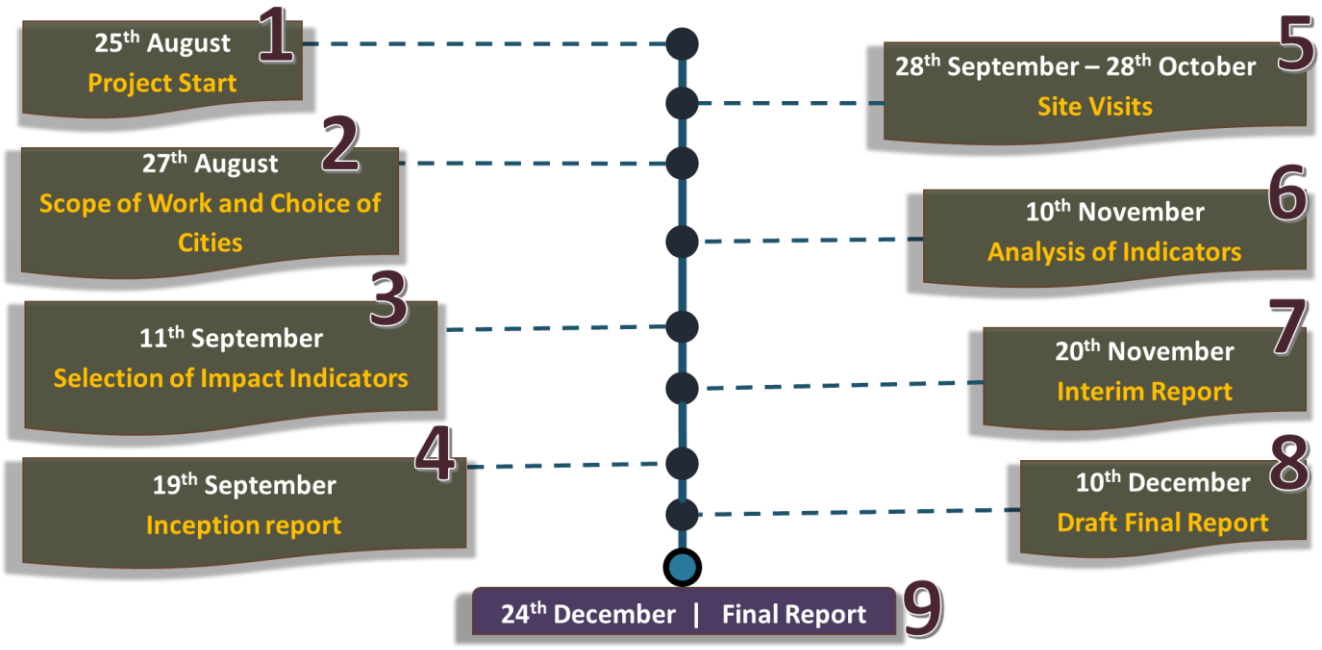


Figure 7.1 Timeline

Following the Project Start, the immediate next step, targeted for 27th August, is the finalization of the **Scope of Work** and the confirmation of the choice of cities, building on the tentative selections outlined above. This is to be followed by the **Selection of Impact Indicators** by 11th September, refining the seven broad indicator heads into a detailed, field-ready evaluation framework. An **Inception Report** is scheduled for 19th September, at which point the study's methodology, sampling approach and instruments will be presented for review before fieldwork begins in earnest.

The core fieldwork window, comprising **Site Visits** to the selected cities, is planned to run from 28th September through 28th October, a five-week period during which primary data will be collected from Municipal Officers, Service Providers, Residents and other Urban Stakeholders across all sampled locations. This will be followed by the **Analysis of Indicators** by 10th November, during which the field data will be consolidated and assessed against the seven indicator heads. The findings of this analysis will first be presented in an **Interim Report** by 20th November, offering an early view of emerging success stories and gaps. This will be refined into a **Draft Final Report** by 10th December, incorporating feedback received on the interim findings, before the study concludes with submission of the **Final Report** on 24th December.

ABOUT THE PROJECT TEAM

NAME	ROLE	EXPERTISE / EXPERIENCE
Prof. Dr. Ramesh Srikonda	Principal Investigator	Professor and Director, SPAV. 40+ years of experience. Architect and Transport Planner. Research Focus in Sustainable Architecture & Energy Efficiency, climate-responsive design, urban planning. Ph.D., PGDEE, MTP, B.Arch.
Prof. Dr. Ayon K. Tarafdar	Co-Principal Investigator	Professor and Head, ACUPCB-SPAV. 23+ years of experience. Environmental Planner. Expertise in climate-sensitive spatial planning, environmental planning, resilience & vulnerability assessment, environmental impact studies. Ph.D (NTNU Norway), MS-UEP (Norway), B.Plan (SPA Delhi)
Prof. Dr. Adinarayanane R.	Team Member	Professor & Head - Department of Planning. 30+ years of experience. Engineer and Urban Planner. Expertise in urban & regional dynamics, sustainable urban development, infrastructure planning, urban land management, climate-responsive planning, energy-efficient planning, advanced urban systems and public policy. Ph.D., M.Tech (Urban and Rural Planning) IIT-Roorkee, B.E. (Civil Engineering)
Dr. Bhagwat Jayeshkumar Maheshkumar	Team Member	Assistant Professor, SPAV. Engineer and Urban Planner. 6+ years of experience. Expertise in urban planning, infrastructure/urban systems, urban modelling and planning research. B.E. (Civil Engineering), M.Plan (Urban Planning) and PhD;
Dr. Arpan Paul Singh Golla	Team Member	Assistant Professor, SPAV. 7+ years of experience. Engineer and Urban Planner. Expertise in urban planning, project management, infrastructure and development planning, environmental planning and planning systems. PhD, M.Tech (Urban Planning) and B.E. Civil Engineering.

Ms. Swathikka S	Research Officer	1+ years of experience. Architect and Environmental Planner. Expertise in GIS and spatial analysis, Climate resilience, Blue Green Infrastructure, Environmental Planning, Disaster Management. B.Arch, M.Plan (EPM)
Ms. Debasmita Bhowmik	Junior Research Officer	Architect and Environmental Planner. B.Arch, M.Plan (EPM)
Ms. Poomail V	Research Assistant	Urban Planner. B.Plan.

ANNEXURE A

START-UP 1: Adva Enviro (Hyderabad)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - FRESH WATER SYSTEMS - HYDERABAD					
1. START-UP (Adva Enviro) http://therainwaterproject.com/our-projects/ - OPERATOR					
Description: The Rainwater Project looks at a citywide approach for water resilience and source sustainability with rainwater harvesting. This involves providing scientific site-specific solutions for rainwater harvesting which also includes restoration of natural and manmade water bodies. They offer end-to-end solutions from design to execution for rainwater harvesting, wastewater reuse and integrated water management solutions					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	COVERAGE AND DEPLOYMENT	1	Recharge pits / RWH structures installed vs targeted	% (count vs target)	Start-up / ULB
		2	Wells / stepwells restored vs targeted	% (count vs target)	Start-up / ULB
		3	Spatial distribution of structures installed	count / location	Start-up / ULB
		4	Interventions by building type	count per type	Start-up / ULB
		5	Range of intervention types deployed	count of types	Start-up / ULB
B	OUTPUT AND DELIVERY PERFORMANCE	6	Annual rainwater harvested and utilised	KL/year	Start-up
		7	Proportion of harvested rainwater recharged / infiltrated	%	Start-up
		8	Annual volume of wastewater reused	KL/year	Start-up
		9	Capacity utilisation of structures (used / installed)	% (of KLD)	Start-up
C	TECHNICAL RELIABILITY & MAINTENANCE	10	Time from allocation to operationalisation vs estimated	days (or months)	Start-up / ULB
		11	Installed systems still functional	% (or count)	Start-up / ULB
		12	Breakdown / repair / servicing frequency	count/year	Start-up / ULB
		13	Structure durability	years without failure	Start-up
		14	Functional performance in extreme rainfall / dry period	% functionality	Start-up
D	COST & FINANCIAL PERFORMANCE	15	Cost per intervention, actual vs estimated	Rs	Start-up
		16	Annual monetary savings generated	Rs/year	Start-up
		17	Water tankers avoided by the intervention	count	Start-up
		18	Milestone-linked grant tranche utilisation	Rs	Start-up
		19	Local persons employed / trained	count	Start-up

INDICATORS AND PARAMETERS – TO AUTHORITIES

START-UP (Adva Enviro) - ULB/AUTHORITY					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	WATER QUALITY AND ENVIRONMENTAL OUTCOME	1	Change in groundwater level, before vs after	metres	Start-up / ULB
		2	Change in water quality, before vs after	index	Start-up / ULB
		3	Reduction in urban flooding / waterlogging incidents	incidents/year	Start-up / ULB

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (Adva Enviro) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	ECONOMIC BENEFIT & ACCESS	1	Reduction in household water expenditure	Rs/year	Consumer (survey)
		2	Reduction in tanker-water dependency	% HH	Consumer (survey)
B	AWARENESS & COMMUNITY PARTICIPATION	3	Community participation in maintenance	Y / trained	Consumer (survey)
		4	Awareness of RWH benefits	% aware	Consumer (survey)
		5	Awareness / training sessions conducted vs targeted	count	Consumer (survey)

ANNEXURE B

START-UP 2: Thales Cleantech (Chennai)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - FRESH WATER SYSTEMS - CHENNAI					
2. START-UP (Thales Cleantech) https://www.thalescleantech.com/ - OPERATOR					
Description: They provide potable water through clean and sustainable Atmospheric Moisture Extraction (AME) technologies. Their proprietary STAME technology involves less number of moving parts or components which ensures minimum 20 years of life with negligible operating cost.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	COVERAGE AND DEPLOYMENT	1	AME units installed vs targeted	% (count vs target)	Start-up
		2	Spatial distribution of AME units	count / location	Start-up
		3	Users served vs targeted	% (count vs target)	Start-up
		4	Site types covered	count per type	Start-up
B	OUTPUT AND DELIVERY PERFORMANCE	5	Actual water produced per AME per day	LPD	Start-up
		6	Capacity utilisation (actual / installed)	%	Start-up
		7	Reduction in dependence on groundwater / conventional sources	% (or L/year)	Start-up
		8	Groundwater conserved through AME	L/year	Start-up
		9	Quality of water produced	index	Start-up
		10	Air temp / RH within required operating range	°C, % (achieved vs required)	Start-up
C	TECHNICAL RELIABILITY & PERFORMANCE	11	Functional reliability of the unit	%	Start-up
		12	Breakdown / servicing frequency	count/year	Start-up
		13	Unit durability	years without failure	Start-up
D	COST & FINANCIAL PERFORMANCE	14	Total cost per intervention	Rs	Start-up
		15	Price of the output water	Rs/L	Start-up
		16	Milestone-linked grant tranch utilisation	Rs	Start-up
		17	Local persons employed/trained	count	Start-up

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (Thales Cleantech) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	ECONOMIC BENEFIT & ACCESS	1	Reduction in water expenditure	Rs. per year	Consumer/public
		2	Reduction in dependency on other water sources	%	Consumer/public
B	SERVICE EXPERIENCE & SATISFACTION	3	Satisfaction with water taste	0-5 scale	Consumer/public
		4	Satisfaction with water quality	0-5 scale	Consumer/public
		5	Satisfaction with water odour	0-5 scale	Consumer/public
C	AWARENESS & COMMUNITY PARTICIPATION	6	Community participation in maintenance	Yes/not trained	Consumer/public
		7	Awareness of AME benefits to public/community	% beneficiaries aware	Consumer/public
		8	Awareness/training sessions conducted v/s targeted	count	Consumer/public

ANNEXURE C

START-UP 3: Supremus Developers (Delhi)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - HYDRO INFORMATICS - DELHI					
1. START-UP (Supremus Developers) https://www.janajal.com/ - OPERATOR					
Description: JanaJal WOW delivers safe water to the doorstep of households in a sustainable and consistent manner. The IOT controlled three-wheelers are secured, monitored and controlled through secure cloud servers using proprietary controllers and sensors.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	COVERAGE AND DEPLOYMENT	1	Active vehicles per day vs fleet size	count (or %)	Start-up
		2	Households served per day	count/day	Start-up
		3	Beneficiaries served vs targeted per month	% (count vs target)	Start-up
		4	Areas covered vs targeted	count / location	Start-up
		5	Community types served	HIG / MIG / LIG	Start-up
		6	Service availability achieved vs targeted	hours/day	Start-up
		7	Service accessibility time achieved vs targeted	minutes	Start-up
B	OUTPUT AND DELIVERY PERFORMANCE	8	Water dispensed per day per vehicle	L/day/vehicle	Start-up
		9	Water delivered per household	L/HH/day	Start-up
		10	Potability compliance	% samples compliant	Start-up
		11	Water-quality testing frequency	tests/month	Start-up
		12	Water-quality alerts raised	count/month	Start-up
C	TECHNICAL RELIABILITY & MAINTENANCE	13	WTP operational uptime achieved vs targeted	hours/month	Start-up
		14	Real-time vehicle tracking uptime	% uptime	Start-up
		15	Sensor / controller failure rate	%	Start-up
		16	Unauthorised refilling incidents	count/month	Start-up
		17	Complaint redressal time	hours / days	Start-up
D	COST & FINANCIAL PERFORMANCE	18	Price of water	Rs/L	Start-up
		19	Revenue per vehicle per month	Rs/vehicle/month	Start-up
		20	Cost recovery ratio	%	Start-up
		21	Operational expenditure per month	Rs/month	Start-up
		22	Local persons employed / trained	count	Start-up

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (Supremus Developers) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	ECONOMIC BENEFIT AND ACCESS	1	Reduction in household water expenditure	Rs. per year	Consumer/public
		2	Purchase frequency	Count per month	Consumer/public
B	SERVICE EXPERIENCE & SATISFACTION	3	Reduction in waterborne disease incidences	Count or %	Consumer/public
		4	User satisfaction	0-5 scale	Consumer/public
C	AWARENESS AND COMMUNITY PARTICIPATION	5	Community participation in maintenance	Yes/not trained	Consumer/public
		6	Awareness of JanaJal WOW	% beneficiaries aware	Consumer/public
		7	Awareness/training programs conducted v/s targeted	count	Consumer/public

ANNEXURE D

START-UP 4: WeGOT Utility Solutions (Chennai)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - URBAN WATER MANAGEMENT - CHENNAI					
START-UP (WeGOT Utility Solutions) - OPERATOR					
Description: A water source management system which tracks water entering a property to ensure that there is no pilferage, theft, or leakage. They also track the quality of water at the source thus ensuring that only clean water will be let into the property. The system enables optimization of water usage with respect to demand, availability, cost, and quality at each source.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	COVERAGE AND DEPLOYMENT	1	Area / population covered vs targeted	% (sq.km or count)	Start-up
		2	Buildings / establishments connected	count	Start-up
		3	IoT devices installed vs locations needing them	% (count vs need)	Start-up
		4	Functional devices vs installed	%	Start-up
		5	STPs / WTPs / RO plants integrated	count	Start-up
		6	Sumps and overhead tanks monitored	count	Start-up
B	DETECTION & MONITORING	7	Leaks detected and resolved	count/month	Start-up
		8	Abnormal / high-consumption cases detected and resolved	count/month	Start-up
		9	Unauthorised connections / theft detected and acted upon	count/month	Start-up

INDICATORS AND PARAMETERS – TO AUTHORITIES

START-UP (WeGOT Utility Solutions) - AUTHORITY					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	SYSTEM EFFICIENCY (LOSS/ LEAKAGE/ BLOCKAGE)	1	Reduction in water loss / NRW, before vs after	MLD (or %)	ULB / Nodal
		2	Reduction in leak detect-to-resolve time, before vs after	hours (or days)	ULB / Nodal
		3	Reduction in water lost to leakage, before vs after	KL/month	ULB / Nodal
B	RESOURCE & SUPPLY OUTCOME	4	Change in water reaching end users, before vs after	MLD	ULB / Nodal
		5	Reduction in groundwater dependence	KL	ULB / Nodal
		6	Change in pumping energy per KL, before vs after	kWh/KL	ULB / Nodal
C	WATER QUALITY & ENVIRONMENTAL OUTCOME	7	Samples meeting water-quality standards	% of tested	ULB / Nodal
		8	Parameters continuously monitored vs required	% (count vs required)	ULB / Nodal
		9	Reduction in supply interruptions, before vs after	count/month	ULB / Nodal
D	GOVERNANCE, ADOPTION & SCALABILITY	10	Reduction in complaints (supply / quality / billing), before vs after	count/month	ULB / Nodal
		11	Supplied water meets connected-user demand after implementation	Y-N	ULB / Nodal

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (WeGOT Utility Solutions) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	ECONOMIC BENEFIT & ACCESS	1	Change in per-capita consumption, before vs after	LPCD	Primary (Consumer)
		2	Reduction in water expenditure, before vs after	Rs/month	Primary (Consumer)
		3	Increase in water availability hours, before vs after	hours/day	Primary (Consumer)
B	SERVICE EXPERIENCE & SATISFACTION	4	Improvement in availability / continuity / pressure	Likert scale	Primary (Consumer)
		5	Improvement in perceived water quality	Likert scale	Primary (Consumer)
		6	Satisfaction — availability	Likert scale	Primary (Consumer)
		7	Satisfaction — quality	Likert scale	Primary (Consumer)
		8	Satisfaction — billing	Likert scale	Primary (Consumer)
		9	Satisfaction — complaint resolution & responsiveness	Likert scale	Primary (Consumer)

ANNEXURE E

START-UP 5: Kumbhi Kagaz (Guwahati)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - URBAN WATER MANAGEMENT - GUWAHATI					
START-UP (Kumbhi Kagaz) - OPERATOR					
Description: A water source management system which tracks water entering a property to ensure that there is no pilferage, theft, or leakage. They also track the quality of water at the source thus ensuring that only clean water will be let into the property. The system enables optimization of water usage with respect to demand, availability, cost, and quality at each source.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	COVERAGE AND DEPLOYMENT	1	Water bodies / wetlands covered vs targeted	% (count vs target)	Start-up
		2	Area treated vs area requiring treatment	% (sq.m or ha)	Start-up
		3	Collection / processing units established	count / location	Start-up
B	OUTPUT AND DELIVERY PERFORMANCE	4	Water hyacinth removed to date	tonnes	Start-up
		5	Hyacinth utilised for paper production	tonnes/month	Start-up
		6	Paper / products produced	kg/month	Start-up
C	TECHNICAL RELIABILITY & PERFORMANCE	7	Operational days per month of the unit	days/month	Start-up
		8	Units operational vs total established	count	Start-up

INDICATORS AND PARAMETERS – TO AUTHORITIES

START-UP (Kumbhi Kagaz) - AUTHORITY					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	WATER QUALITY & ENVIRONMENTAL OUTCOME	1	Reduction in water-hyacinth coverage, before vs after	sq.m or ha	ULB / Nodal
		2	Waterway length cleared, before vs after	km / m	ULB / Nodal
		3	Change in dissolved oxygen (DO), before vs after	mg/L	ULB / Nodal
		4	Change in water quality, before vs after	index	ULB / Nodal
		5	Reduction in hyacinth-removal frequency needed, before vs after	count/year	ULB / Nodal
		6	Reduction in mosquito / weed nuisance complaints	count/month	ULB / Nodal
B	GOVERNANCE, ADOPTION & SCALABILITY	7	ULB / Government willingness to continue or expand	Yes/No	ULB / Nodal

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (Kumbhi Kagaz) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	ECONOMIC BENEFIT & ACCESS	1	Change in income from project activities, before vs after	Rs/person/month	Consumer (survey)
		2	Paper / product sold per month	kg/month	Consumer (survey)
		3	Revenue from hyacinth-based products, before vs after	Rs/person/month	Consumer (survey)
		4	Beneficiaries engaged in collection	count	Consumer (survey)
		5	Beneficiaries trained in processing / paper-making	count	Consumer (survey)
		6	Improvement in livelihood opportunities	Likert	Consumer (survey)
B	AWARENESS & COMMUNITY PARTICIPATION	7	Benefit to wetland-dependent communities (e.g. fishing)	Yes/No	Consumer (survey)
		8	Continuation of activities beyond implementation	Yes/No	Consumer (survey)
		9	Satisfaction with the project	Likert	Consumer (survey)

ANNEXURE F

START-UP 6: DBD Water Systems Private Limited (Mumbai)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - URBAN WATER MANAGEMENT - MUMBAI					
START-UP (DBD Water Systems) - OPERATOR					
Description: They are a cloud-based platform exclusively for water utility. It is a multi-protocol convergent platform which is multilingual, meter hardware-vendor independent. The platform will enable water management control by providing the users with protocol independent metering, detailed billing, multiple payment options and dynamic analytic view.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	COVERAGE AND DEPLOYMENT	1	Properties/connections onboarded vs targeted	% (count vs target)	Start-up
		2	Share of field meter protocols supported by the platform	% (brands vs in field)	Start-up
		3	Meters reading data successfully vs total connected	%	Start-up
		4	Languages configured vs languages needed for the user base	%	Start-up
B	OUTPUT AND DELIVERY PERFORMANCE	5	Platform / data uptime	%	Start-up
		6	Meter reads received vs expected	%	Start-up
		7	Bills generated automatically vs total bills due	%	Start-up
C	TECHNICAL RELIABILITY & PERFORMANCE	9	Billing anomalies / estimation errors flagged and resolved	% resolved (or count/month)	Start-up
		10	Consumption anomalies / leak alerts generated and resolved	% resolved (or count/month)	Start-up

INDICATORS AND PARAMETERS – TO AUTHORITIES

START-UP (DBD Water Systems) - AUTHORITY					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	BILLING & REVENUE OUTCOME	1	Change in billing accuracy, before vs after	%	ULB / Nodal
		2	Change in billing cycle time, before vs after	days	ULB / Nodal
		3	Change in revenue collection efficiency, before vs after	%	ULB / Nodal
		4	Reduction in metering / billing disputes, before vs after	% (or count/month)	ULB / Nodal
B	OPERATIONAL VISIBILITY	5	Staff actively using the analytics dashboard	% of assigned staff	ULB / Nodal
		6	Data-driven decisions/interventions taken using platform insights	count/month	ULB / Nodal
		7	Reduction in manual meter-reading/book-keeping effort	man-hours/month (or %)	ULB / Nodal
C	GOVERNANCE, ADOPTION & SCALABILITY	8	Meter hardware swapped without platform change	count of successful swaps	ULB / Nodal
		9	Staff trained on the platform	count	ULB / Nodal
		10	ULB / Government willingness to continue or expand	Yes/No	ULB / Nodal

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (DBD Water Systems) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	ECONOMIC BENEFIT & ACCESS	1	Residents on usage-based (metered) billing vs flat-rate, before vs after	%	Consumer (survey)
		2	Change in water bill amount, before vs after	Rs/month	Consumer (survey)
		3	Residents using digital / multiple payment modes	%	Consumer (survey)
B	AWARENESS & COMMUNITY PARTICIPATION	4	Residents with access to / using the billing dashboard or app	%	Consumer (survey)
		5	Satisfaction in billing transparency	Likert	Consumer (survey)
		6	Satisfaction in ease of payment	Likert	Consumer (survey)
		7	Satisfaction in complaint resolution & responsiveness	Likert	Consumer (survey)

ANNEXURE G

START-UP 7: Faclon Labs Pvt Ltd (Mumbai)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - URBAN WATER MANAGEMENT - MUMBAI					
START-UP (Faclon labs) - OPERATOR					
Description: Smart Water Network Management through sensors, data and analytics. Faclon Labs provides remote monitoring and automation solutions for water supply departments, providing data for better management of water infrastructure and operations.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	COVERAGE AND DEPLOYMENT	1	Treatment plants/pipeline points instrumented vs targeted	% (count vs target)	Start-up
		2	IoT sensors (flow/pressure/level/quality) installed	count	Start-up
		3	Functional sensors vs installed	%	Start-up
		4	ETPs/STPs/pumping stations integrated	count	Start-up
B	OUTPUT AND DELIVERY PERFORMANCE	5	Sensor data uptime	%	Start-up
		6	Real-time data latency	minutes	Start-up
		7	Dashboards/reports generated and accessed	count/month	Start-up
C	TECHNICAL RELIABILITY & PERFORMANCE	9	Leaks/NRW instances detected and resolved	% resolved (or count/month)	Start-up
		10	Pressure/flow abnormalities flagged and resolved	% resolved (or count/month)	Start-up
		11	Predictive maintenance alerts raised and acted upon	% acted upon (or count/month)	Start-up

INDICATORS AND PARAMETERS – TO AUTHORITIES

START-UP (Faclon labs) - AUTHORITY					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	SYSTEM EFFICIENCY (LOSS/LEAKAGE)	1	Reduction in water loss/NRW, before vs after	MLD (or %)	ULB / Nodal
		2	Reduction in leak detect-to-resolve time, before vs after	days (or %)	ULB / Nodal
		3	Reduction in water lost to leakage, before vs after	KL/month	ULB / Nodal
B	RESOURCE & ENERGY OUTCOME	4	Change in pumping energy per KL, before vs after	kWh/KL	ULB / Nodal
		5	Reduction in water/energy treatment costs, before vs after	Rs./month (or %)	ULB / Nodal
		6	Change in volume of water reaching end users, before vs after	MLD	ULB / Nodal
C	WATER QUALITY & ENVIRONMENTAL OUTCOME	7	Samples meeting water-quality standards, before vs after	% of samples tested	ULB / Nodal
		8	Reduction in supply interruptions, before vs after	count/month	ULB / Nodal
D	GOVERNANCE, ADOPTION & SCALABILITY	9	Staff using platform for decision-making	% of assigned staff	ULB / Nodal
		10	ULB willingness to continue or expand deployment	Yes/No	ULB / Nodal

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (Faclon labs) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	ECONOMIC BENEFIT & ACCESS	1	Change in water availability hours, before vs after	hours/day	Consumer (survey)
		2	Change in supply adequacy vs demand, before vs after	%	Consumer (survey)
B	AWARENESS & COMMUNITY PARTICIPATION	4	Improvement in perceived water quality	Likert	Consumer (survey)
		5	Satisfaction with supply continuity / pressure	Likert	Consumer (survey)
		6	Satisfaction with complaint resolution & responsiveness	Likert	Consumer (survey)

ANNEXURE H

START-UP 8: Naturesani (Delhi)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - URBAN SEWERAGE - DELHI					
START-UP (Naturesani) - OPERATOR					
Description: They have developed waterless, odourless urinals & commodes along with other retrofittable contraptions. Their product works on Hydro-mechanical technology, which requires no sealant liquid. The complete water-repellent tech ensures that bad odour trapped in the drainage system cannot pass back into the restroom.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**AUTHORITY / START-UPS / CONSUMER**
A	COVERAGE AND DEPLOYMENT	1	Target facilities covered vs required	% (count vs need)	Start-up / ULB
		2	Beneficiaries served vs expected	% (count vs target)	Start-up / ULB
		3	Spatial coverage of the intended problem area	% / location	Start-up / ULB
		4	Units installed	count	Start-up / ULB
B	OUTPUT AND DELIVERY PERFORMANCE	5	Water consumption per unit vs conventional (before)	litres/flush	Start-up / ULB
		6	Reduction in water consumption after implementation	litres/day	Start-up / ULB
		7	Reduction in wastewater generated from urinals	litres/day	Start-up / ULB
C	TECHNICAL RELIABILITY & PERFORMANCE	8	Cleaning / maintenance frequency required	visits/month	Start-up / ULB
		9	Units with recurring failures / non-functional	count (or %)	Start-up / ULB
		10	Uptime without prolonged breakdown	days	Start-up / ULB

INDICATORS AND PARAMETERS – TO AUTHORITIES

START-UP (Naturesani) - ULB/AUTHORITY					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**AUTHORITY / START-UPS / CONSUMER**
A	RESOURCE & SUPPLY OUTCOME	1	Reduction in sewerage flow from urinals, before vs after	litres/day	ULB / Nodal
B	SYSTEM EFFICIENCY(LOSS/LEAKAGE/BLOCKAGE)	2	Reduction in sewer / drain blockages linked to urinals, before vs after	incidents/month	ULB / Nodal
		3	Reduction in sewerage-related complaints, before vs after	count/month	ULB / Nodal
C	WATER QUALITY & ENVIRONMENTAL OUTCOME	4	Reduction in odour complaints, before vs after	count/month	ULB / Nodal

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (Naturesani) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**AUTHORITY / START-UPS / CONSUMER**
A	SERIVICE EXPERIENCE & SATISFACTION	1	Intended users actually using the waterless urinal	count	Consumer (survey)
		2	Satisfaction with hygiene	Likert	Consumer (survey)
		3	Satisfaction with usability	Likert	Consumer (survey)
		4	Satisfaction with odour	Likert	Consumer (survey)
		5	Satisfaction with overall experience	Likert	Consumer (survey)
		6	Change in perceived odour / cleanliness, before vs after	Likert	Consumer (survey)
		7	Actual benefits achieved vs expected	description	Consumer (survey)

ANNEXURE I

START-UP 9: Smart Terra Urban Water Management (Hyderabad)

INDICATORS AND PARAMETERS – TO OPERATOR

THEME - WATER GOVERNANCE - HYDERABAD					
START-UP (Smart Terra Urban Water Management) - OPERATOR					
Description: SmartTerra has developed AI-powered analytics software that helps water utilities detect water loss issues using data that is already available with them such as billing data or SCADA data.					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	**Coverage & Deployment**	1	Network length / DMAs under analytics	km (or count)	Start-up
		2	Supply volume monitored	MLD	Start-up
		3	Meters / sensors integrated into the platform	count	Start-up
B	**Detection & Monitoring**	4	Leaks / bursts detected per km	events/km	Start-up
		5	Apparent-loss cases flagged (theft, meter error)	count	Start-up
		6	Minimum-night-flow anomalies detected	count	Start-up
		7	Detection accuracy (confirmed / flagged)	%	Start-up
C	**Technical Reliability & Maintenance**	8	Reduction in leak-detection time	% (or days)	Start-up
		9	Model / data uptime	%	Start-up
		10	Predictive alerts issued	count/year	Start-up
		11	Duration of continuous operation	months	Start-up

INDICATORS AND PARAMETERS – TO AUTHORITIES

START-UP (Smart Terra Urban Water Management) - ULB / AUTHORITY					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	**System Efficiency (loss / leakage / blockage)**	1	Reduction in Non-Revenue Water (NRW)	% (or MLD)	ULB / Utility
		2	Reduction in real (physical) losses	MLD (or %)	ULB / Utility
		3	Reduction in apparent (commercial) losses	MLD (or %)	ULB / Utility
		4	Change in Infrastructure Leakage Index (ILI)	index	ULB / Utility
		5	Leak closure rate (repaired / detected)	%	ULB / Utility
		6	Reduction in average repair time	% (or hours)	ULB / Utility
		7	Reduction in pipe bursts / failures	count/year	ULB / Utility
B	**Resource & Supply Outcome**	8	Water saved available for redistribution	MLD	ULB / Utility
C	**Cost & Financial Performance**	9	Additional revenue recovered / billed	Rs/year	ULB / Utility
		10	Production & pumping cost saved on recovered water	Rs/year (or %)	ULB / Utility
D	**Governance, Adoption & Scalability**	11	Data integrated into SCADA / billing system	scale / Y-N	ULB / Utility
		12	NRW staff trained and using the tool	count	ULB / Utility
		13	Use in the utility's official NRW strategy	Y-N	ULB / Utility

INDICATORS AND PARAMETERS – TO CONSUMER

START-UP (Smart Terra Urban Water Management) - CONSUMER					
SL/NO	**INDICATORS**	**SL/NO**	**PARAMETERS**	**UNIT**	**DATA SOURCE**
A	**Service Experience & Satisfaction**	1	Increase in supply hours	hours/day	Consumer (survey)
		2	Reduction in supply interruptions	% (or count)	Consumer (survey)
		3	Consumers perceiving more reliable supply	% of respondents	Consumer (survey)
		4	Overall satisfaction with supply	1-5 scale	Consumer (survey)

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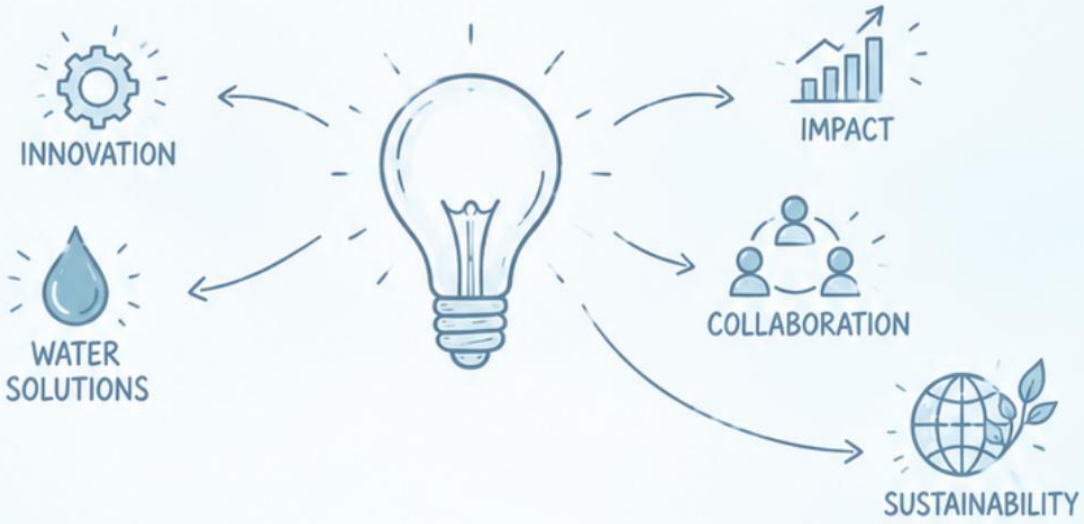

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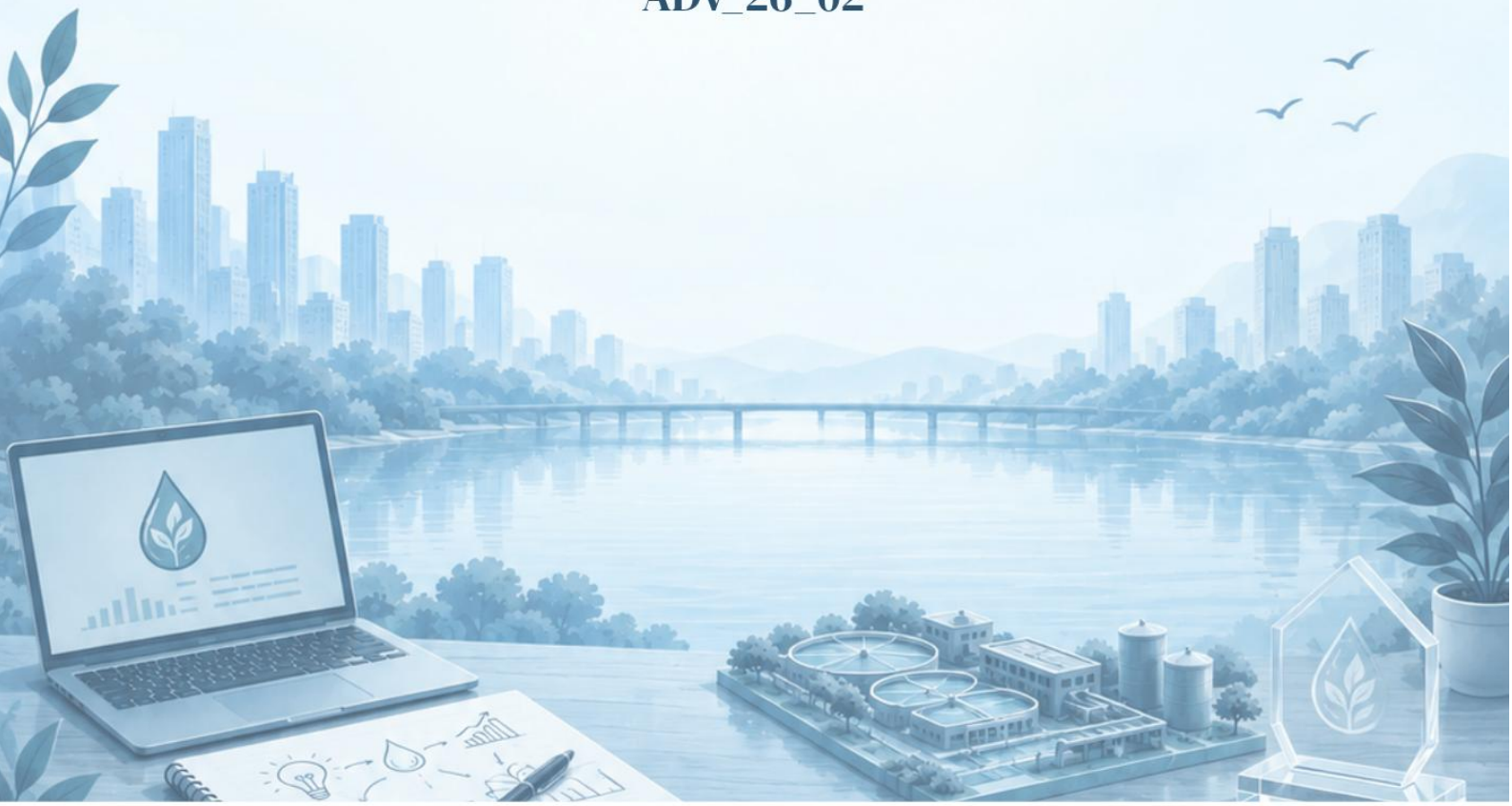

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