



# **Managing Urban Heat, El Niño, Drought and Water Scarcity: Short-Term and Long-Term Water Security Actions for Urban Local Bodies**

**Government of Maharashtra**

In collaboration with Center Water and Sanitation (CWAS)  
CRDF, CEPT University

**11<sup>th</sup> October 2026**



**CWAS** CENTER  
FOR WATER  
AND SANITATION

**CRDF** CEPT RESEARCH  
AND DEVELOPMENT  
FOUNDATION

**CEPT**  
UNIVERSITY

# Droughts declared in 265 out of 358 talukas of Maharashtra

सन २०२६ च्या खरीप हंगामातील  
Trigger-१ (प्रथम कळ) लागू झालेल्या  
२६५ तालुक्यांमध्ये दुष्काळ जाहीर करून  
विविध उपाययोजना व सवलती लागू  
करणेबाबत.

महाराष्ट्र शासन  
मदत व पुनर्वसन विभाग,  
शासन निर्णय क्रमांक:- समिती-२०२६/प्र.क्र.८२/मदत-२  
हुतात्मा राजगुरु चौक, मादाम कामा मार्ग,  
मंत्रालय, मुंबई- ४०००३२  
दिनांक:- २५ सप्टेंबर, २०२६

वाचा:- १) शासन निर्णय क्रमांक: संकिर्ण-२०१७/प्र.क्र.१७३/२०१७/३ दि.०७ ऑक्टोबर, २०१०  
२) शासन निर्णय, क्रमांक: संकिर्ण-२०१७/प्र.क्र.१७३/२०१७/म-७, दि. २८ जून, २०१८  
३) शासन पत्र क्रमांक: एससी वाय-२०२१/प्र.क्र.१००/म-७, दि. १८ ऑक्टोबर, २०२१  
४) शासन निर्णय क्रमांक: एससीवाय-२०२३/प्र.क्र.३७/म-७, दि. ३१ ऑक्टोबर, २०२३  
५) कृषी आयुक्त यांचा अहवाल दि. २४ सप्टेंबर २०२६

## प्रस्तावना:

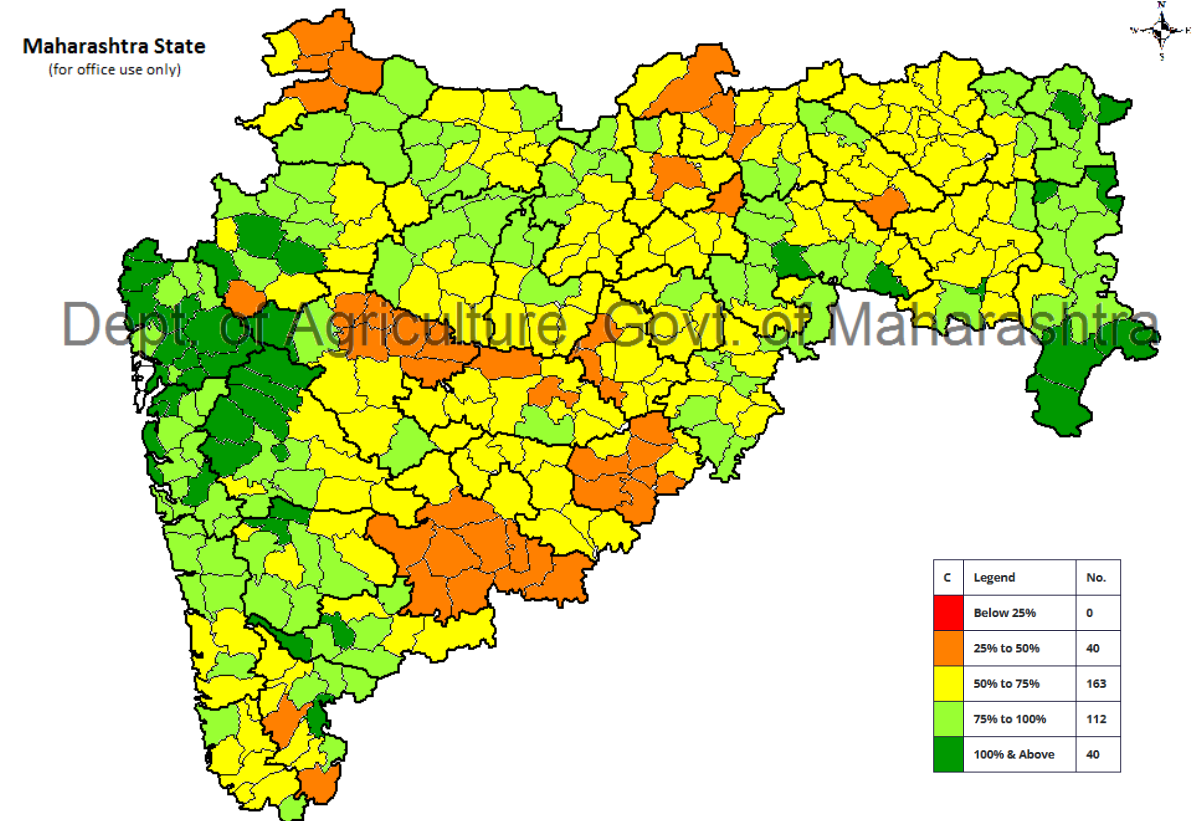
दुष्काळ व्यवस्थापन संहिता २०१६ नुसार राज्यातील दुष्काळी परिस्थितीचे मूल्यांकन करण्याबाबत संदर्भाधीन शासन निर्णय क्रमांक १ व २ अन्वये सविस्तर कार्यपद्धती विहित करण्यात आली आहे. खरीप २०२६ च्या हंगामातील परिस्थितीच्या आधारे राज्यातील २६५ तालुक्यांमध्ये दुष्काळी परिस्थिती असल्याचे Trigger-१ (प्रथम कळ) संदर्भात आयुक्त कृषी यांच्या अहवाला वरून दिसून येते. सदरहू Trigger-१ (प्रथम कळ) नुसार दुष्काळी तालुके घोषित करणे व त्यामध्ये करावयाच्या विविध उपाययोजना व सवलती लागू करण्याची बाब शासनाच्या विचाराधीन होती.

## शासन निर्णय :

राज्यातील तालुक्यांमध्ये जून ते आज पर्यंत या कालावधीतील पर्जन्याची तूट व अन्य घटकांनी प्रभावित झालेल्या २६५ तालुक्यांमध्ये दुष्काळी परिस्थिती असल्याचे आयुक्त, कृषी यांच्या अहवालावरून दिसून येते. सदर २६५ तालुक्यांमध्ये Trigger-१ (प्रथम कळ) लागू असल्यामुळे तिथे पंचनामे करण्याची कार्यवाही जिल्हाधिकारी यांनी तात्काळ सुरु करावी. सर्वेक्षण केलेल्या क्षेत्रातील पिकांची स्थिती दर्शवणारे छायाचित्र व जीपीएस कोऑर्डिनेट संकलन करून पिक परिस्थितीचा अहवाल आयुक्त, कृषी यांच्या मार्फत शासनास तात्काळ सादर करण्यात यावा.

- Due to EL Nino driver dry spells, Maharashtra faced 18% to 19% overall monsoon deficit.
- Due to rainfall deficit, draught declared in 75% of the state.

Tehsil wise Rainfall (as compared to normal rain) from 1st June till October



GR of Government of Maharashtra of declaration of 265 draught Taluka's

# State preparing to brace the draughts

☰ 🔍 Sat, Oct 10, 2026 | New Delhi 30 °C

**HT Hindustan Times**

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## Maharashtra govt orders 10% water cut from October 16 across state amid El Niño concerns

Industries must reuse or recycle at least 30% of water, while irrigation will be allowed only after meeting drinking water, livestock and fodder needs.

Updated on: Oct 5, 2026, 16:49:12 IST

By [Saurabha Kulshreshtha](#)

Prefer HT on Google

- Implement a **minimum 10% water cut** across urban and rural local bodies from 16 October 2026.
- Prioritise **drinking water, livestock and fodder** needs before allocating water for irrigation.
- Reserve **adequate drinking water and maintain an additional 10% emergency stock** in reservoirs until 31 August 2027.
- Prevent water losses by **addressing leakages and unauthorised water extraction**.
- Operate **STPs at full capacity**, maximise treated wastewater **reuse for gardening, construction and washing**.
- Mandate industrial recycling of at least 30% of water consumption.
- **Conduct public awareness** campaigns to promote water conservation.

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## Maharashtra's water crisis deepens: Two-thirds of govt tankers concentrated in just three districts

Abhijeet Patil / Oct 09, 2026, 23:31 IST

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Kolhapur: [Maharashtra's](#) emerging water crisis has pushed an unprecedented 611 govt water tankers into service across 517 villages and 2,147 hamlets, with nearly two-thirds of them operating in just Ahilyanagar, Chhatrapati Sambhajnagar and Beed districts.

Bhima river in Solapur district has dried up and now flows only when water is released from [Ujani dam](#). A state water supply and sanitation department report dated Oct 4 showed tanker deployment across districts — Pune (7), Dharashiv (8), Nashik (15), Jalna (22), Sangli (36), Satara (39) and Solapur (98).

<https://www.hindustantimes.com/india-news/maharashtra-govt-devendra-fadnavis-orders-10-percent-water-cut-from-october-16-amid-el-ni-o-concerns-urban-local-bodies-cities-mumbai-nagpur-pune-101791197416869.html>

<https://timesofindia.indiatimes.com/city/kolhapur/maharashtras-water-crisis-deepens-two-thirds-of-govt-tankers-concentrated-in-just-three-districts/articleshow/134840603.cms>

**You cannot improve what  
you cannot measure!**

**Do we know where do we stand today?**

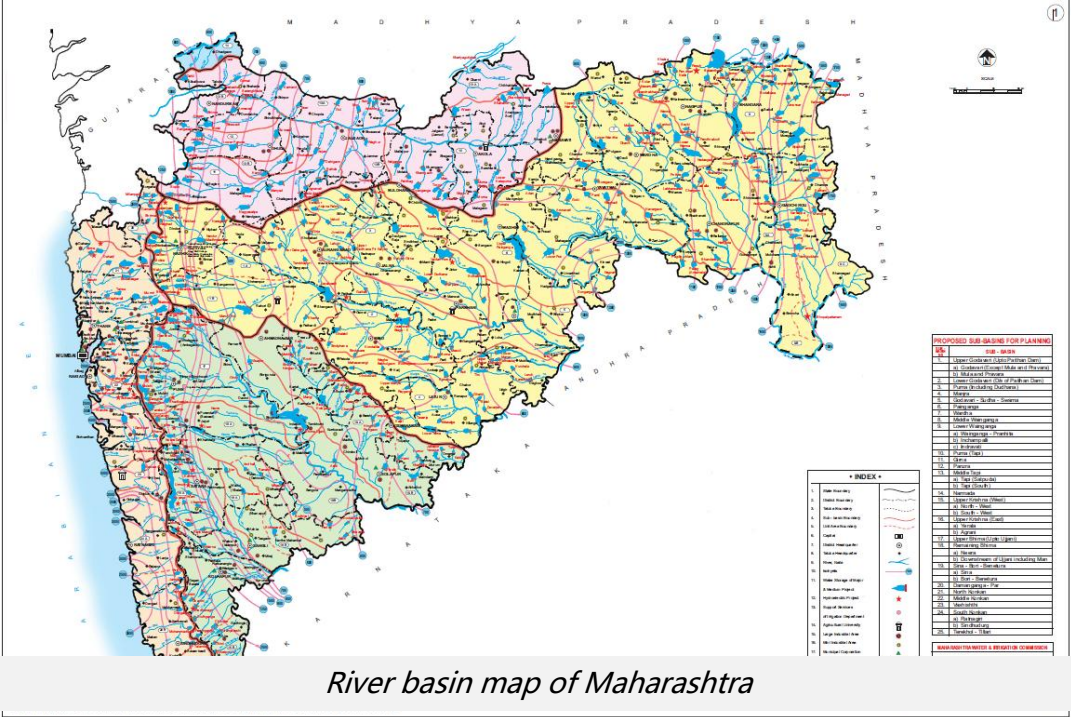
# Total municipal water demand of Maharashtra is ~ 10,000 MLD, with 60% dependency on surface sources

Maharashtra’s depend on five major river basin systems —Godavari, Krishna, Tapi, Narmada, and West-Flowing Rivers.

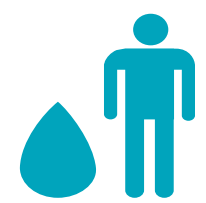
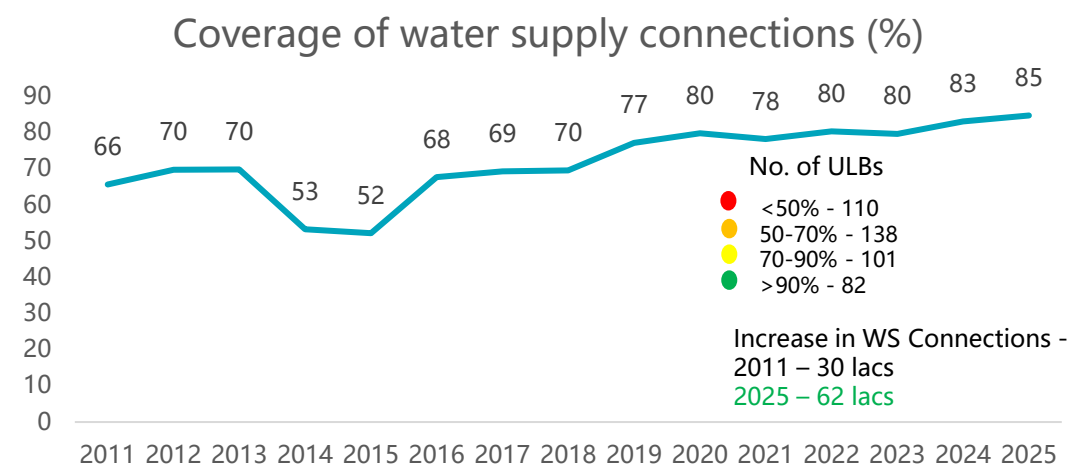
- The four east-flowing basins (Krishna, Godavari, Tapi and Narmada) have only 55% of the dependable yield, despite supporting 92% of cultivable land and over 60% of the rural population.
- Nearly 49% of these basins’ area, inhabited by 43% of their population, is water-deficit or highly water-deficit.
- 45% of the state’s water resources come from west-flowing, largely monsoon-dependent rivers, which cannot be fully utilized

River Basins in Maharashtra

| S.No | Name of Basin | Geographical area (Mha) / Percent of Area w.r. to Maharashtra | Culturable area (Mha) | Annual Average Availability (Mm3) | 75% Dependable yield (Mm3) / Percentage with respect to state | Permissible use as per Tribunal award / committee report (Mm3) |
|------|---------------|---------------------------------------------------------------|-----------------------|-----------------------------------|---------------------------------------------------------------|----------------------------------------------------------------|
| 1    | Godavari      | 15.43 / 49.5%                                                 | 11.25                 | 50880                             | 37300 / (28.35%)                                              | 34185                                                          |
| 2    | Tapi          | 5.12 / 16.7%                                                  | 3.73                  | 9118                              | 6977 / (5.30%)                                                | 5415                                                           |
| 3    | Narmada       | 0.16 / 0.5 %                                                  | 0.06                  | 580                               | 315 / (0.24%)                                                 | 308                                                            |
| 4    | Krishna       | 7.01 / 22.6%                                                  | 5.63                  | 34032                             | 28371 / (21.56%)                                              | 16818                                                          |
| 5    | West Flowing  | 3.16 / 10.7%                                                  | 1.86                  | 69210                             | 58599 / (44.54%)                                              | * 69210                                                        |
| 6    | Maharashtra   | 30.80 / 100.0%                                                | 22.53                 | 163820                            | 131562 / (100%)                                               | 125936                                                         |



# Maharashtra's Urban Water Scenario: Improving Access, Persistent Gaps



Per Capita Water Availability in 2011 **119 Lpcd**

Per Capita Water Availability in 2025 **132 Lpcd**



Duration of Supply in Hrs in 2011 **2.9 Hrs**

Duration of supply in 2025 **3.8 Hrs**



Water Coverage Status in State 2025 **85%**

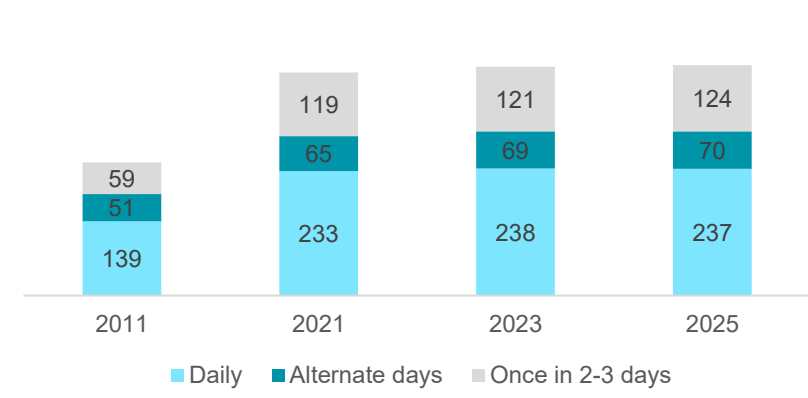
Water Coverage Status in SLUM 2025 **82%**



Extent of NRW in 2011 **28%**

Extent of NRW in 2025 **24.2%**

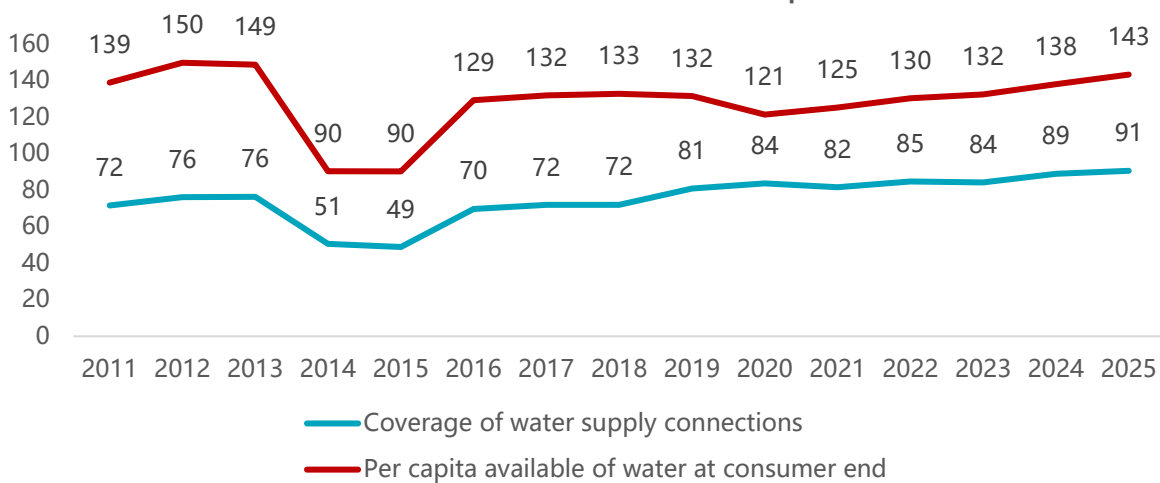
Maharashtra- Days of water supply



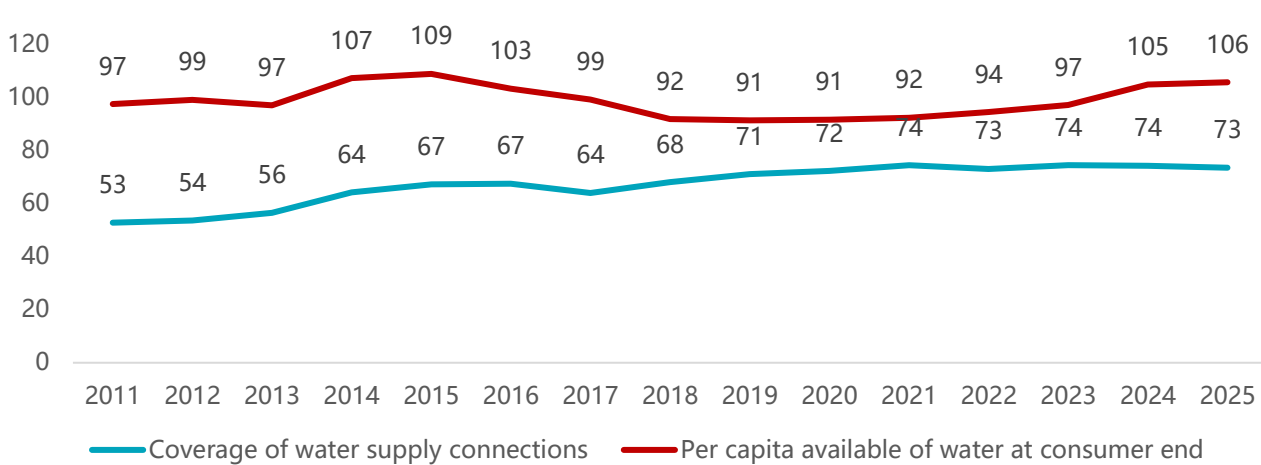
- Maharashtra has made significant progress in expanding daily water supply coverage since 2011.
- However, the increase in the number of ULBs providing daily water supply has been modest between 2021 and 2025, indicating the need for continued efforts.

# Water access has improved, but availability per household is still a concern in small and medium towns

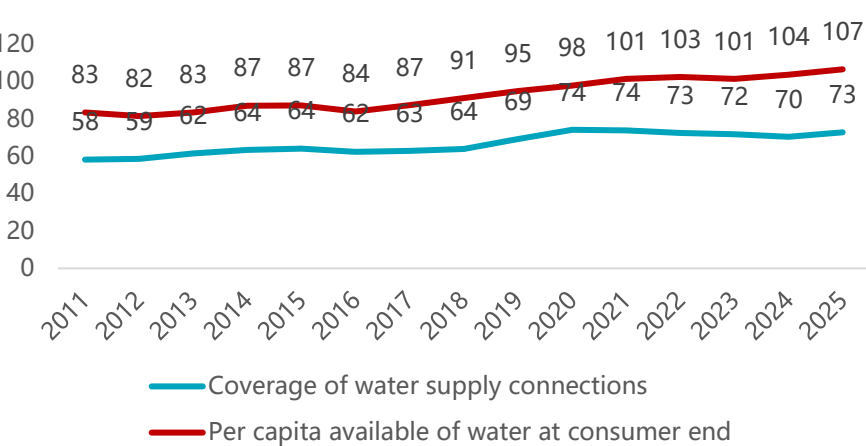
Cov of WS vs LPCD in Mun. Corporations



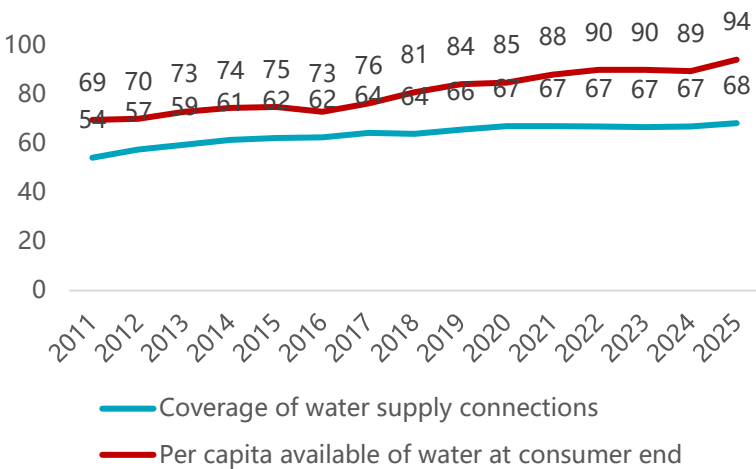
Cov of WS vs LPCD in Class A



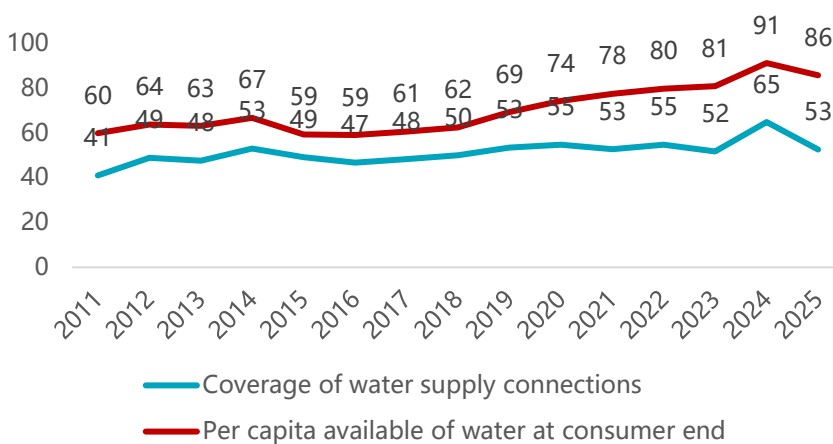
Cov of WS vs LPCD in Class B



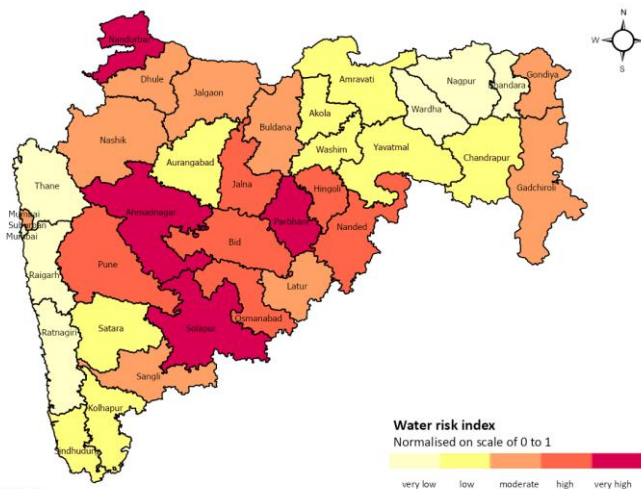
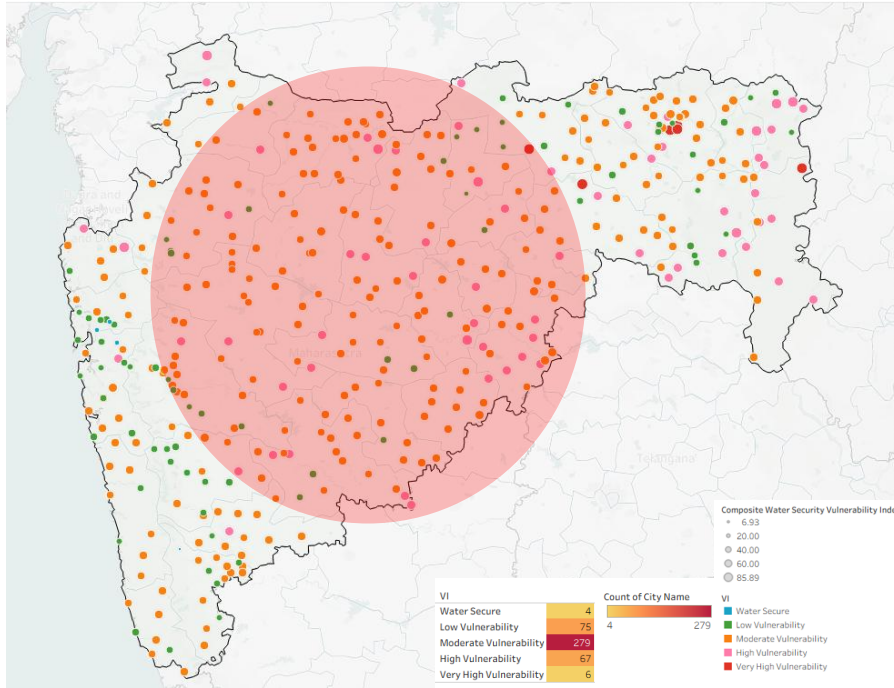
Cov of WS vs LPCD in Class C



Cov of WS vs LPCD in Class NP



# Water security vulnerability assessment of ULBs in Maharashtra



- **Water Security Vulnerability Index (WSVI)**, a composite index developed using water supply indicators to identify ULBs facing water security challenges. It combines key indicators such as **water supply coverage, LPCD, continuity of supply, metering, NRW, and water quality** into a single score ranging from 0 to 100, where a higher score indicates greater vulnerability.
- The index is calculated by converting each indicator into a vulnerability score based on its gap from the desired benchmark and then averaging the scores:

$$WSVI = \frac{\sum \text{Vulnerability Scores}}{\text{Number of Indicators}}$$

- ULBs can be classified as **Water Secure (0–20)**, **Low Vulnerability (20–40)**, **Moderate Vulnerability (40–60)**, **High Vulnerability (60–80)**, and **Very High Vulnerability (80–100)**. The index helps identify priority cities for interventions related to water security, NRW reduction, metering, and service improvements.

- Districts such as **Dharashiv, Chh. Sambhajinagar, Ahilyanagar, Nandurbar, Solapur, Nashik, Beed and Latur** exhibit higher water security vulnerabilities.
- This also reflects in the water risk index map of the State Climate Action Plan

# **What actions municipal decision makers should take?**

# **10 questions each municipal administrator should ask**

- 1. How many days of water do we have?**
- 2. What happens if our main source falls by 30 to 50%?**
- 3. What is our minimum essential water requirement?**
- 4. Which neighbourhoods are most vulnerable?**
- 5. Which users get priority?**
- 6. How much water can we save immediately?**
- 7. How much water can wastewater reuse provide?**
- 8. How many tankers/emergency sources are actually available?**
- 9. Who takes the decision when the trigger is reached?**
- 10. What action happens tomorrow morning—not next year?**

# Water Emergency Ladder: Self-assessment of your city



|                |          |                                                    |                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                  |
|----------------|----------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Lower severity | <b>1</b> | <b>NORMAL</b><br>Prepare and conserve              | <b>Typical trigger / condition</b> <ul style="list-style-type: none"> <li>• Adequate water availability</li> <li>• Normal rainfall and source conditions</li> </ul>                                                         | <b>Key actions (examples)</b> <ul style="list-style-type: none"> <li>• Routine monitoring of sources, demand and water quality</li> <li>• Preventive maintenance and leak detection</li> <li>• Promote regular water conservation</li> <li>• Build drought preparedness and strengthen infrastructure</li> </ul> |
|                | <b>2</b> | <b>WATCH</b><br>Early warning                      | <b>Typical trigger / condition</b> <ul style="list-style-type: none"> <li>• Early decline in reservoir levels</li> <li>• Below-normal rainfall forecast</li> <li>• Potential risk of supply shortfall</li> </ul>            | <b>Key actions (examples)</b> <ul style="list-style-type: none"> <li>• Intensify monitoring and data review</li> <li>• Alert departments and stakeholders</li> <li>• Promote voluntary conservation</li> <li>• Prepare for possible restrictions</li> </ul>                                                      |
|                | <b>3</b> | <b>ALERT</b><br>Reduce demand                      | <b>Typical trigger / condition</b> <ul style="list-style-type: none"> <li>• Declining reservoir/storage levels</li> <li>• Projected supply duration reducing</li> <li>• Increasing demand or higher water losses</li> </ul> | <b>Key actions (examples)</b> <ul style="list-style-type: none"> <li>• Implement restrictions on non-essential uses</li> <li>• Intensify conservation measures</li> <li>• Promote reuse of treated wastewater (non-potable)</li> <li>• Public communication and awareness</li> </ul>                             |
|                | <b>4</b> | <b>SEVERE</b><br>Activate contingency measures     | <b>Typical trigger / condition</b> <ul style="list-style-type: none"> <li>• Low reservoir/storage levels</li> <li>• Reduced source yield</li> <li>• Supply hours significantly reduced</li> </ul>                           | <b>Key actions (examples)</b> <ul style="list-style-type: none"> <li>• Implement approved supply schedules</li> <li>• Activate alternative sources</li> <li>• Intensify leakage control and repairs</li> <li>• Provide targeted emergency supply to vulnerable areas</li> </ul>                                  |
| High severity  | <b>5</b> | <b>EMERGENCY</b><br>Protect essential water supply | <b>Typical trigger / condition</b> <ul style="list-style-type: none"> <li>• Very low reservoir/storage levels</li> <li>• Supply available for a short period only</li> <li>• Widespread supply interruptions</li> </ul>     | <b>Key actions (examples)</b> <ul style="list-style-type: none"> <li>• Activate emergency command and coordination</li> <li>• Deploy tankers and temporary sources</li> <li>• Prioritise drinking water and critical services</li> <li>• Ensure water quality and access for vulnerable communities</li> </ul>   |

# Prepare Water Contingency Plan



## 1. Prioritise Drinking Water:

Protect essential domestic water supply and public health by assessing available water stocks and reserving adequate supplies for drinking.

## 2. Manage Demand Proactively :

Establish phased conservation measures and predefined shortage triggers to reduce non-essential consumption before supplies become critical.

## 3. Ensure Equitable Water Distribution:

Identify vulnerable settlements and underserved areas, and prepare alternative supply arrangements, including verified backup sources and tankers when necessary.

## 4. Minimise Water Losses:

Detect and repair pipeline leakages, monitor water losses and improve distribution efficiency to conserve available supplies.

## 5. Protect public health and service continuity

Maintain safe drinking-water quality through regular testing, treatment and disinfection, while ensuring continuity of essential sanitation and healthcare services during shortages.

## 6. Strengthen Long-Term Water Resilience:

Promote rainwater harvesting, groundwater recharge, restoration of water sources and treated wastewater reuse for suitable non-potable purposes.

## 7. Strengthen Coordination & Accountability

Define departmental responsibilities, funding, emergency response measures and monitoring mechanisms across ULBs and relevant government agencies.



# Urban water management approach

**Drought is a supply shock but the severity of the crisis depends on how the city manages its entire water system.**

## **Source protection**

### **Tracking water availability**

Reservoirs, rivers, groundwater, transfers, reuse and treatment capacity.

## **Water use efficiency**

### **Tracking water lost or wasted**

Network leaks, household leaks, overflow, inefficient uses and poor measurement.

## **Service reliability and Equity**

### **Water fairly delivered**

Reliable access to essential household needs, hospitals, sanitation and critical services.

**Management objective: Measure first, act early, protect basic needs, and publish results.**

**Close the gap between dependable supply and essential demand before emergency rationing becomes unavoidable.**

# Step 1: Know your water source and their availability

**Objective: Establish how much water is available, where it is going and where immediate savings are possible.**

| Action                       | How to implement                                                                             | Target within 7 days                                             | Evidence to maintain                                     |
|------------------------------|----------------------------------------------------------------------------------------------|------------------------------------------------------------------|----------------------------------------------------------|
| 1. Prepare a water balance   | Record water received from each source, water treated and water supplied to the city         | 100% of major water sources and treatment plants covered         | Daily source-wise water register                         |
| 2. Identify major leakages   | Ask engineers and ward teams to inspect pipelines, valves, ESRs and pumping stations         | Identify top 10 major leakages; prioritise repairs within 7 days | Geo-tagged photos, complaint register and repair records |
| 3. Check reservoir storage   | Record water levels and usable storage in dams, reservoirs and ESRs                          | Assess available storage and estimated days of supply            | Reservoir-level register                                 |
| 4. Identify high water users | List municipal gardens, public buildings, markets, institutions and other bulk consumers     | Inspect at least 20 high-consumption locations, where available  | Inspection checklist and meter readings                  |
| 5. Establish the baseline    | Calculate average daily water supplied over the previous 7–30 days, using comparable records | One baseline figure in MLD                                       | Signed baseline sheet                                    |

## Step 2: Implement water-saving measures

**Objective: Convert the baseline into measurable reductions in water losses.**

| Action                          | How to implement                                                             | Proposed target                                             | Evidence                                        |
|---------------------------------|------------------------------------------------------------------------------|-------------------------------------------------------------|-------------------------------------------------|
| 1. Repair leakages              | Deploy municipal plumbers and contractors to repair identified leaks         | Complete priority repairs; review all 10 locations          | Before-and-after photos, repair dates           |
| 2. Reduce avoidable consumption | Stop potable-water use for road washing, fountains and unnecessary gardening | Inspect and address 100% of identified municipal facilities | Inspection reports and revised schedules        |
| 3. Optimise pumping             | Match pumping hours with demand; avoid overflow from ESRs and sumps          | Check all major pumping stations and ESRs                   | Pump operating log and overflow register        |
| 4. Improve distribution         | Review valve operations and supply timings, especially in tail-end areas     | Review all wards; resolve priority supply imbalances        | Ward-wise supply schedule and complaint records |
| 5. Monitor water supplied       | Record source-wise production and distribution daily                         | Daily reporting by the engineering team                     | Daily MLD dashboard                             |

## Step 3: Alternative water management plan

**Objective: Reduce the demand for freshwater by substituting suitable non-potable uses with treated wastewater or other safe alternative sources**

| Action                         | How to implement                                                                                           | Proposed target by Day 30                                                | Evidence                                                 |
|--------------------------------|------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------------------------|
| 1. Identify treated wastewater | Check STP output, treatment quality and current reuse                                                      | Prepare an inventory of all operational STPs and available treated water | STP logbook and quality-test reports                     |
| 2. Identify reuse users        | Contact construction sites, municipal gardens, road-maintenance teams and suitable industries              | Identify at least 3 potential reuse users, where available               | User list with estimated daily demand                    |
| 3. Start reuse arrangements    | Arrange tanker supply or existing non-potable connections after checking treatment quality and suitability | Start at least 1 feasible reuse arrangement                              | Delivery log, meter readings and user acknowledgement    |
| 4. Monitor weekly savings      | Compare current supply with the baseline and record leakage repairs and alternative-water use              | Four weekly reviews, including the initial baseline review               | Dashboard signed by the responsible engineer             |
| 5. Prepare a longer-term plan  | Identify vulnerable wards, source risks, additional conservation measures and funding needs                | Submit a 6–12-month water-security action plan                           | Approved action plan with timelines and responsibilities |



## **Key actions and evidences from practice**

# Five actions, one operating strategy

- 01 Household leakage** Find and repair leaks on the customer side.
- 02 Demand management** Reduce avoidable consumption across users.
- 03 Non-revenue water** Measure and reduce physical and commercial losses.
- 04 Source monitoring** Forecast shortages and trigger early action.
- 05 Fair rationing/ Equity** Allocate limited supply transparently when needed.

# 1 - Household leakage control

## Where to look

Toilet cisterns • taps • float valves • rooftop tanks • underground service pipes

## How to detect

Close taps and appliances; check whether the meter continues to register use. Inspect for overflow and damp patches.

## How to respond

Repair quickly; record before/after readings; offer subsidised kits and approved plumber lists.

## Target areas

- Target high-use buildings, old housing stock and repeat complaints.
- Regularization of water connection in slums

## Incentives

- Women SHGs groups as 'Jala Sathi' to promote water saving and awareness
- Formal engagement of SHGs + Plumber training to SHGs + Plumber toolkit Building capacity of SHGs to address the leaking taps at household level
- Enable ward helplines, Free repair camps and housing-society accountability.
- Start up innovation + Promote water saving fixtures at household levels

## Penalty provisions

### Upto Rs 25k fine, criminal case for water wastage in Sambhajinagar

Times News Network / Oct 05, 2026, 23:33 IST

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Amol Yedje, municipal commissioner

**Chhatrapati Sambhajinagar:** Residents of Chhatrapati Sambhajinagar city wasting water or not fixing leakages will face a fine of Rs5,000 for first offence, Rs10,000 for second and Rs25,000 plus criminal offence for third time after Oct 15.

Municipal commissioner Amol Yedje has set the Oct 15 deadline for completing all repair works related to household

connections, leaking taps and internal pipelines in the wake of [drought](#) situation. After that, if leakage or wastage is found, penal action will be taken.

## 2 - Demand management – Lessons from Cape Town's Day Zero

*Cape Town's Day Zero was avoided not by finding one new water source, but through a whole-city response combining demand reduction, technology, governance, communication and preparedness.*

**~1,200 MLD**

Cape Town summer demand,  
2015

**~500 MLD**

Reported consumption, early  
2018

**~50 MLD**

Pressure-management savings  
over two months, reported Mar  
2018

**450 MLD**

City target during severe  
restrictions

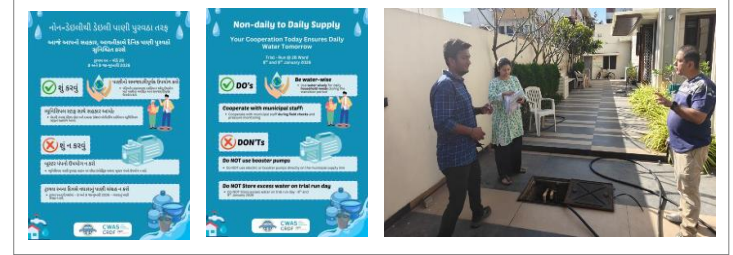
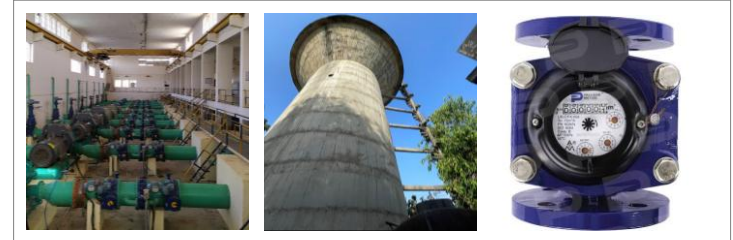
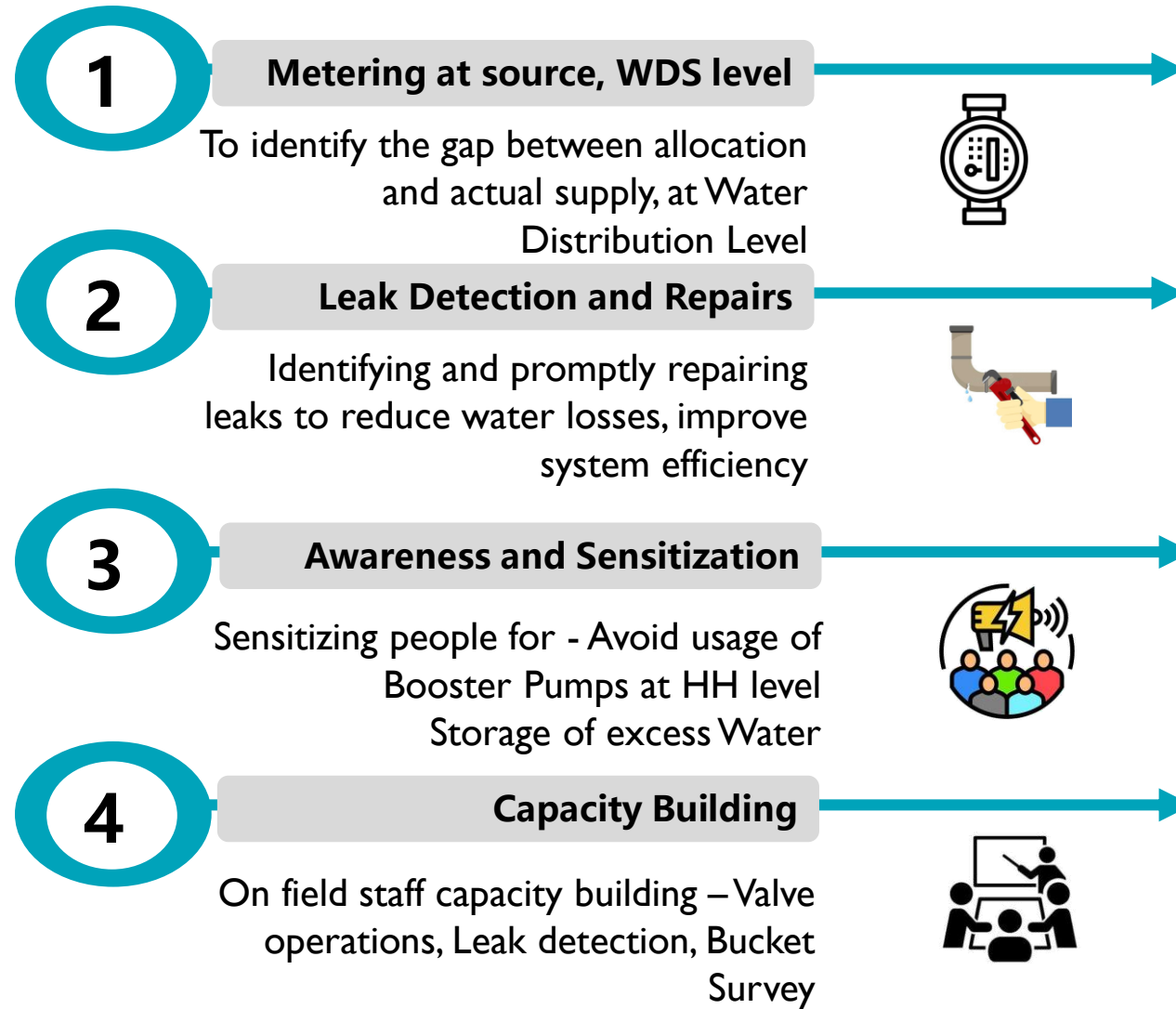
- **Aggressive demand management:** Water restrictions were progressively tightened, eventually targeting **50 litres/person/day**.
- **Pressure management:** The city **reduced water pressure** across supply zones to cut consumption and leakage.
- **Behavior change:** **Daily/weekly public communication**, water dashboards, tariffs and public campaigns encouraged households and businesses to reduce use.
- **Alternative sources:** Groundwater, **water reuse**, **desalination** and **inter-basin transfers** were explored/developed to diversify supply.
- **Emergency preparedness:** The city prepared distribution points and disaster-management arrangements in case Day Zero actually occurred.

### Actions for Indian cities

- Publish a clear water-saving target and weekly progress.
- Restrict potable-water use for discretionary activities.
- Set plans for large commercial and institutional users.
- Use pressure management with hydraulic and water-quality safeguards.

# Demand Management Strategy to move towards Water Security

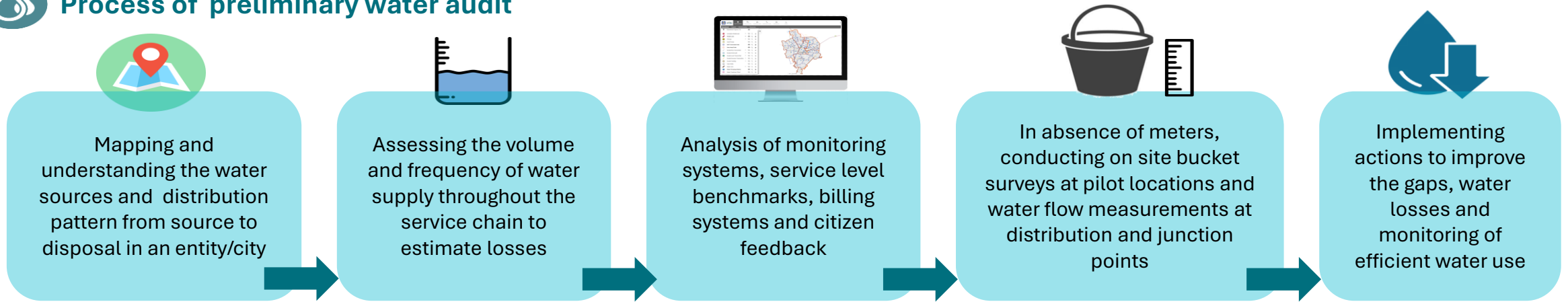
## Learnings from Gandhidham, Gujarat



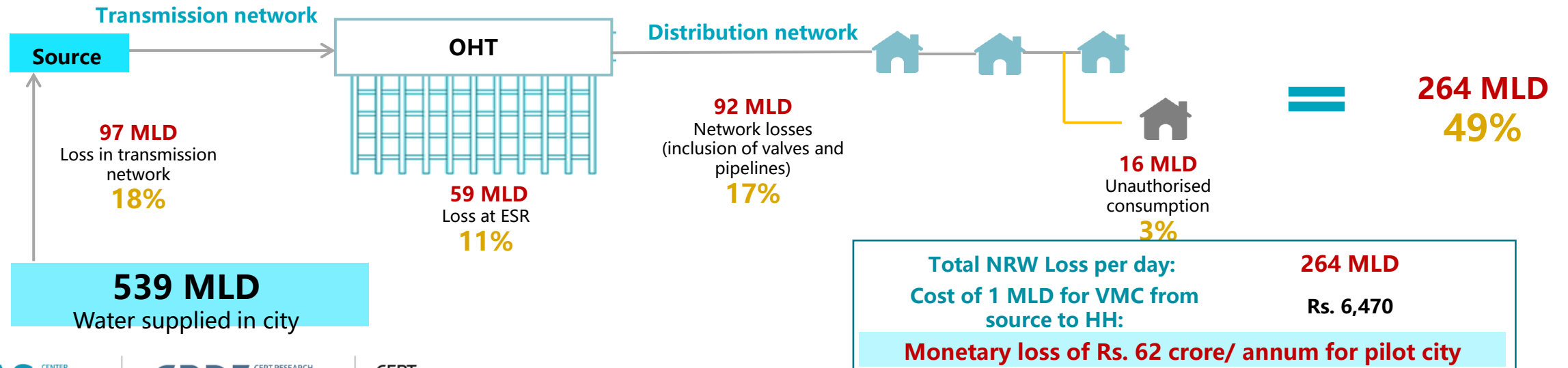
### 3 – Conduct preliminary water audit : ~ 3000 MLD of estimated physical water losses in cities of Maharashtra



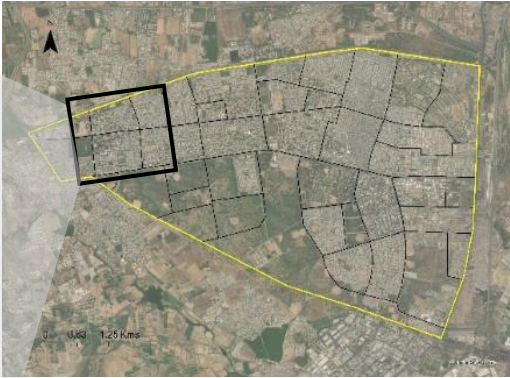
#### Process of preliminary water audit



#### Total NRW Loss from Source to Households – Example from pilot city in Gujarat



# Use complaint data to identify water leakages



Leakages during Trial run

- Distribution Network
- Valve leakages
- ▲ Complaint leakages

| Sr.No | Area Name          | Location                   |
|-------|--------------------|----------------------------|
| A     | 2B Headworks       | 23°04'32.7"N 70°04'42.7"E  |
| B     | SRC Plot (college) | 23°04'15.9"N 70°04'37.0"E  |
| 1     | 2B/257             | 23°04'15.9"N 70°04'37.0"E  |
| 2     | 4A/148             | 23°04'26.0"N 70°05'16.9"E  |
| 3     | 4A/132             | 23°04'26.8"N 70°05'17.0"E  |
| 4     | SDB/48             | 23°04'16.93"N70°04'57.99"E |
| 5     | SDB/135            | 23°04'11.68"N70°04'55.07"E |
| 6     | CBX (7 WALI)       | 23°04'2.08"N70°05'4.88"E   |
| 7     | TBX (12 WALI)      | 23°04'1.43"N70°04'34.08"E  |

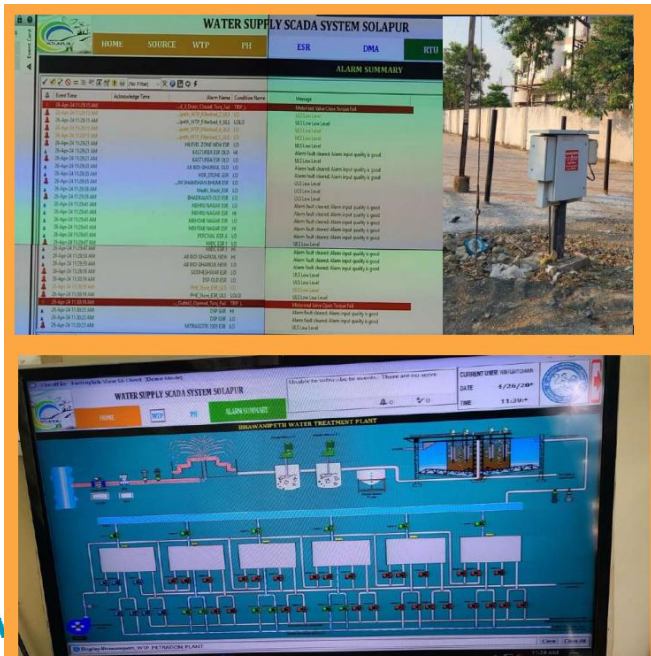
Leakages have been identified at valves and across the distribution network. These issues need to be addressed immediately to reduce Non-Revenue Water (NRW), improve system efficiency, and ensure that the augmented water supply is utilized effectively.

# Digital Solutions for promoting efficiency in water operations

Leveraging AI, IoT, smart sensors and data analytics to enable efficient, reliable and sustainable water supply

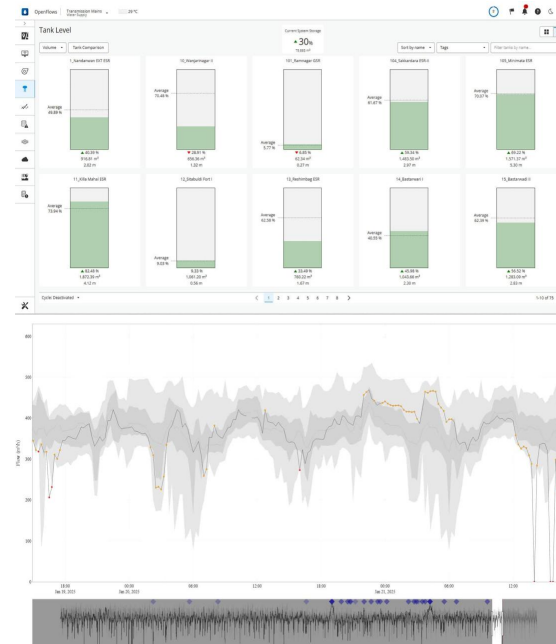
## Solapur – Improving Water Supply System using Information and Communications Technology (ICT) and SCADA systems

- Post implementation of SCADA the city has been made tanker free.
- With the continuous monitoring of water flow and pressures, the water lost due to leakages has been reduced from 42% to 9%.



## Nagpur - Seeing the whole water network through Digital Twin

- The water digital twin unifies SCADA, GIS, and hydraulic modeling data in one platform to provide a real-time view of network performance.



## Chhatrapati Sambhajinagar - Monitoring and Inspection by Robotic Equipment in Water Supply Network



Detecting illegal connections in water supply lines



# 4 - Source monitoring and alternative water management practices

## Setting up a city water emergency cell to monitor and daily reporting to MCs/ COs

### Reservoirs/lakes

Storage, inflows, outflows, usable yield

### Groundwater

Water table, extraction, recharge trends

- Dashboard design at city level
- Optimum use of existing SCADA
- Install real time monitoring systems
- Interoperability of water data from different department
- Explore data sharing APIs for evidence based decision making



# Chennai's 2019 water crisis due to source depletion

## What happened

Severe reservoir depletion coincided with high demand and greater dependence on groundwater and tanker supply.

## What it exposed

Planning must account for source concentration, rainfall variability, groundwater stress and distribution inequity.

## What to strengthen

Reservoir forecasting, recharge protection, emergency logistics, wastewater reuse and public communication.

## A more resilient portfolio

Surface water

Groundwater  
with safeguards

Treated reuse

Rainwater & recharge

Demand savings

# Reuse Potential for Used Water for Maharashtra

## Industrial Reuse



**Cooling Towers**



**Data Centers and IT**



**Chemical Manufacturing**



**Textile Industries**



**Automobiles**

## Agricultural Reuse



**Irrigation**



**Fertilizer Substitute**



**Horticulture**



**Fisheries**

## Ecological Reuse



**Gardening & Landscaping**



**Groundwater Recharge**



**Social and Urban Forestry**



**Water Bodies and Tanks Recharge**



**Other Public Spaces**

## Civic Reuse



**Railways**



**Construction**



**CT and PT Cleaning**



**Fire Department**



**Others (vehicle washing, roads, etc.)**

# Civic and ecological reuse options in city



**Road Washing and Median watering**



**Washing vehicles: Bus station and car service stations**



**Community toilets and Public Toilets cleaning**



**Watering Public parks and gardens**



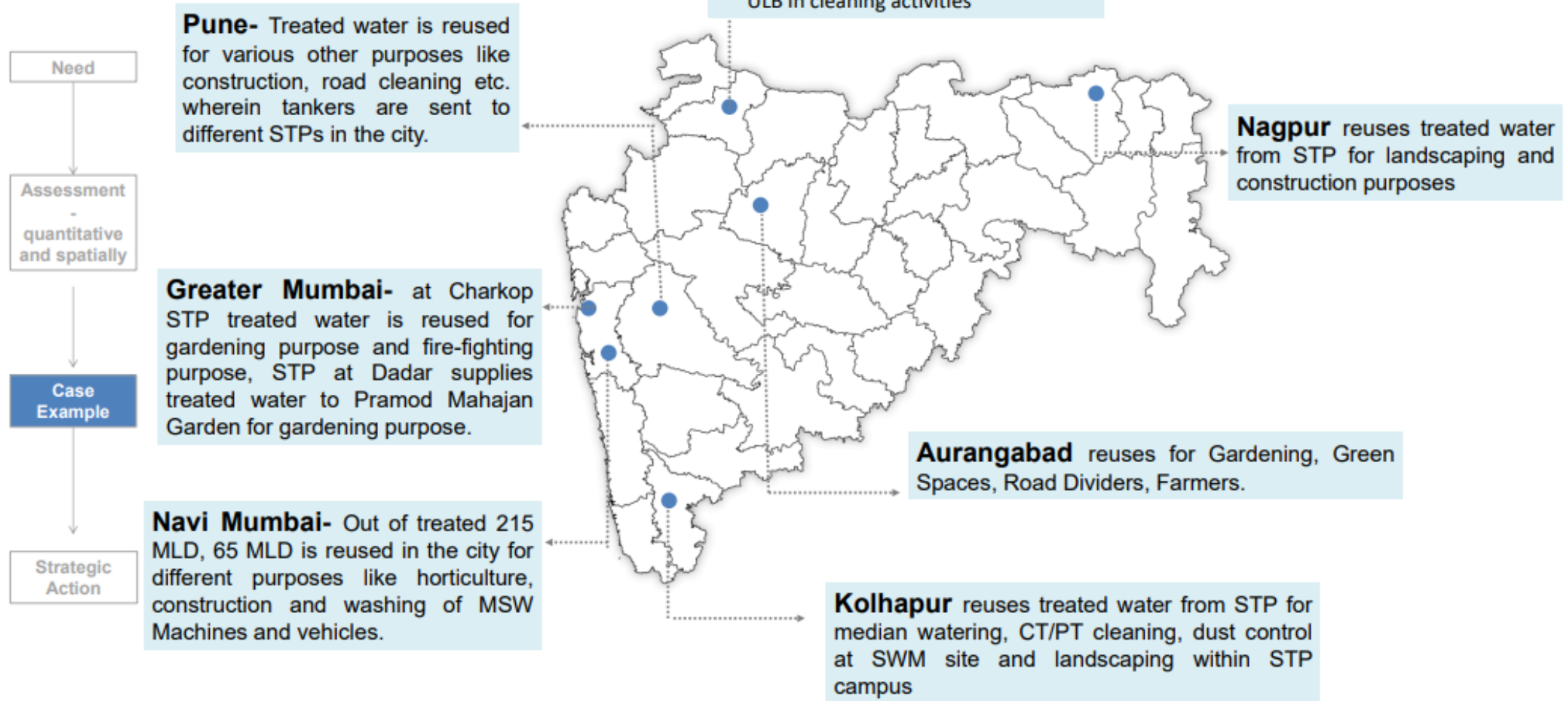
**Water bodies and lake recharge; fisheries and pisciculture**



**Construction works**

# Cases from Maharashtra on reuse of treated water

## Case examples- Maharashtra



# 5 - Ensure equity

1

**Protect public health**

## **Predictable schedules**

Publish supply hours by ward;  
notify residents before changes.

## **Tanker governance**

Map delivery points; track trips,  
volumes, quality and missed  
deliveries.

2

**Guarantee basic household  
needs for poor**

## **Safe storage & quality**

Communicate safe storage; test  
systems as needed after  
interruptions.

## **Anti-hoarding controls**

Monitor illegal resale and ensure  
transparent allocation at public  
points.

3

**Sustain critical services**

## **Vulnerable groups**

Prioritise hospitals, care facilities,  
informal settlements and people  
with mobility constraints.

## **Exit criteria**

Relax restrictions when supply  
outlook and storage show  
sustained improvement.

4

**Restrict discretionary use**

# ULB team need to Preparedness at System and Citizen Levels

Preparedness is required at both the valve operator level and the citizen level to ensure smooth operations and effective transition toward improved water supply.

## 1. Valve Operator Level – Training and Capacity Building

Training and capacity building will be required for valve operators on the following aspects:

- Proper operation of valves
- Timely reporting of leakages
- Identifying and addressing issues such as line breakage, blockages in the system, and pressure-related problems
- Escalation and reporting of issues to the respective Operations & Maintenance (O&M) team

## 2. Citizen Level – Awareness and Sensitization

An awareness drive will be required to sensitize residents on responsible water use. This should include:

- Preventing wastage of water
- Adopting appropriate storage and usage practices
- Understanding the importance of water wastage and reuse

# Community engagement, awareness and capacity building for demand management and long-term water security

## Capacity building



Anjar Area Development Authority (AADA)- Builders, developers Workshop



Teachers Training for RWH in schools



Plumbers Training



Valve operators training – Transitioning from non daily to daily water supply



Sensitization workshop for Architects, builders, developers

## Awareness program



Use of networks of NGOs, CSOs, Industry

Students and teachers awareness program

## Multiple Stakeholder consultations



Focus group discussions with citizens and local residents

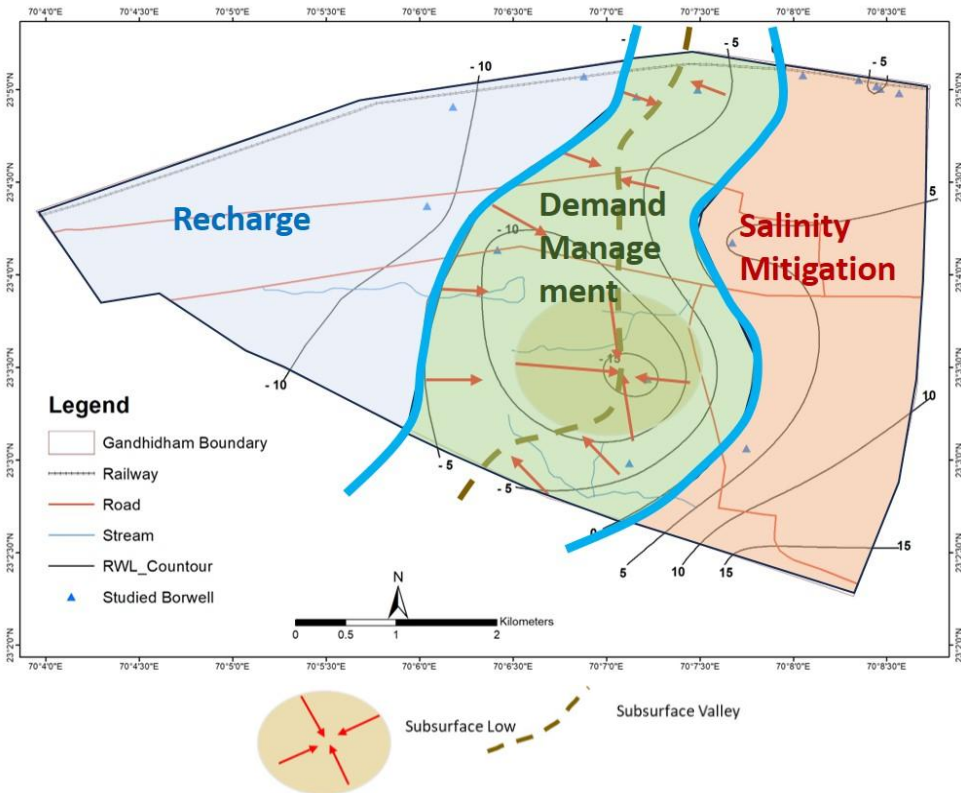
Multiple Stakeholder consultations with govt officials

Field visit to capture good practices in and around Kachchh

# Long term plan: Citywide master plan on Rainwater Harvesting (RWH) and Groundwater Recharge (GWR) supported by Geo-Hydrology study

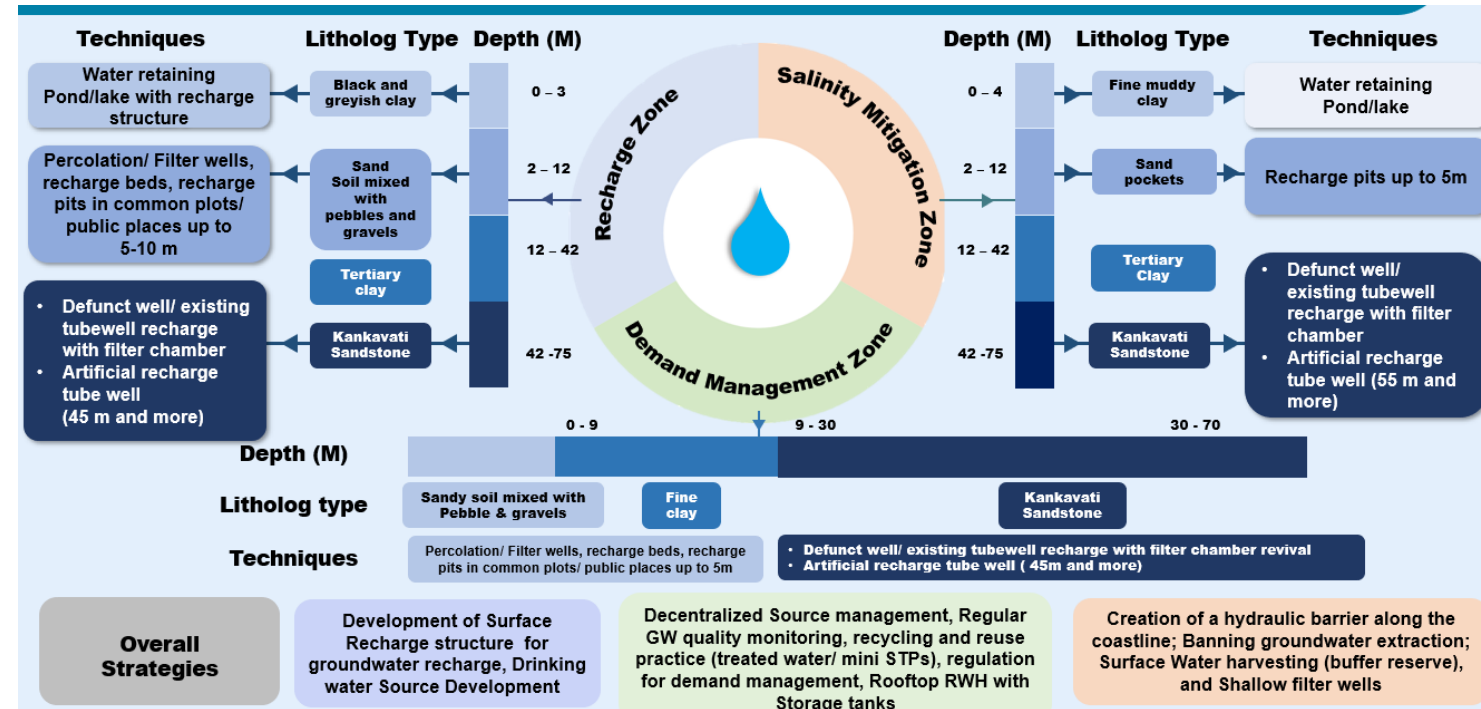
## Geohydrological Study

- For understanding aquifer and watershed of cities
- Developed the - Zone-wise Groundwater recharge strategy
- Identification of potential water recharge Techniques



Zone-wise groundwater recharge strategy chart

## Citywide Scale-up – Rainwater Harvesting (RWH) and Groundwater Recharge (GWR)



# Explore technological innovation

# Fog net/ Fog fence – Sustainable water harvesting from Fog



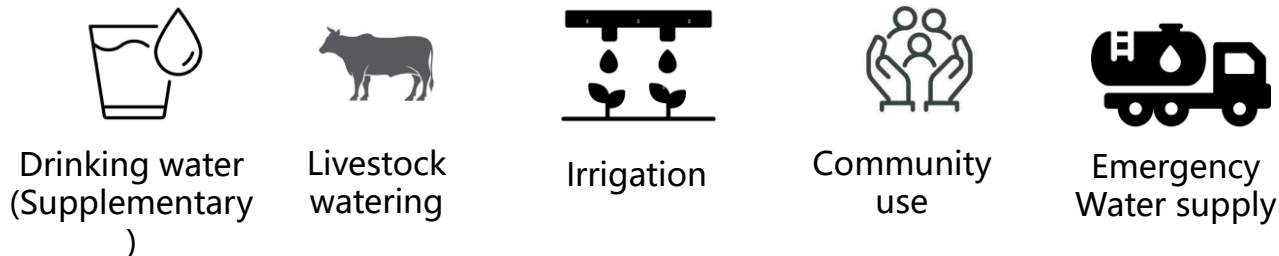
Fog nets are special mesh structures that captures tiny fog droplets suspended in the air. The water droplets collect on the mesh, merge & drip into gutters which are then stored for later use.

Coastal regions High intensity fog regions Emergency water required

## How it works



## Applications



## Advantages

- ✓ Renewable of sustainable water source
- ✓ Low maintenance long life span
- ✓ Reduces dependency on bottled water
- ✓ No energy required for operation
- ✓ Easy to install and scalable
- ✓ Less space required for setup

## Limitations

- ⚠ Effective in fog prone areas
- ⚠ Performance varies with fog intensity & wind
- ⚠ Requires space for installation
- ⚠ Water quality depends on local air condition

## Performance & efficiency (Indicative)

**2 to 20 L/m<sup>3</sup>/day** Fog collection rate  
**>30 fog days/year** Fog frequency required  
**5 to 10 years** Lifespan  
**Low** Maintenance

# Fog Harvesting examples in India

| Sr. | Parameter                         | Small pilot                 | Medium pilot                | Larger pilot                |
|-----|-----------------------------------|-----------------------------|-----------------------------|-----------------------------|
| 1   | Number of sites                   | 1                           | 3                           | 5                           |
| 2   | Mesh area per site                | 20 m <sup>2</sup>           | 20 m <sup>2</sup>           | 50 m <sup>2</sup>           |
| 3   | Total mesh area                   | 20 m <sup>2</sup>           | 60 m <sup>2</sup>           | 250 m <sup>2</sup>          |
| 4   | Assumed yield                     | 0.5–2 L/m <sup>2</sup> /day | 0.5–2 L/m <sup>2</sup> /day | 0.5–2 L/m <sup>2</sup> /day |
| 5   | Potential collection per day      | 10–40 L                     | 30–120 L                    | 125–500 L                   |
| 6   | Potential collection over 30 days | 300–1,200 L                 | 900–3,600 L                 | 3,750–15,000 L              |
| 7   | Storage capacity                  | 100–200 L                   | 300–600 L                   | 1,000–2,000 L               |
| 8   | Indicative setup cost             | ₹25,000–₹60,000             | ₹75,000–₹1.8 lakh           | ₹2.5–₹6 lakh                |
| 9   | Monitoring period                 | 30 days initially           | 30–90 days                  | 3–6 months                  |
| 10  | Primary purpose                   | Test feasibility            | Compare sites               | Assess scale-up potential   |

Costs are indicative planning estimates in Indian rupees, not vendor quotations.

| Location                             | Technology / study               | Reported water yield                |
|--------------------------------------|----------------------------------|-------------------------------------|
| Ettimadai, Western Ghats, Tamil Nadu | Fog-net potential assessment     | 7.67 ± 0.7 L/day per m <sup>2</sup> |
| Lakhpat, Kutch, Gujarat              | Fog-net harvesting potential     | ND                                  |
| Kothara, Kutch, Gujarat              | Dew collection using a condenser | 0.46 L/m <sup>2</sup> /day          |



Source: <https://pubs.aip.org/aip/acp/article-abstract/2521/1/020007/2889101/Efficiency-analysis-and-material-characteristics>, <https://indjst.org/articles/fog-harvesting-a-wind-flow-perspective-in-western-ghats-coimbatore-tamil-nadu>, <https://pmc.ncbi.nlm.nih.gov/articles/PMC7007155/>

# Atmospheric Water Generation (AWG) Solutions for Sustainable Water Security – Turning air into clean reliable drinking water



AWG systems extract moisture from the atmosphere and convert it into clean drinking water through condensation and multistage purification.

## Working Mechanism



### OPERATING CONDITIONS



Relative Humidity  
30–90%  
Best performance  
above 60% RH



Ambient  
Temperature  
18–40°C



Requires  
Electricity  
(or Renewable Energy)

## Applications



**Urban Areas**  
Drinking  
water kiosk



**Govt. office**  
Facing  
problem of  
drinking



**Schools**  
Safe drinking  
water for  
students



**Industries**  
Process water  
gets to  
workers

## Advantages



Produces water without  
extraction from GW



Suitable where piped  
water is unavailable



Decentralized water  
source



Can operate using  
solar PV



Reduces dependency  
on bottled water



Less space required  
for setup

## Limitations



High electricity  
consumption



Performance decreases  
in low humidity



Requires periodic  
maintenance and  
filter replacement



Not suitable where  
primary source supply  
is high

## Performance indicators



**Water production capacity**

40 LPD and greater (depends on unit size)



**Relative Humidity required**

>30% RH



**Ambient temperature**

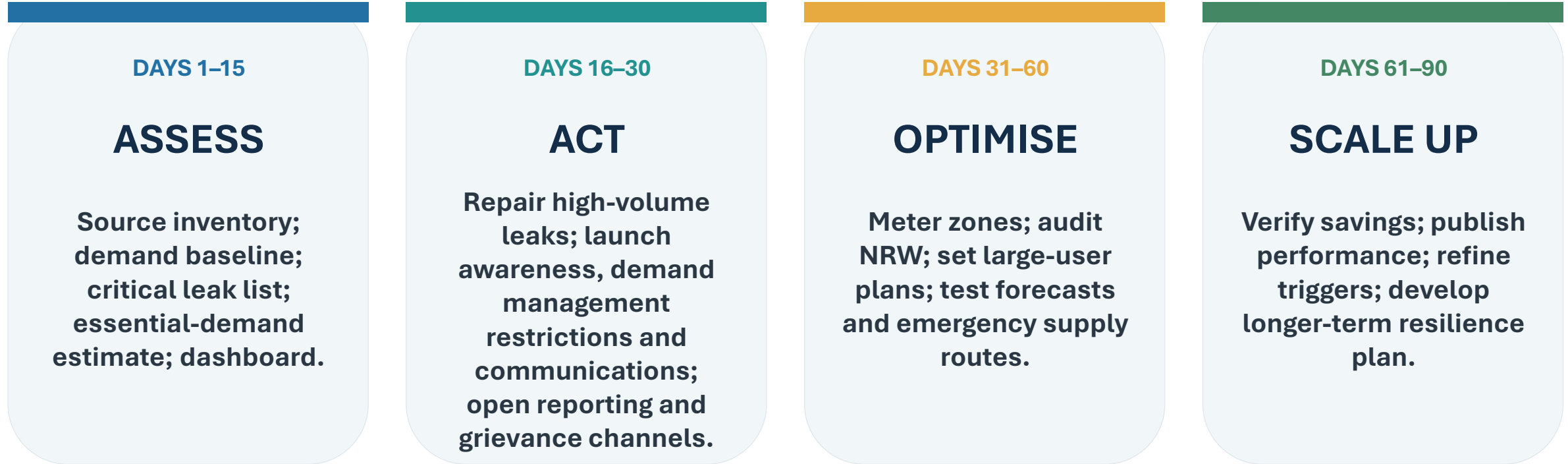
18 degrees – 40 degrees

# AWG Installation across India

| Location                                    | Installation / number of units                                                 | Reported capacity or output                                                                                       |
|---------------------------------------------|--------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Wadji village, Washim district, Maharashtra | 1 reported Meghdoot AWG at a primary school and Anganwadi                      | Approximately 500 litres/day; village population around 2,000                                                     |
| Mumbai Central Railway Division             | 17 kiosks across 6 stations: CSMT, Dadar, Kurla, Thane, Ghatkopar and Vikhroli | A report on CSMT units stated 30–35 litres/hour per unit.                                                         |
| Government schools, Uttarakhand             | 15 units across Dehradun and Tehri Garhwal                                     | 10 units at 60 L/day and 5 units at 150 L/day; combined rated capacity 1,350 L/day.                               |
| Nagaland government schools                 | 22 schools in a reported state-wide initiative                                 | Installation programme reported in March 2026; a combined verified output figure was not available in the source. |
| Citadines OMR, Chennai                      | 4 AWGs in high-traffic areas                                                   | Reduced purchased drinking water by 2,100 litres/month, or about 90%.                                             |
| BEL / CSIR-IICT technology, India           | Technology offered in multiple capacities                                      | Configurations of 30, 100, 500 and 1,000 L/day were announced by the Government of India in 2019.                 |

Source: <https://www.pib.gov.in/newsite/PrintRelease.aspx?lang=2&reg=48&relid=188838>,  
<https://www.capitaland.com/en/investment/our-impact/sustainability/case-studies/air-to-water-chennai.html>,  
<https://www.airowater.com/products/nagaland-education-initiative/>, <https://timesofindia.indiatimes.com/city/dehradun/ukhand-atmospheric-water-generator-units-installed-in-15-schools/articleshow/91844386.cms>, <https://www.maithriaqua.com/post/maithri-aquatech-rewind-2022-23>

# Summary: Call for municipal action



**Frequent Capacity building, local ground level staff, setting up technical cell at city level, Collaboration with corporates and CSO's**

# Resources

1. Singapore: [https://www.youtube.com/watch?v=GgKi2x9od\\_0](https://www.youtube.com/watch?v=GgKi2x9od_0)
2. Capetown - spotlight series of **briefings by experts** - <https://www.drought-response-learning-initiative.org/spotlight-series/>
3. Capetown - <https://www.drought-response-learning-initiative.org/about-the-crisis/>
4. Bengaluru: <https://www.youtube.com/watch?v=jvFk4NsYurA>
5. Surat: <https://www.youtube.com/watch?v=LHS0MgPYD3Q>
6. Garavadi ,Maharashtra: <https://www.youtube.com/watch?v=-8nqnOcoLqE>
7. World Bank (2020) — Shimla urban water and sanitation reforms  
<https://www.worldbank.org/en/results/2020/10/22/transforming-the-urban-water-and-sanitation-sector-in-indias-shimla-city>
8. World Bank (2021) — Shimla Water Supply and Sewerage Services Improvement  
<https://www.worldbank.org/en/news/press-release/2021/11/05/world-bank-to-support-shimla-water-supply-and-sewerage-services-with-another-160-million>

# Contact Details

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# Thank you

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## About us

The Center for Water and Sanitation (CWAS) is a part of CEPT Research and Development Foundation (CRDF) at CEPT University. CWAS undertakes action-research, implementation support, capacity building and advocacy in the field of urban water and sanitation. Acting as a thought catalyst and facilitator, CWAS works closely with all levels of governments - national, state and local to support them in delivering water and sanitation services in an efficient, effective and equitable manner.



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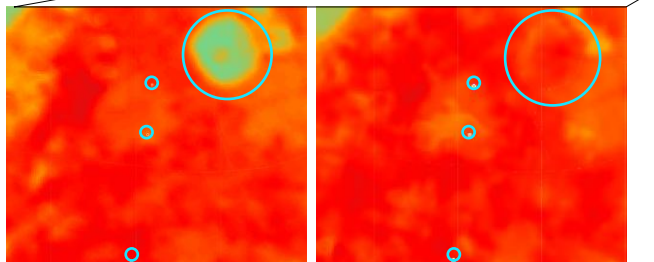
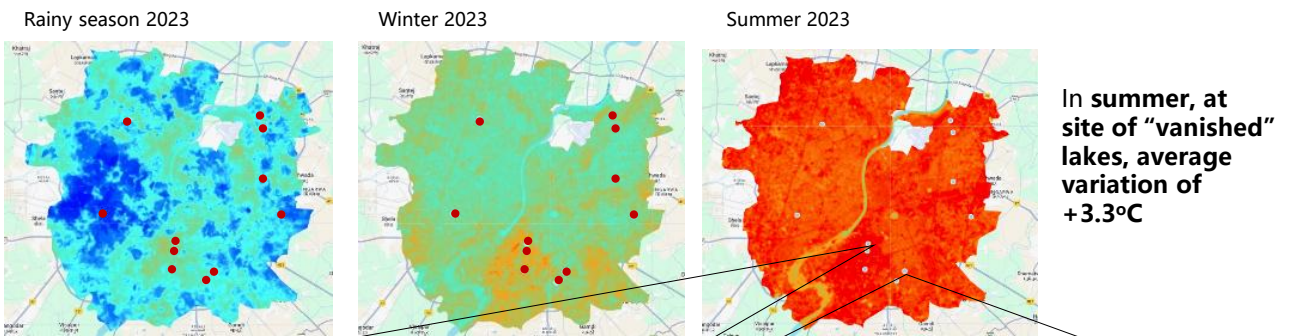
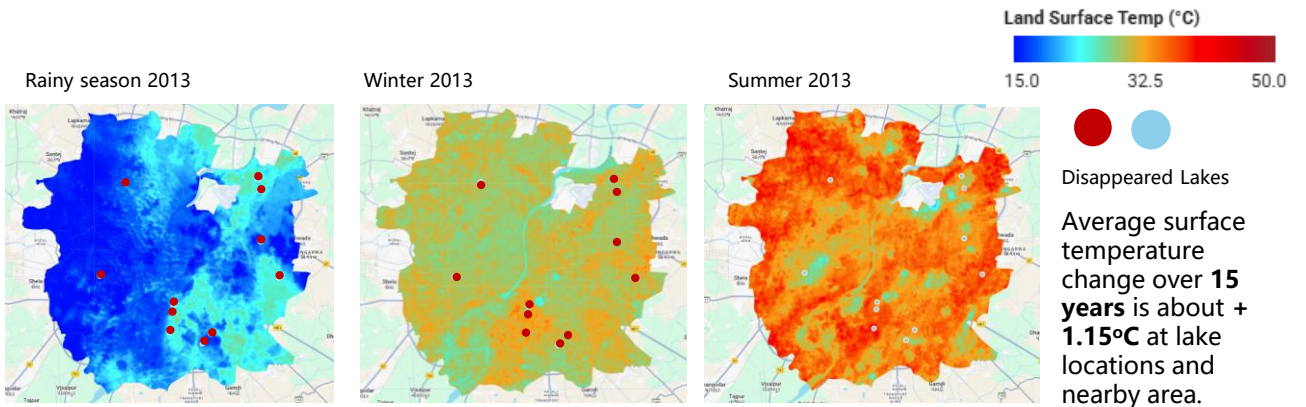
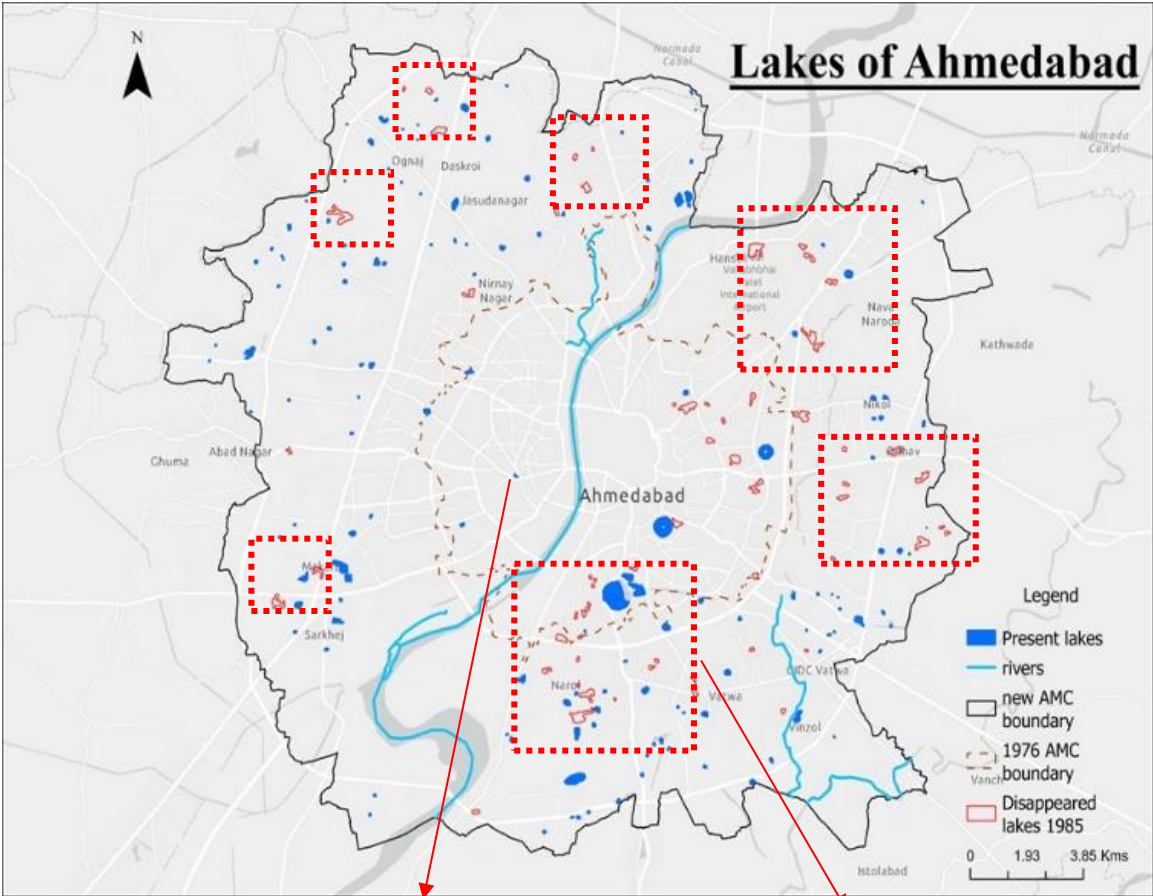
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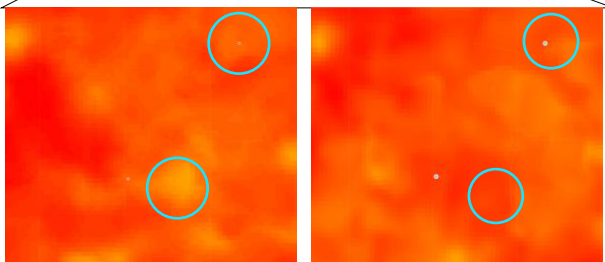
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UNIVERSITY

# Urban temperatures linked to disappeared lakes?

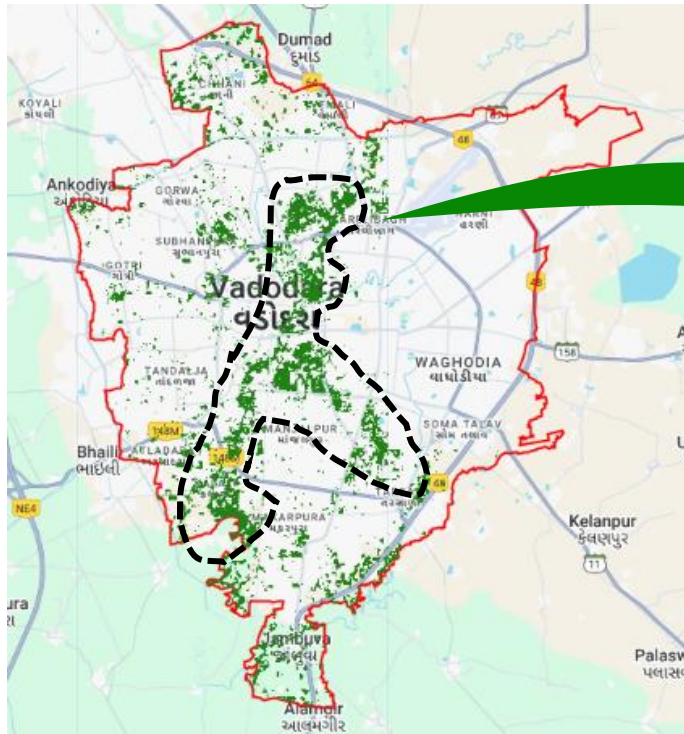


Summer 2009 - 29.2°C Summer 2024 - 39.1°C

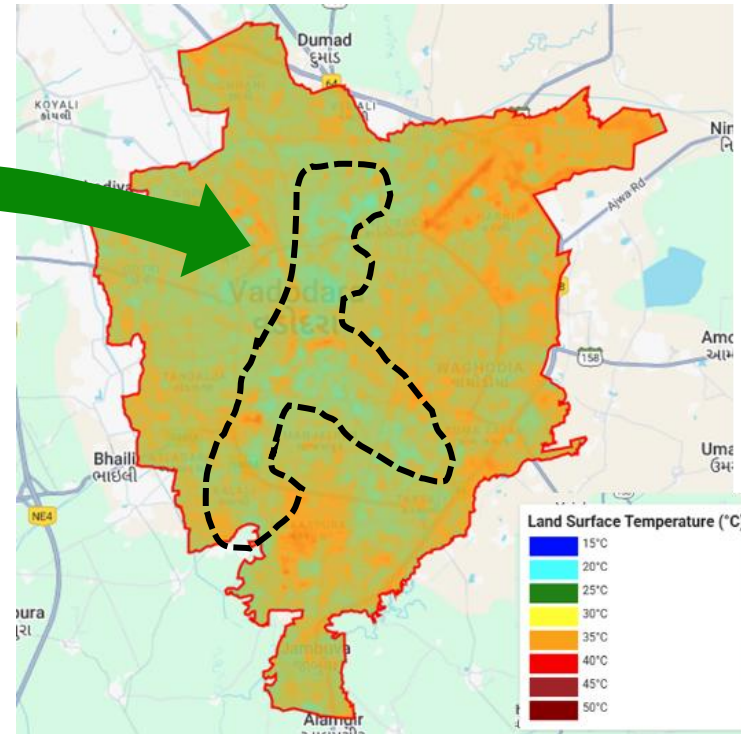


Summer 2009 - 35.7°C Summer 2024 - 37.2°C

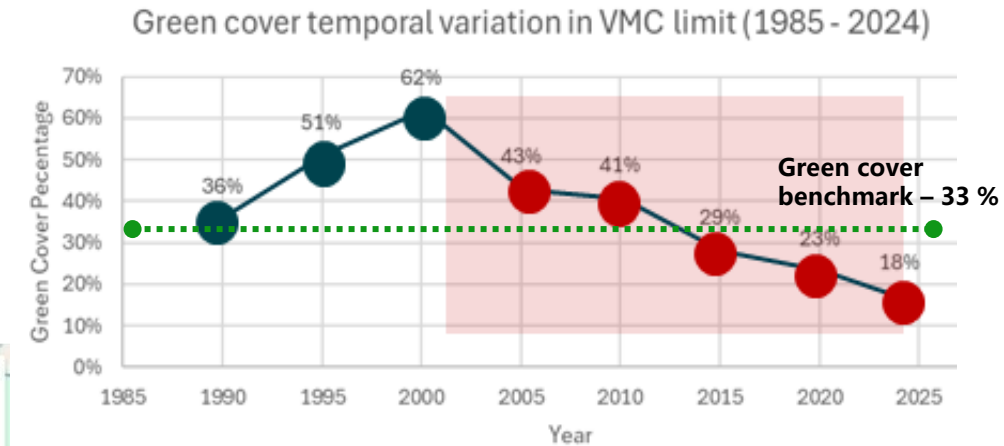
# Increasing urban green coverage can combat rising temperature and heat waves



Green cover across the Vadodara



Land Surface temperature across Vadodara municipal council

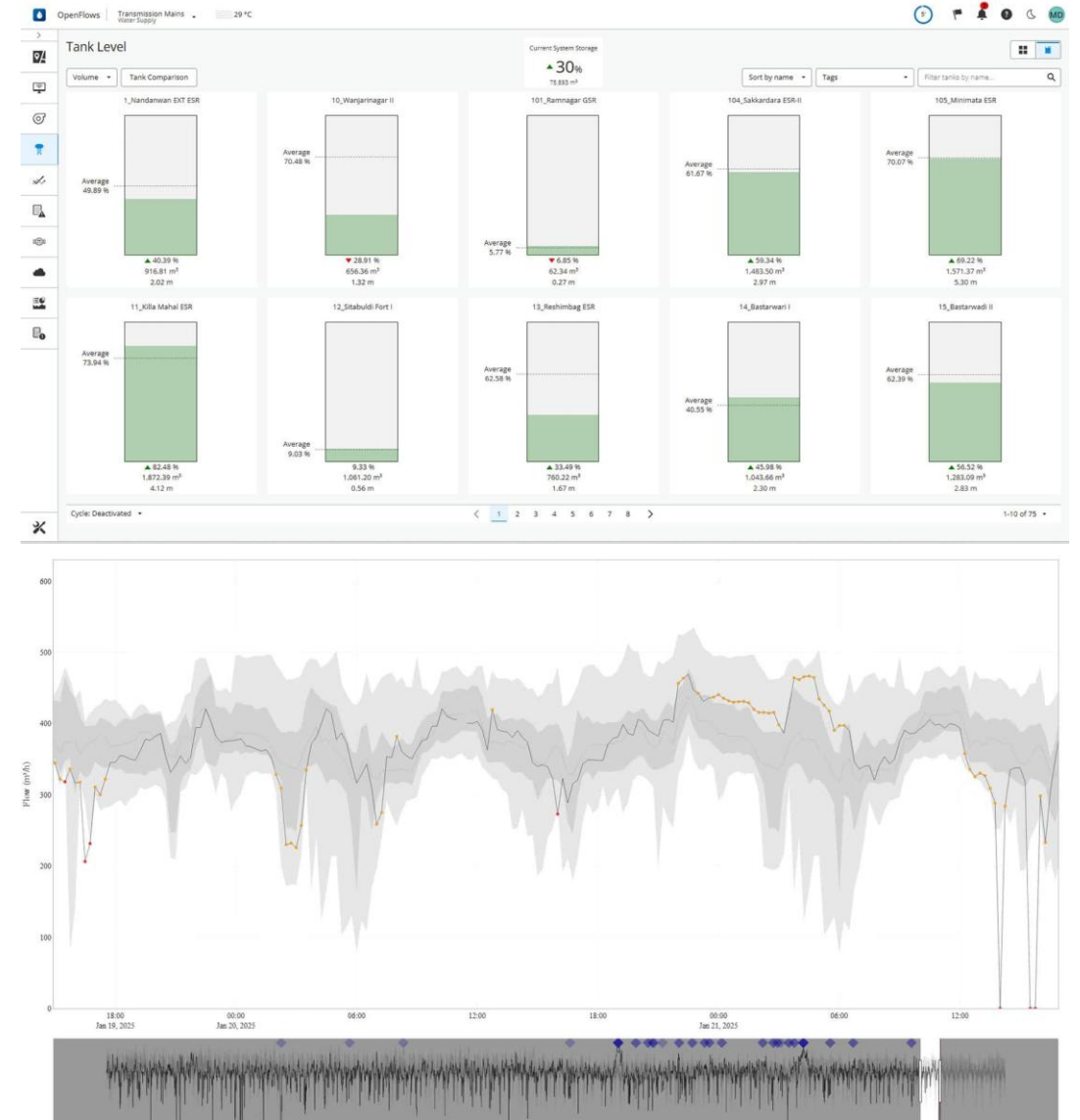


- Reducing % of green cover in Vadodara over the years. Over the last decade, average temp. also increased by  $0.8^{\circ}\text{C}$
- Remote sensing techniques show a relation between green cover and surface temperature.
- Built up expansion and hard surface expansion plays an role in increasing the land surface temperature

# Nagpur - Seeing the whole water network through Digital Twin

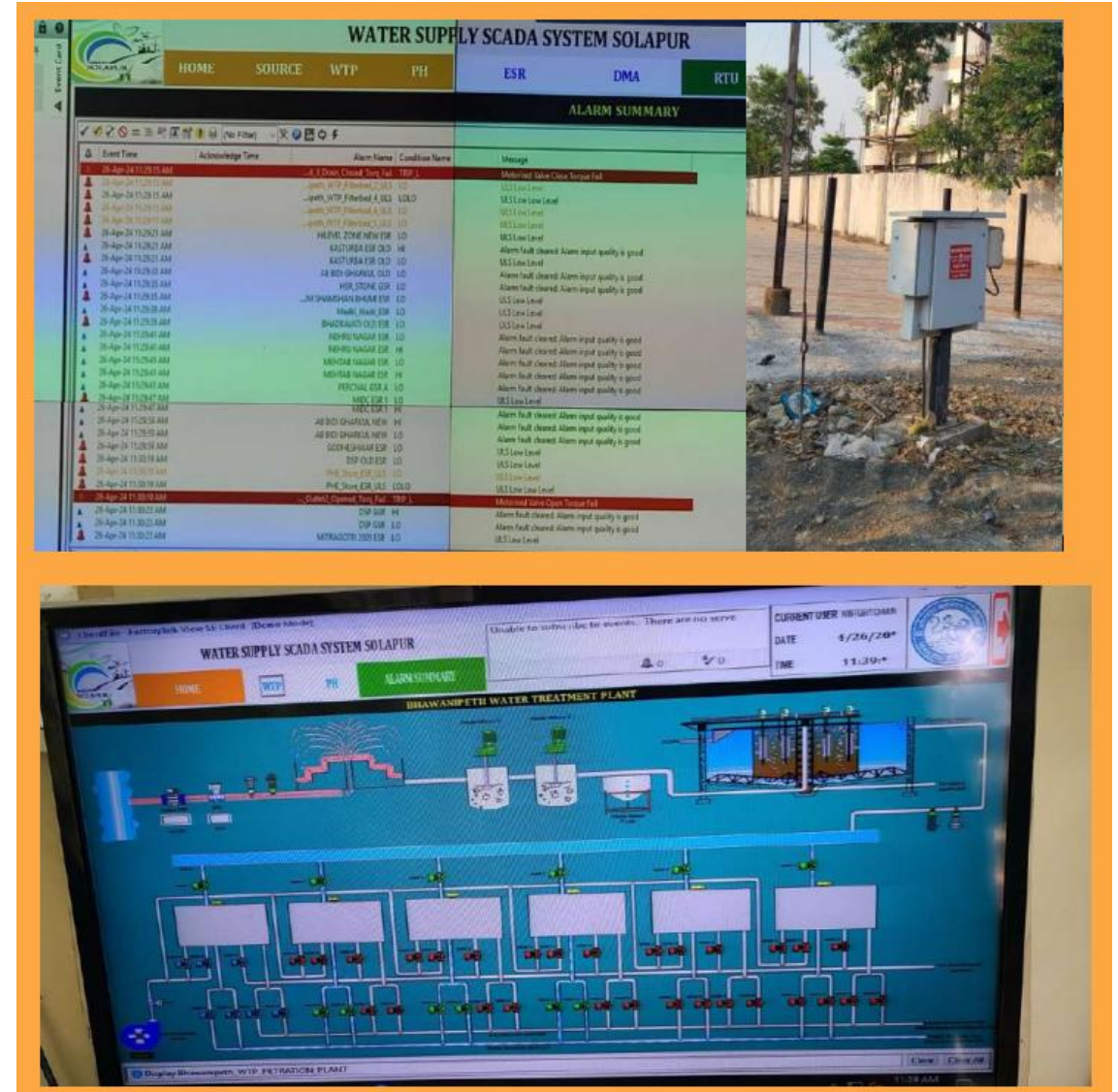
- Orange City Water Pvt. Ltd. (OCW) deployed a smart water digital twin using OpenFlows WaterSight to modernize Nagpur's citywide water distribution system.
- The water digital twin unifies SCADA, GIS, and hydraulic modeling data in one platform to provide a real-time view of network performance.
- Real-time network visibility helps operators detect issues sooner, run hydraulic simulations, and respond faster to pump failures and pipe breaks.
- Better insight into the water network supports reduced water losses and non-revenue water, improved pump efficacy, and reliable service for more than three million residents.
- The digital twin shifts Nagpur's water utility from manual analysis to data-driven operations and long-term planning for the distribution system.

Source: <https://www.bentley.com/en/blog/seeing-the-whole-water-network-through-a-digital-twin/>



# Solapur – Improving Water Supply System using Information and Communications Technology (ICT) and SCADA systems

- Post implementation of SCADA the city has been made tanker free.
- With the continuous monitoring of water flow and pressures, the water lost due to leakages has been reduced from 42% to 9%.
- Earlier the water distribution was such that less water was supplied to the extended areas whereas post SCADA and implementation of smart water tools, there has been an equal distribution of water throughout the city.
- With the installation of actuators and automation of the complete system at the WTP, HR requirement has been reduced to 1/3rd of the earlier requirement.
- City plans to install the technology for leakage detection and installation of AMR meters across the city

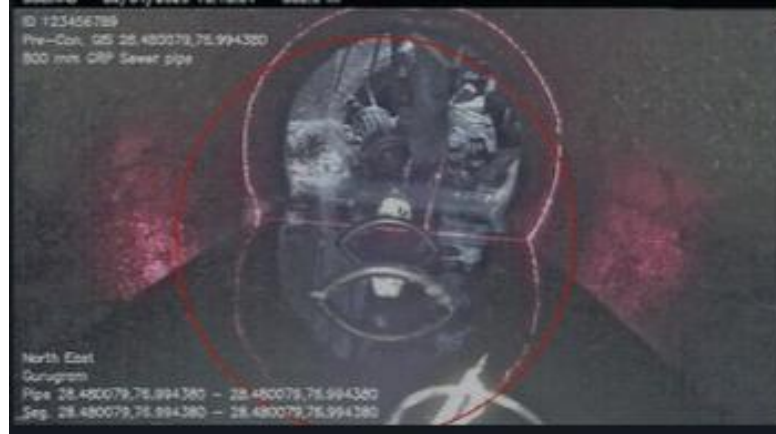


# Satara - Xylem's Digital Water Management Initiative

- **Digital water management:** Partnership with Xylem to support the council's digitalisation journey through Xylem Vue and smart water management technologies.
- **Digital twin and integrated analytics:** Enable data-driven monitoring and analysis of water supply network operations to support better decision-making.
- **Smart water infrastructure:** Satara's AMRUT 2.0 programme includes automated consumer water meters and automation of water treatment plants, pumping stations and storage reservoirs.
- **Operational efficiency:** Digital monitoring can support improved water accounting, identification of abnormal operating conditions and more efficient distribution management.
- **Key objective:** Move towards an intelligent water utility with improved operational visibility, service reliability and sustainable water management.
- Satara ULB has been honored with the prestigious awards in the categories of intelligent water utility performance & sustainability systems and global excellence in digital water infrastructure



# Chhatrapati Sambhajnagar - Monitoring and Inspection by Robotic Equipment in Water Supply Network



Detecting illegal connections in water supply lines

- Pipe condition assessment
- Laser profile (deformation, bending etc.)
- Leak detection and cracks in pipes
- Blockage detection in pipe such as tree root intrusion, waste dumped, C&D waste, silt deposition etc.



# Use of Digital Innovative Solutions for Water Supply Services

Clearbot robot: Lake cleaning and pollution detection-trash, water hyacinth

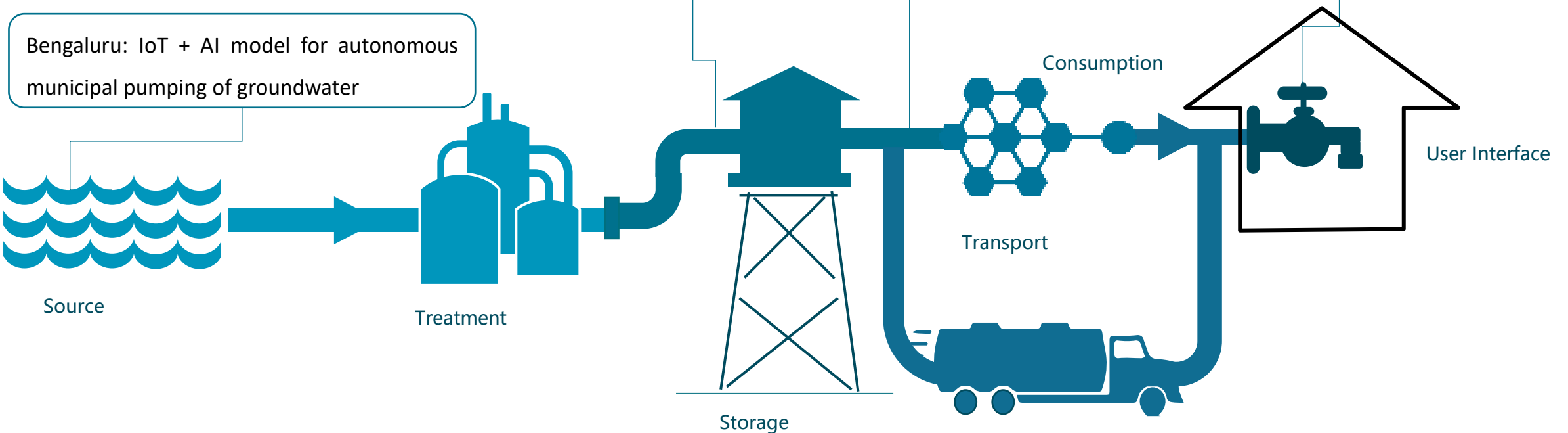
Endobot robot + Swasth AI: Robotic equipment crawls inside the water pipelines in the area and helped identify contamination points, cracks, leaks, encrustations, and broken pipe walls

AquaNurch (India) digital twin models for water bodies – weather and climate data + water quality data form sensors to maintain health of water body for improving fish farming / ecological restoration

SmartTerra: NRW reduction, loss reduction even in intermittent supply, abnormal meter reading detection

Hubli, Karnataka: Study on short term water demand forecast modelling using artificial intelligence for smart water management | inputs - water consumption, climatic parameters, and calendar inputs (like an hour of the day, holidays, etc.)

Bengaluru: IoT + AI model for autonomous municipal pumping of groundwater





## Bangalore - AI for groundwater

### AI-based groundwater monitoring system to revolutionize water management in city

TNN / Apr 23, 2024, 04:03 IST

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Bengaluru: To tackle water scarcity in the city, BWSSB has announced a tender for a real-time monitoring system for borewells. Developed in collaboration with the Indian Institute of Technology (IIT) Bombay, the system will be implemented by the Bengaluru Water Supply and Sewerage Board (BWSSB). The project aims to monitor 1,000 public borewells in the first phase, with the remaining 10,000 to be covered in the second phase.

### Bengaluru water board bets big on AI and IoT; floats tender for real-time monitoring system for borewells

Bengaluru Water Supply and Sewerage Board chairman said that the first phase of the project will cover 1,000 public borewells across the city, with the remaining 10,000 in the second phase.

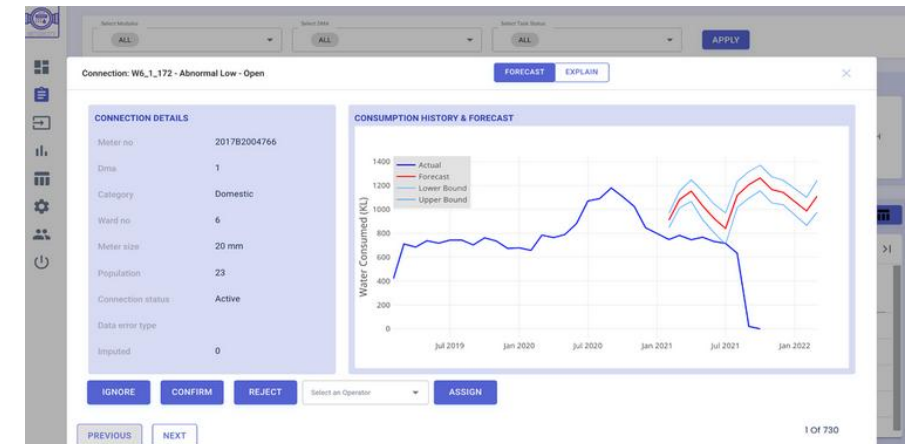
CHRISTIN MATHEW PHILIP | MAY 17, 2024 / 20:56 IST

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## SmartTerra: NRW reduction - Indonesia

- Detect water loss even in intermittent supply
- abnormal meter reading detection

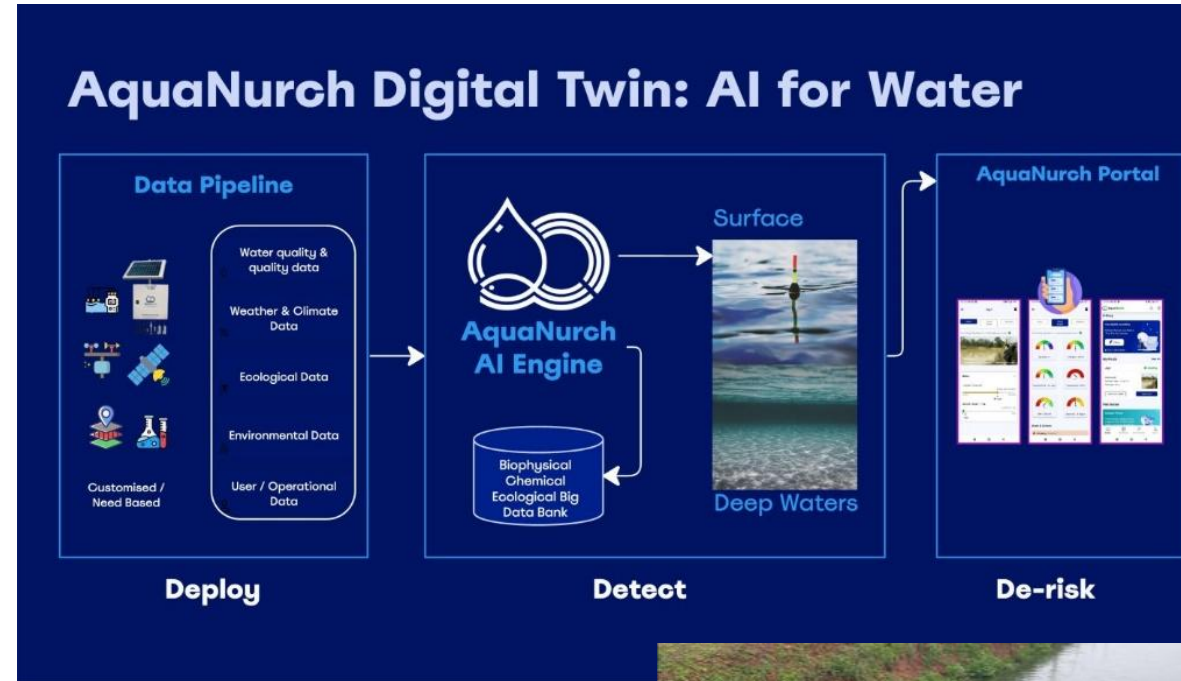


## Clearbot robot

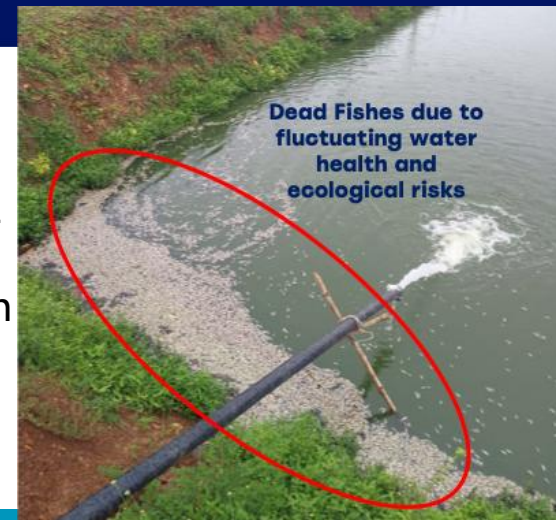


- Lake cleaning and pollution detection-trash, water hyacinth
- Autonomous – swim on its own
- One robot is able to collect a metric ton of trash a day
- Computer vision - "We generate data about what's in the water, what's the make-up of the stuff that's there, how much of it is recyclable and what materials we should be focusing on."

## AquaNurch (India) digital twin models for water bodies



- Weather and climate data + water quality data from sensors to maintain health of water body for improving fish farming / ecological restoration



# Governance: Who should do what?

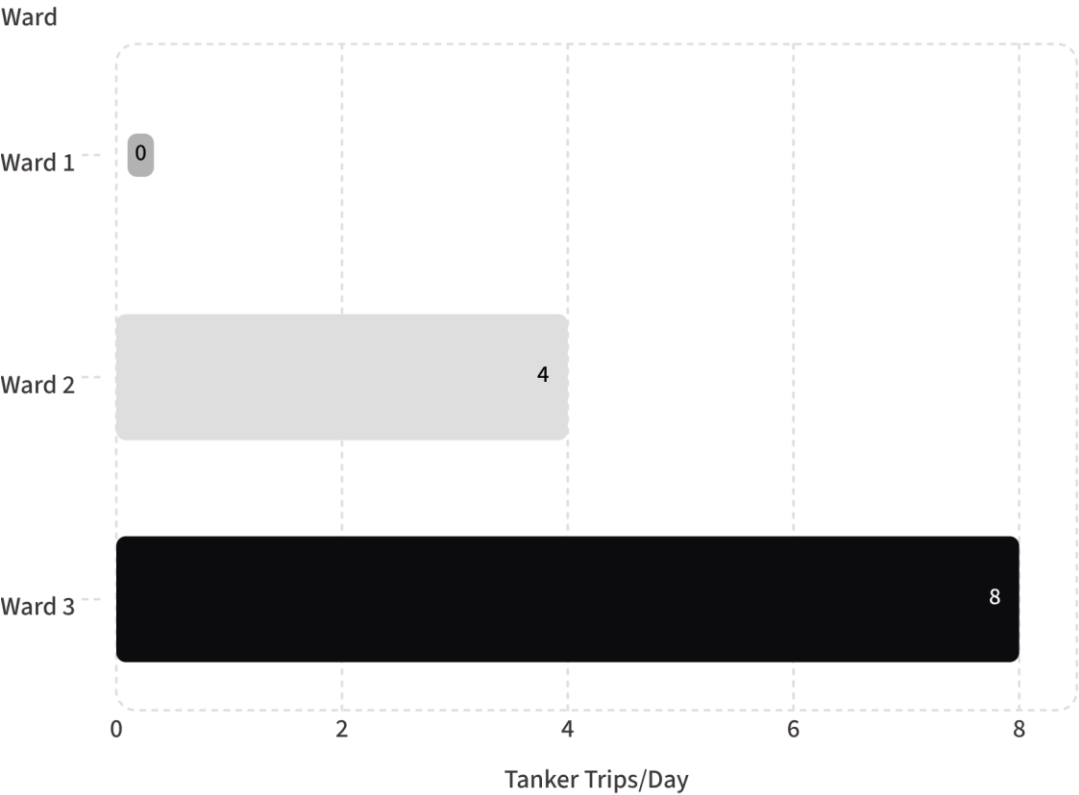
| Responsible officer/team             | Responsibility                                                            | Review frequency |
|--------------------------------------|---------------------------------------------------------------------------|------------------|
| Municipal Commissioner/Chief Officer | Set targets, resolve bottlenecks and coordinate departments               | Weekly           |
| Water-supply engineer                | Source balance, production, pumping, leakage repairs and supply schedules | Daily            |
| Ward officers                        | Report local shortages, leakages and avoidable consumption                | Daily            |
| Sanitation/STP team                  | Monitor treated wastewater quantity, quality and reuse                    | Weekly           |
| Accounts/planning team               | Estimate costs, identify funds and prepare the longer-term plan           | Monthly          |

# Ward-Level Water Security Monitor: Sample Dashboard

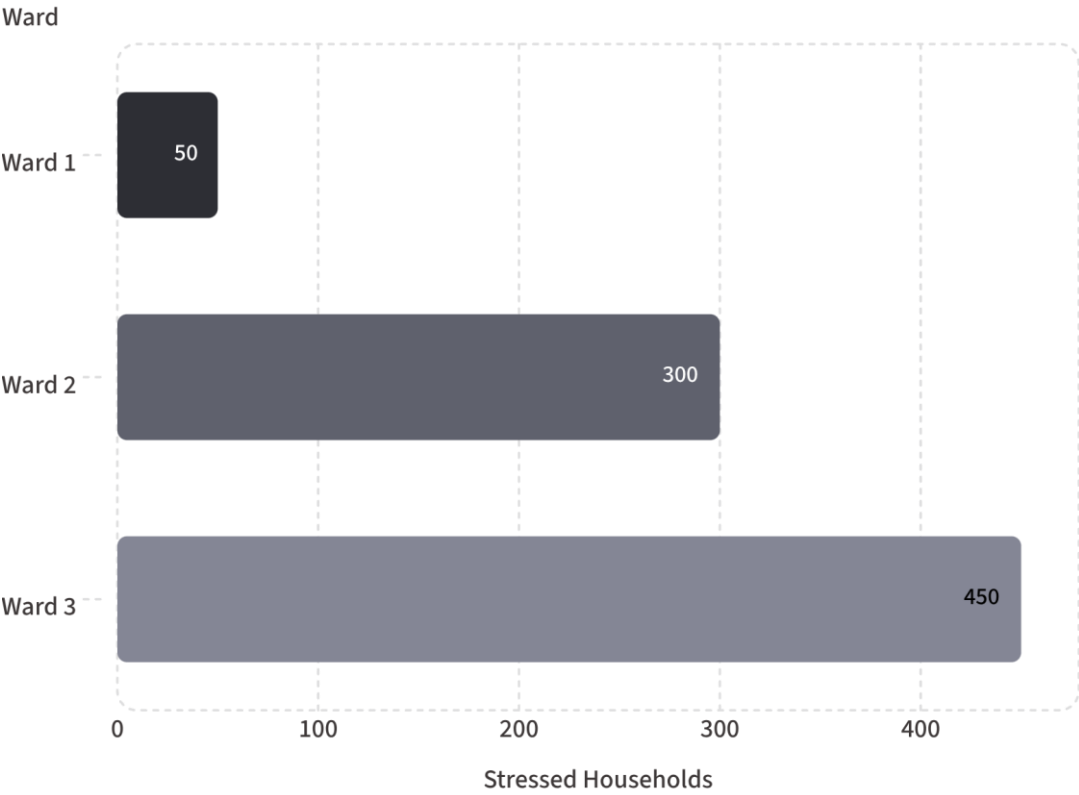
The ward-wise tracker helps the ULBs pinpoint exactly where to intervene — and what action to take.

| Ward   | Households | Supply Frequency | Water-Stressed HHs | Tanker Trips/Day | Priority Issue  | Action                       |
|--------|------------|------------------|--------------------|------------------|-----------------|------------------------------|
| Ward 1 | 2,000      | Daily            | 50                 | 0                | Local leakage   | Repair pipeline              |
| Ward 2 | 1,800      | Alternate days   | 300                | 4                | Low pressure    | Pressure assessment          |
| Ward 3 | 1,500      | Once in 3 days   | 450                | 8                | Supply shortage | Review distribution schedule |

Tanker Dependence by Ward



Water-Stressed Households



 **Key Principle**

Define "water stress". What counts as a deficit in your city must reflect your city's context.

 **Data Quality Rule**

Label every data point as **Measured**, **Estimated**, or **Unavailable**. A preliminary balance balance using estimates is valid — but transparency is non-negotiable.

 **Next Step for ULBs**

Assign a responsible officer to each ward-level action and review completion weekly. The Action & Reuse Tracker closes the loop between data and delivery.



# ULB Water Security Dashboard

Water Balance | Monitor | Act | Ensure a Resilient City

ULB: Sample City

Reporting Period: 1 – 30 April 2026



Safe Water  
Healthy City  
Better Tomorrow

## 1 Key Numbers (City Snapshot)



Water Supplied  
(Daily Average)

**10.0 MLD**

Target: 10.5 MLD



Population Served

**1,80,000**

(Estimated)



Supply Coverage

**92%**

Target: 100%



Non-Revenue Water  
(NRW)

**30%**

Target: 27%

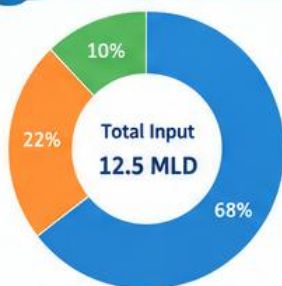


Water Storage Remaining

**18 days**

(Based on current stock & demand)

## 2 Water Balance (Current Month)



- Billed Consumption  
**8.5 MLD** (68%)
- Unbilled / Authorised Use  
**2.8 MLD** (22%)
- Estimated Losses (NRW)  
**1.2 MLD** (10%)

NRW = 30% (Target: 27%)

## 3 Water Sources & Supply

| Source              | Available (MLD) | Supplied (MLD) | Storage (%) |
|---------------------|-----------------|----------------|-------------|
| Dam / Reservoir     | 6.0             | 5.5            | 70%         |
| Groundwater         | 2.0             | 1.8            | 60%         |
| Other (e.g. tanker) | 1.5             | 1.5            | -           |
| Total               | 9.5             | 8.8            | -           |

## 4 Ward-wise Water Security

| Ward   | Supply Frequency | HHs Covered (%) | Tanker Trips/Day | Status   |
|--------|------------------|-----------------|------------------|----------|
| Ward 1 | Daily            | 98%             | 0                | Normal   |
| Ward 2 | Alternate days   | 85%             | 4                | At Risk  |
| Ward 3 | Once in 3 days   | 70%             | 8                | Critical |
| Ward 4 | Daily            | 95%             | 1                | Normal   |
| Ward 5 | Alternate days   | 80%             | 3                | At Risk  |

## 5 Key Indicators (This Month)



Per Capita Supply

**120 LPCD**

(Target: 135 LPCD)



Supply Gap

**1.7 MLD**

(Demand: 10.5 MLD)



Leakage Response

**6 / 10**

(Priority leaks repaired)



Treated Wastewater Reuse

**15%**

(of available)



Days of Storage

**18 days**

(Target: > 30 days)

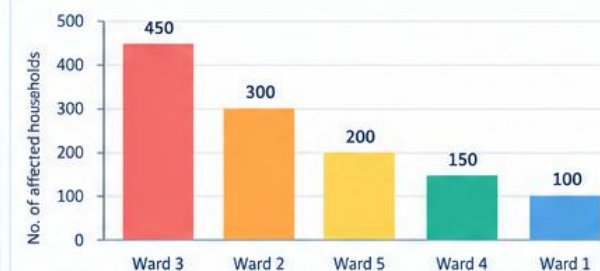


Household Coverage

**92%**

(Target: 100%)

## 6 Top 5 Water-Stressed Wards



Reasons: Source shortage | Network losses | Low pressure | Tanker dependence | Power interruptions

## 7 30-Day Action Tracker

| Action                                   | Responsible       | Deadline | Status      |
|------------------------------------------|-------------------|----------|-------------|
| Repair top 10 leaks                      | EE (Water Supply) | 15 Apr   | Completed   |
| Check meters & pumps                     | AE (Operations)   | 20 Apr   | In Progress |
| Improve supply schedule (critical wards) | Dy. CO            | 25 Apr   | In Progress |
| Reduce tanker dependence                 | Health Officer    | 30 Apr   | Not Started |
| Prepare 90-day plan                      | CO                | 30 Apr   | Not Started |



Our Next Steps (30 Days)

1

Complete water balance and source inventory

2

Identify and prioritise 5 water-stressed wards

3

Repair critical leakages and reduce NRW

4

Improve supply schedule and monitor impact

5

Prepare 90-day water security plan

# ULB Water Leakage Control Plan: Plumbers + Household Clusters

## 1. How to divide households among plumbers

The following is an illustrative deployment model. Each ULB should adjust staffing based on network length, household density, complaint volume and available plumbers

| Household cluster | Households | Plumbers assigned | Main responsibility         |
|-------------------|------------|-------------------|-----------------------------|
| Cluster 1         | 200        | 2                 | Inspect and repair leakages |
| Cluster 2         | 200        | 2                 | Inspect and repair leakages |
| Cluster 3         | 200        | 2                 | Inspect and repair leakages |
| Cluster 4         | 200        | 2                 | Inspect and repair leakages |
| Cluster 5         | 200        | 2                 | Inspect and repair leakages |
| Total             | 1,000      | 10                | Five leakage-control teams  |

For this example, each team covers 200 households with two plumbers. This is a planning assumption, not a fixed staffing norm. One plumber can focus on inspections and complaint identification, while the other supports repairs; both can undertake repairs together where required.

# Simple 30-day action plan

| Timeline   | Activity                          | Quantitative target                                                                | Responsibility              |
|------------|-----------------------------------|------------------------------------------------------------------------------------|-----------------------------|
| Days 1–3   | Divide the city into clusters     | Map all target households and pipelines                                            | Water supply engineer       |
| Days 4–7   | Household and pipeline inspection | Inspect 200 households per team                                                    | Two-plumber team            |
| Days 8–15  | Identify and prioritise leakages  | Prepare a list of all detected leaks; prioritise the top 10 critical leaks per ULB | Plumbers + engineer         |
| Days 16–23 | Repair leakages                   | Repair all feasible priority leaks; escalate major pipeline repairs                | Plumbers + engineering team |
| Days 24–27 | Verify repairs                    | Recheck repaired locations and repeat complaints                                   | Supervisor                  |
| Days 28–30 | Review performance                | Report leaks identified, repaired, pending and water savings where measured        | Nodal officer + CO          |

*Important: The inspection target should be adjusted for the type of household connection, pipeline access and available staff. The objective is to identify and fix leaks, not merely complete household visits.*

