



THE WATER WE ALREADY HAVE: WHY INDIA'S NEXT EFFICIENCY GAINS LIE IN LOSS MANAGEMENT

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India's water strategy has an uncomfortable blind spot.

Municipal boards and policy makers spend their considerable time trying to figure out where to get the next bit of water. The approach never changes. They tap into another river, dig deeper into already drained aquifers, lay out hundreds of kilometres of new pipes, and build larger treatment facilities.

Yet we consistently ignore what happens after the water enters the pipe. The sad reality is, a significant portion of the water that we pay for to be extracted, treated, and pumped just vanishes before it ever reaches a tap, and the water that is supplied but not ultimately accounted for as billed consumption is captured under the term 'Non-Revenue Water' (NRW).

Managing NRW is not a routine maintenance task or a back-office utility exercise. It is one of the most practical ways to expand the effective capacity of urban water systems.

When water vanishes between a treatment plant and a household tap, the loss extends far beyond liquid volume. Utilities have already paid for raw abstraction,

chemical treatment, and the electricity required to pump that water across vast distances. A litre of water lost after treatment is, in some ways, like an NPA: the investment has been made, but the value remains unrealised.

The Central Public Health and Environmental Engineering Organisation (CPHEEO) sets a benchmark of 20% for NRW under its Service Level Benchmarking framework and its 24x7 water supply guidelines.

The scale of lost investments: Realities of Indian urban landscape

Mumbai illustrates the staggering volume at stake. With an estimated NRW rate hovering around 30%, the city loses approximately 1,155 million litres per day. That is over one billion litres of treated water disappearing every 24 hours from a single metropolitan system. Sourcing a new supply of that magnitude would require billions in capital expenditure and years of infrastructure development.

Every lost litre carries a heavy carbon and energy footprint. Water distribution is a process that needs a lot of power, especially where the geography makes it necessary to move long-distances.

Bengaluru offers a clear case study to this. The Bengaluru Water Supply and Sewerage Board (BWSSB) draws water from the Cauvery River, transporting it roughly 100 kilometres and lifting it 350 metres uphill before it enters the city network. When physical losses occur inside such distribution lines, the energy spent pumping that water up the elevation gradient is permanently wasted.

The US Environmental Protection Agency and the World Bank both emphasise this link: physical water losses force utilities to over-pump and over-treat, compounding the financial and operational drain.

Intermittent supply and the contamination hazard

Network loss is also a public health hazard. Much of urban India operates on intermittent supply. When



pressure in a pipe falls below the pressure outside it, water and contaminants from the surrounding environment can potentially enter through cracks, defective joints and other weaknesses.

Continuous pressurisation can help protect water quality. However, utilities cannot simply increase pressure in ageing networks without managing the structural integrity of the assets first. For a continuously pressurised network, the underlying infrastructure must be capable of withstanding the required operating pressures and flows.

Transitioning from reactive repair to predictive intelligence

Solving NRW requires transitioning from reactive repair to predictive network monitoring. Traditional acoustic leak detection, such as listening for escaping water through step testing or noise logging remains valuable for metallic pipes and pressurised zones. Modern networks, however, demand multi-layered processes.

District Metered Areas (DMAs) provide the foundational baseline by isolating hydraulic zones to track inflows against billed consumption. Integrating real-time pressure sensors helps utilities identify anomalies long before water breaches the street surface.

Advanced monitoring frameworks are accelerating this shift across global and domestic utilities:

- » **Satellite Radar & Machine Learning:** A 2026 study in the *Journal of Environmental Management* demonstrated how machine learning can analyse satellite radar imagery to pinpoint leaks beneath paved roads. The top model located roughly 81% of hidden leaks in test zones. Rather than replacing ground crews, this technology acts as a force multiplier, helping field teams with better guidance to inspect the right locations first.
- » **In-Pipe Acoustic Inspection:** For large transmission pipelines, free-swimming acoustic devices travel inside a pressurised pipeline with the flow to record acoustic events without taking the line out of service. India's CPHEEO guidance recognises the free-swim ball technique, and Dubai's Electricity



and Water Authority showed its practical impact by using SmartBall inspections to detect 43 leaks and save an estimated 130 million imperial gallons of water between 2021 and 2022.

- » **Smart Metering Infrastructure:** The Bengaluru Water Supply and Sewerage Board (BWSSB) is taking a targeted approach by replacing legacy pipelines in high-loss zones to reach a 20% loss target. Rather than a blanket rollout, BWSSB is starting with large commercial users, deploying digital meters to catch abnormal consumption early and stop revenue leakages caused by faulty meters or unbilled usage.

Global lessons: Operational discipline over quick fixes

International precedents show that low loss rates stem from operational discipline rather than single

technology deployments. The Netherlands records distribution losses of around 6.5%, among the lowest in Europe, alongside relatively rapid renewal of its drinking-water network.

Similarly, Singapore's PUB has rolled out around 300,000 smart metres in the first phase of its Smart Water Meter Programme. The metres record consumption several times a day and transmit the data digitally, helping utilities and consumers identify abnormal usage and potential leaks.

This operational mindset must extend inside the industrial sector. Facilities operating complex utility loops, boilers, and cooling towers frequently experience unrecorded internal losses. Establishing a closed-loop water balance, enforcing online monitoring on recycling lines as recommended by the Central Pollution Control Board, and utilising treated effluent for non-potable industrial uses, which is a key focus of CPHEEO guidelines, aligns loss management directly with industrial water circularity.

Five Strategic Imperatives for India's Water Sector

To execute this nationally, India's water sector must prioritise five core operational shifts:

- » **Mandate Basic Network Visibility:** Bulk metreing, functional consumer metres, GIS asset mapping, and DMA structures must become mandatory infrastructure prerequisites.
- » **Integrate Pressure Management:** Utilities must actively control pressure profiles to limit stress





on legacy pipes while eliminating back-siphonage contamination risks.

- » **Reform Procurement Models:** Contracting must shift away from paying vendors strictly by kilometres of pipe laid. Contracts should bind compensation to long-term performance metrics, including leakage reduction, pressure stability, and asset life.
- » **Deploy Targeted Technology:** Remote sensing, inline acoustic tools, and satellite surveillance should be deployed strategically based on specific loss profiles rather than applied as blanket solutions.
- » **Optimise Network Storage:** Service reservoirs must be utilised to smooth out supply transitions and manage pressure zones, serving as active hydraulic controls rather than static holding tanks.

The National Water Mission's target of improving water-use efficiency by 20% also underlines the scale of the task. Building new supply schemes without plugging existing leaks only compounds operational waste. As initiatives like AMRUT 2.0 push cities towards more continuous, pressurised water supply, securing our underground distribution grid becomes the ultimate test of urban governance. Municipalities must recover the water slipping through their streets today before committing capital to the next distant reservoir.

About the Author

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Yashovardhan Agarwal, MD, Sintex BAPL Limited & Welspun BAPL Limited, is a results-driven leader with a proven track record across industries and business domains – plastic, building materials and automotive industry. He currently spearheads the plastic division of Welspun which includes - Sintex and Welspun BAPL. His primary responsibility is developing and executing strategic initiatives, building a team of dynamic professionals, establishing sustainable practices, forging key partnerships to drive organizational excellence and delivering long-term value to stakeholders. His key focus is to reinforce the Sintex brand through product innovation, sustainable business solutions and a long-term strategy to set new benchmarks and create lasting value for stakeholders.

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