

# Management of Urban Water Supply Network: Technical, Economic, Feasibility Assessment, and Ensuring Losses Controls and Sustainability

## Broad Area

Habitation and Maintenance

## Need for the Study in the Context of Future of Cities

Safe water is the most important utility for a healthy society. Water demands in Indian cities are growing rapidly in line with urbanization, leading to stress on finite water resources and supply chains. Majority of the Indian cities/towns do not possess cent percent water supply coverage. So far, water supply in the most of the Indian cities is intermittent (~3 hrs/day), though a few cities are in process to come up with 24x7 supply system (like Kota, Hubli, Dharwad, and Nagpur). The per capita water supply also ranges from a very low 9 lpcd to substantially high 584 lpcd. The non-uniform and inadequate water supply is perceived to be a result of not only resources constraints, but technology limitation, losses controls, management challenges and economic sustainability issues also play decisive roles. Water losses alone accounts for up to 50% of designated supply, leading to excess pressure on supply systems. In view of the water leakages, thefts and seepage from water distribution systems, planning commission of India is advocating top priority of water sector reforms to improve the operational efficiency and loss minimization. Further ensuring potable quality of supplied water is another challenge that requires special attention. Therefore, there is a pivotal need to critically evaluate the merits-demerits, issues, and challenges with different water supply schemes on technical, social and sustainability aspects, and to develop appropriate technology to minimize losses, ensuring sustainability of water supply schemes.

## Objective and Scope of Work

The study aim at multifold objectives as:

1. To conduct a technical, economic, social, and feasibility assessment of different water supply patterns (like 24x7, intermittent) in the context of Indian cities.
2. Modeling and simulation including network analysis, water losses detection and quantification for efficient distribution network management.
3. To propose water pricing model suitable for Indian cities.

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4. To workout framework for conversion of existing supply system to an alternate system of choice, like conversion of intermittent to 24x7 supply system.

## **Methodology**

1. Study locations: selected areas in 2-3 cities with different water supply schemes.
2. Primary and secondary data collection on water supply systems of selected cities including population and socio-economic status, network layouts, flow and quality data, water treatment, distribution and coverage, O&M details, water losses, revenue and pricing etc.
3. Data reconciliation and analysis for performance evaluation of supply schemes focusing on the aspects like safe water supply, equitable distribution, financial viability, losses minimization as well as fulfillment of stakeholder's interests.
4. Assessment of hydraulic state of distribution network with appropriate computation tool.
5. Identification of the issues with the water supply networks (water losses, quality control, frequency of failures, operation and maintenance problems etc.)
6. Critically review the state-of-art on water losses detection methods, and their suitability in Indian contexts.
7. Identification and estimation of water losses in a lab-scale water distribution network by simulating the acquired dynamic data with the help of statistical/numerical modeling.
8. Sensitivity and error analysis for comparing actual and computed data.
9. Establishing a numerical/statistical relation between water losses and energy uses in O&M in order to compute the energy contribution of water losses.
10. Critical assessment of water pricing models and their suitability for Indian cities considering type of supply system and socio-economic status. Development of a robust water pricing model applicable for Indian conditions.
11. The study on feasibility and requirement of 24x7 water supply vs intermittent water supply in the context of Indian cities considering water demands, level of satisfaction, willingness to pay, technical strength, management challenges, and other socio-environmental factors. Proposing the procedural guidelines and frameworks for conversion of an existing system to alternate water supply systems.

## **Outcomes/Deliverables**

- An index based sustainability assessment system for water distribution network.
- Model to identify and estimate water losses in a water supply pipe network.
- A relation to compute the possible energy saving by minimizing water losses.

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- A decision support framework for authorities, planners and stakeholders for decision making on:
  - Choice of suitable supply system (24x7, intermittent, metered/non-metered);
  - Water losses minimization scheme;
  - Framing revenue recovery models;
  - Handling operational and maintenance challenges.

## **Team Composition**

<b>Principal Investigator</b>	
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<b>Co Investigators</b>	
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