POLICY TIPS-I

Need for Effective Monitoring and Evaluation System for Drinking Water Supply

Gopal Naik
Prem Shankar Mishra

March 2025

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Gopal Naik and Prem Shankar Mishra, IIM Bangalore

The *Jal Jeevan Mission (JJM)* launched by the Government of India has connected more than 80% of rural Indian households and many completed schemes have already entered the crucial phase of operations and maintenance. While the performance at the construction phase will have a significant bearing on the quality and cost of service delivery, it is in the Operation and Maintenance (O&M) phase that we get to measure the ultimate service delivery performance. Ensuring that drinking water systems perform properly, involves a combination of effective operations and regular monitoring, maintenance, following established standards, evaluation and feedback mechanism to guarantee adequate, safe, reliable and affordable water delivery.

Single and Multi-village Schemes (MVS) under the *Jal Jeevan Mission*, due to their differences in the extent of coverage of households and water sources, have different levels of complexity in operations and maintenance. Multi-Village Schemes are large, catering often to thousands of households and mostly depend on the surface source, requiring elaborate treatment plants, large storages and extensive distribution networks. Monitoring and evaluation for such systems must be robust to capture real-time data from different parts of the system so that quick evaluation can be done, and corrective measures implemented.

Setting up an effective monitoring and evaluation system for drinking water supply involves creating a systematic approach to assess the performance, quality and sustainability of the system to achieve the goal of delivering adequate, safe, and reliable water supply at affordable charges.

Affordability is an important criterion for sustainability of drinking water systems in rural India as the average per capita income is low and rural households are poorer compared to their urban counterparts. The user charges being dependent on the cost of delivering water supply, mean that keeping the cost low is an important objective of all drinking water supply systems. While cost and quality of construction have a significant bearing on both the fixed and operating cost, the quality and efficiency of operations determine the operating cost. From a user-charge perspective operating cost is a very important component as the fixed cost component may be met partially or fully by the Government, although for a sound system user charges should be determined based on both the costs.

The main components of operating costs are salary and power costs both at the bulk supply level in MVS as well as at the community level. Power costs are dependent on how much water is pumped at various stages in the system compared to how much is supposed to be pumped or supplied to the households. The difference, the extent of **Non-Revenue Water (NRW)**, can have significant impact on the operating costs and therefore user charges. Non-Revenue Water (NRW) is defined as the difference between the volume of water introduced into the water distribution system and the volume of water billed to end-users (Frauendorfer & Liemberger, 2010).

According to the United Nations World Water Development Report (2019), the global demand for water is estimated to increase by 20% to 30% above current levels of water use by 2050. In addition, climate change is expected to create additional pressure on water resources. In a water-scarce country like India, it becomes imperative to better manage existing water resources by reducing water losses. Reducing NRW is a powerful demand management instrument for rural and urban local bodies in decreasing stress on existing resources.

Worldwide, significant amounts of vital water resources are lost every second due to high levels of NRW. Water loss ranges from 7% to 70% across countries (developed and developing countries). Across many African nations, NRW levels often exceed 50%, significantly higher than the global average of 30%. According to a recent study from the International Water Association (IWA), globally we lose about 346 million cubic metres of water per day or 126 billion cubic metres of water per year in water distribution systems, costing approximately USD 39 billion per year. Each drop lost requires additional water to be produced and distributed, escalating energy consumption, operational costs, and the depletion of already scarce water reserves. Reducing of NRW contributes to improving the water security of a community.

In India, there is no single national standard for NRW, however, guidelines from agencies such as the Ministry of Housing and Urban Affairs (MoHUA), the Central Public Health and Environmental Engineering Organization (CPHEEO), and the Bureau of Indian Standards (BIS) provide benchmarks. For well-managed utilities, an acceptable NRW level is below 15%. Internationally, organizations such as the World Bank and the American Water Works Association (AWWA) recommend that NRW should ideally remain below 20% of total water production. Many developed countries as well as those experiencing water scarcity have achieved sub-15% levels (Annexure 1 and 2). In the context of the *Jal Jeevan Mission* (JJM) and rural water supply, minimizing losses is a key priority. High NRW levels exceeding 20% remain a significant concern.

The analysis of Non-Revenue Water (NRW) losses across different network points in *Gandsi-Banavara Multi-Village Scheme* (MVS) system serving 530 habitations in Arasikere taluk, Hassan district of Karnataka, indicate that, on average, 30% to 35% of water is lost between the raw water intake at Jack Wells and its final distribution to households. Specifically:

1. Between Jack Well Inlets and MBRs at WTP: Average NRW loss is 6%**.**
2. Between MBRs within the WTP and 530 habitations: NRW losses averaged 15% to 20%.
3. Overall losses from Jack Well Inlets to Habitations: Estimated at 21% to 25%, highlighting significant inefficiencies across the distribution network.
4. Furthermore, additional water losses were observed between village Overhead Tanks (OHTs) and individual households, which were estimated through the In-Village Distribution System (IVDS). These losses account for 5% to10% of the total water supplied. The total NRW losses in this Multi-Village Scheme (MVS) amount to 30% to 35%. The high levels of NRW in a new system indicate significant water wastage, posing financial burdens apart from wastage of scarce energy and water resources.

For this MVS, it was also estimated that a kilolitre of drinking water supply would cost in the range of INR 40 to INR 60. The data was used to simulate the financial burden on the country for different levels of NRW and cost per kiloliter (Kl). The table below indicates the likely cost.

Sl. No.	**% of NRW**	**Total Cost Per Annum at different levels of NRW at cost/Kl (in Cr INR)**		
1		INR 40/Kl	INR 50/Kl	INR 60/Kl
2	5	3500	4375	5250
3	10	6999	8749	10499
4	15	10499	13124	15749
5	20	13999	17498	20998
6	25	17498	21873	26248
7	30	20998	26248	31497
8	35	24498	30622	36747
9	40	27997	34997	41996
10	50	34997	43746	52495

Source: Authors calculation, 2025

The table shows that if the actual NRW is 35%, the additional cost to the country is INR 24,500 Cr at a per Kl cost of INR 40 and INR 36,747 Cr at a per Kl cost of INR 60. If the system can achieve 15% NRW then the annual saving at the country level will be to the tune of INR 14,000 Cr at INR 40 per Kl and INR 21,000 Cr at INR 60 per Kl. Even with savings of 10% of NRW, there will be a saving of INR 7,000 Cr at INR 40 per Kl and INR 1,0500 Cr at INR 60 per Kl.

If there are no measures taken to control NRW, it is likely to increase continuously and soon lead to a very high cost of water supply, making the system unsustainable to operate. Without proper monitoring and control, illegal tapping and wastage of water would take place leading to an increase in the cost of water. When costs per household is high, the default rate also goes up and some households exit from availing the water leading to further increase in the cost per household and leading to a 'race to the bottom'- a downward spiral of unsustainable performance. Therefore, it is important to set up an effective **monitoring and evaluation (M&E) systems** for drinking water supply. This process involves clearly defining the objectives with specific indicators for quantity and quality of water, service delivery, infrastructure condition, customer satisfaction, system performance and sustainability. A data collection plan for each of the indicators should be specified in terms of frequency and timing, tools and technology and the responsible agency. The data analysis and reporting procedure should be indicated. Benchmarks should be determined to compare the actual indicators with the benchmarks. A system of providing feedback to the decision makers needs to be established to take corrective actions and improve performance. Continuous effort in capacity building and training is needed to improve skills. The systems should focus on technology, innovation, and processes for continuous evaluation and improvement. Information about the system performance should be transparent and accessible to stakeholders.

Annexure 1: Percentage of Non-Revenue Water (NRW) (National Average) in Different Countries

SN	Country	% of NRW (National Average)
1	Brazil	40
2	Israel	8
3	Australia	10
4	Vietnam	40
5	China	21
6	Germany	7

Source: International Water Association

Annexure 2: Table Benchmarking OECD Countries (Compiled from IBNET Database)

Audit Year	Country/City	Non-revenue Water as Percent by Volume of Water Supplied (%)
2021	Abu Dhabi	2.04
2015	Denmark	6.91
2013	Australia	10.30
2020	USA	13.58
2014	South Korea	16.28
2015	Poland	17.21
2013	Czech Republic	17.65
2020	Finland	19.09
2020	New Zealand	21.23

Source: *Al-Ali, M. S. 2022*

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