Policy Tips - IV

Determining Drinking Water Tariff in Rural India

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Introduction

The Jal Jeevan Mission (JJM) is a flagship initiative of the Government of India to provide functional household tap connections (FHTCs) to every rural household, ensuring adequate, safe and reliable drinking water. Beyond infrastructure creation, the initiative emphasizes equally on operations and maintenance which includes ensuring source sustainability, water procurement and treatment, ensuring water quality conforming to BIS standards, functional tap in each household to ensure equal access, maintenance of infrastructure, user fee collection, etc., through village-level institutions such as Village Water and Sanitation Committee (VWSC)/Gram Panchayats (GPs), to promote long-term water security. For these bodies to carry out sustainable Operation and Maintenance (O&M), the challenge is that they will have to raise sufficient revenue from users through water tariff that is affordable to the people.

The tariff charged for drinking water supply determines the financial sustainability of the system as it guides both the consumers and providers of water service to take appropriate consumption and supply decisions. High tariff discourages consumers to avail the service whereas low tariff has the risk of not covering the cost. The basis for determination of tariff, in general, range from cost-based to competitive pricing, depending mainly on market structure. In a competitive market, the equilibrium price represents the price at which the market clears, indicating that the demand from consumers for drinking water balances the amount of supply. As a result, this pricing leads to allocative efficiency, as the price discovered signifies a state of maximum social welfare without any deadweight loss.

However, the piped drinking water supply service resembles a natural local monopoly, not a competitive market. In market structures other than competitive, the service provider decides the prices mostly based on profit-maximizing principles, and hence there is likely to be deadweight loss, particularly for inelastic demand essential goods like water. Considering this, a community-managed system is ideal where the consumers and service providers are the same which minimizes the deadweight loss. However, in the absence of bench marks like market prices, tariffs will have to be determined with utmost care to ensure efficiency and effectiveness of operations and maintenance and to minimize deadweight loss. In pursuit of making drinking water accessible to the households at reasonable prices, cost-based pricing is the most suitable option as long as the operations are effective and efficient.

In many countries, the water tariff is set below its marginal costs, making it difficult to achieve full cost recovery. Full cost recovery (FCR) means that the water charges recover all economic, environmental, and resource costs. The overall supply costs can be categorised into capital costs and O&M costs[1,2]. However, most water services aim at full financial cost recovery (FFCR). A cost-based tariff approach should focus on minimising these costs so that the water charges imposed on households closely align with their willingness to pay (WTP). While capital costs recovery is challenging, O&M cost recovery must be attempted.

Tariff options for rural drinking water

JJM schemes include both Single-Village and Multi-Village schemes. In a Single-Village Scheme (SVS) fixed costs include the cost of construction of overhead tanks (OHTs) along with water treatment facility, pumping, pipelines, valves, taps, etc., while O&M costs relate to the salaries of pump operators, power cost, periodic maintenance cost, consumables and repair expenses. In a cost-based tariff determination, the options range from total cost recovery to only O&M cost recovery. If total cost is recovered from the users, it would help in creating a corpus fund for the fixed cost component which can be utilized as and when replacement of infrastructure is needed. However, if the affordability of the users is low, tariff may be determined based solely on O&M costs.

The Multi-Village Scheme (MVS) consists of two main levels of decision making. The first level is the Bulk Water Supply, where water is sourced, treated, stored, and supplied (at bulk) to the villages. The second level is developing infrastructure in the village to provide piped water to individual households, referred to as the In-Village Distribution Network (IVDN). In an MVS, both fixed and operational and maintenance costs are incurred in both BWS and IVDN levels (Table 1). The fixed costs pertain to the expenses associated with infrastructure and installation, while the O&M costs include salaries, electricity charges, and repair and

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[1] Seppälä, O. T., & Katko, T. S. (2003). Appropriate pricing and cost recovery in water services. *Journal of Water Supply: Research and Technology—AQUA*, *52*(3), 225-236.

[2] Reese, M. (2013). Cost recovery and water pricing in water services and water uses in Germany. *Journal for European Environmental & Planning Law*, *10*(4), 355-377.

maintenance expenses. If the Management of Bulk Water Supply may be done by a different agency than that of IVDN, then Bulk Water Supply management will decide unit water charges to be levied to IVDN on volumetric basis considering either O&M cost or full cost. This, generally, is a policy decision of the respective state government. IVDN considers this cost and its own costs, either O&M only or full cost, to arrive at water tariff at the user level.

Table 1: Distribution of Costs in the Multi-Village Scheme (MVS) under JJM

MVS: Stages	Fixed Cost (FC)	O&M Cost (OMC)
Bulk Water Supply (BWS)	Infrastructure and Installation costs (at the BWS level)	Salary, power costs, cost of consumables, insurance, admin expenses and repair and maintenance costs
In-Village Distribution Network (IVDN)	In-village capital costs: Infrastructure and Installation costs (of overhead tank, pipelines, taps etc.) within the villages	Salary, cost of bulk water purchase, power cost and repair and maintenance costs

Therefore, there are multiple approaches to decide water tariff depending on which specific costs are intended for recovery through water (user) charges.

One approach is to calculate water charges by factoring in both fixed costs and operation and maintenance (O&M) costs at both the BWS and IVDN levels.

That is, $T_1 =$ **BWS-FC + BWS-O&M + IVDN-FC + IVDN-O&M**

In this option, the costs associated with water charges encompass all expenses involved in operating the MVS in rural areas, thereby reflecting the overall costs. The advantage of this method is that it helps build a corpus that can be utilized to replace the infrastructure when needed. Nevertheless, this option would result in a significantly high-water tariff, and in the early stages of the scheme, it may be difficult to recover high water charges, particularly from economically disadvantaged households.

The second option is to consider recovering both the fixed and operational and maintenance (O&M) costs at the IVDN level and including only the O&M costs at the BWS level.

$T_2 =$ **BWS-O&M + IVDN-FC + IVDN-O&M**

At the IVDN level, if communities contribute to in-village infrastructure capital costs by paying **IVDN-FC** then this total amount or a portion of it can be allocated to a 'corpus fund.' This fund can be utilized by the Village Water and Sanitation Committees (VWSCs) or Gram Panchayats (GPs) to support long-term repair costs, both major and minor, at the village level. This tariff strategy aims to recover all O&M expenses, which include salaries, power costs, and minor repairs, etc., along with a portion of the fixed cost. This not only charges less than the previous option (T1) but can also be introduced at the outset, keeping in mind the priority of supporting low-income households. Simultaneously, this alternative empowers communities by enabling them to undertake significant repairs, thus reducing their reliance on the government.

Another alternative option, however, is to impose water tariff that accounts for only the O&M expenses (for both the BWS and IVDN levels), as outlined below:

$T_3 =$ **BWS-O&M + IVDN-O&M**

If this option is adopted, the tariff for drinking water for rural households would solely reflect the operation and maintenance (O&M) expenses. The water charges imposed on rural households under the third option would be the lowest compared to the other two options mentioned. Additionally, this choice can serve as a foundation for determining the water charges, as it may offer better recovery rates than the previous two alternatives and support low-income households.

Considering the three alternative options of determining drinking water tariff (i.e. user fees) on rural households, strategically it may be better to start with the third option (T_3) and look at other options overtime such as T_2. However, in all these options, we need to develop strategies that minimize the costs associated with providing drinking water, which will in turn lead to lower water charges.

Strategies to keep water charges low

An important approach to reducing drinking water charges is to explore how O&M costs can be reduced. O&M costs are costs associated with repairs and replacements, salaries, energy usage and maintenance. In developing countries, poor maintenance (of pipelines) often leads to considerable water loss, resulting in high instances of non-revenue water. Poor quality infrastructure can lead to high repair and replacement costs and can account for a large share of O&M costs. Likewise, overstaffing is a frequent challenge in developing countries. Also, if recruitment of personnel is not done with care, it can lead to high operational inefficiencies and elevate O&M costs.

Community involvement and management would help in reducing these costs. If the local community is involved at the time of construction, the quality of infrastructure is likely to be better reducing repair needs. Also, in case there is any repair work to be done, the timeliness and quality of repair are likely to be better, thus reducing the need for repair in the future. Greater involvement of the community will also help in reducing wastage of water, possibly moving to volumetric pricing and 24/7 supply. They will also arrive at cost-effective ways of meeting the personnel needs and therefore reduce costs.

The choice of technology for water treatment influences operation and maintenance (O&M) costs. Implementing solar water pumping and treatment entails higher initial (fixed) costs but results in lower operational costs due to the utilisation of free solar energy. Opting for more solar water treatment options would contribute to lower energy costs and, consequently, lower O&M expenses.

Focusing on reducing repair and maintenance costs, along with salaries and technological costs, would help to reduce overall operation and maintenance (O&M) costs while improving operational efficiency. As a result, this would lower the water tariff for rural households, making it more affordable for them. Cost savings should also ensure that the reductions in O&M expenses result in water tariff set below the international benchmarks established for water bills, since water pricing is associated with the users' ability to pay. According to international guidelines (indicated by the World Bank and the OECD), water bills should not surpass 3-5% of a household's income[3]. However, it has been noted that, on average, households in OECD countries spend less than 2% of their income on water expenses[4]. We can aim to keep costs within a similar range.

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[3] García-Valiñas, M. A., Martínez-Espiñeira, R., & González-Gómez, F. (2010). Affordability of residential water tariffs: Alternative measurement and explanatory factors in southern Spain. *Journal of Environmental Management*, *91*(12), 2696-2706.

[4] Grafton, R. Q., Ward, M. B., To, H., & Kompas, T. (2011). Determinants of residential water consumption: Evidence and analysis from a 10-country household survey. *Water Resources Research*, *47*(8).

Thus, community participation at the grassroots levels helps in keeping a check water charges and making them affordable. Their engagement in monitoring operational expenses, maintenance of assets, and cost recovery will foster more efficient water usage. This involvement will also result in a reduction of non-revenue water, or water loss. In a Multi-Village System, since the Village Water Supply Committee (VWSC) also must pay fees to the Bulk Water Supply (BWS) agency as per the volumetric pricing, community involvement will help ensure that only required quantity of water is distributed, thus establishing check on the bulk water fees.

Conclusion

In conclusion, setting rural drinking water tariff under the Jal Jeevan Mission (JJM) requires a carefully designed cost-based strategy that would consider the non-competitive nature of rural drinking water supply service and the limited paying capacity of low-income households. Among the alternative tariff options discussed, recovering operation and maintenance costs either partially or fully emerges as one of the feasible options in the initial stages. Moreover, reducing water charges depends on systematically reducing underlying costs, particularly those related to repairs, staffing, energy use, and technology choices. In this context, community participation plays a central role by improving operational efficiency, reducing non-revenue water, overseeing cost recovery, and aligning bulk water supply with actual village-level demand. Strengthening local institutions such as VWSCs and Gram Panchayats, alongside appropriate technological choices like solar-based systems, can significantly reduce O&M costs. Thus, a community-led, cost-minimising pricing framework can ensure that rural water charges remain within internationally accepted affordability thresholds, while simultaneously promoting long-term sustainability and reliable drinking water delivery.

Reynaud, A. (2016). Assessing the impact of full cost recovery of water services on European households. *Water Resources and Economics*, *14*, 65-78.