Study on Alternative Cost Allocation Matrix for Bulk Water Tariff (2013-16)

Executive Summary

Study done by,

Idam Infrastructure Advisory Private Limited

Supported by,

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Executive Summary

Background

MWRRA was set up under the provisions of the Maharashtra Water Resources Regulatory Authority Act, 2005 (Act XVIII of 2005). Section 11 of the Act empowers MWRRA to regulate water resources within the state of Maharashtra and also to fix the tariffs for the water user entities.

As per the MWRRA Act, 2005, bulk water tariffs in the state are required to recover the O&M costs of the irrigation system. The criteria for fixing tariffs for this purpose are to be determined in consultation with the beneficiary public. Thus a tariff designed to recover capital cost and/or the cost of environmental damage is outside this criteria. Users are, however, not absolved of the responsibility of using water efficiently and ensuring that when it is discharged after use, it is of prescribed quality. These objectives are to be enforced through a system of penalties and incentives in the tariff structure. Thus, the tariff structure for the state as a whole will not only need to recover the O&M costs while ensuring affordability and accessibility but also promote efficient use of water and environmental sustainability through such a system.

In view of the above, the criteria for bulk water tariff for 2010–13 were formed by MWRRA. O&M costs have to be recovered across all user groups, namely industry, drinking, and agriculture. An arithmetical averaging model was developed for allocation of O&M costs considering three parameters, namely (1) affordability, (2) accessibility, and (3) quantity and timeliness. A matrix was constructed by allocating weighting to each of these parameters representing their relative importance to the three bulk user categories. Further, affordability was given a weighting of 0.6 on a scale of 0 to 1, and the other two parameters were each given a weighting of 0.2.

Scope of Work

During the stakeholder consultation process, MWRRA identified the need to analysis and re-consider the cost allocation matrix. MWRRA issued a pre-qualification notice to take up the analysis of the matrix for cost allocation (2013–16) for developing the criteria with justification (reasoning and logic) for more precise

allocation of costs among different categories of water users in the tariff exercise for 2013–16. This allocation was to be based on the actual percentages of total assessment of tariff or revenue towards water tariff for different categories of users and actual O&M costs for the last 3 years as compared to the allocations in the final criteria for 2010–13.

Approach and Methodology

Idam Infra's approach to the proposed assignment is guided by the above philosophy and principles outlined in the MWRRA Act. To focus on the various components assigned and to optimize the use of available skills and experience, we divided the scope of work to be performed into modules within each task (Figure 1) covering the selected activity as specified in the pre-qualification notice. Detailed modalities, arranged by activity, are elaborated in the following paragraphs:

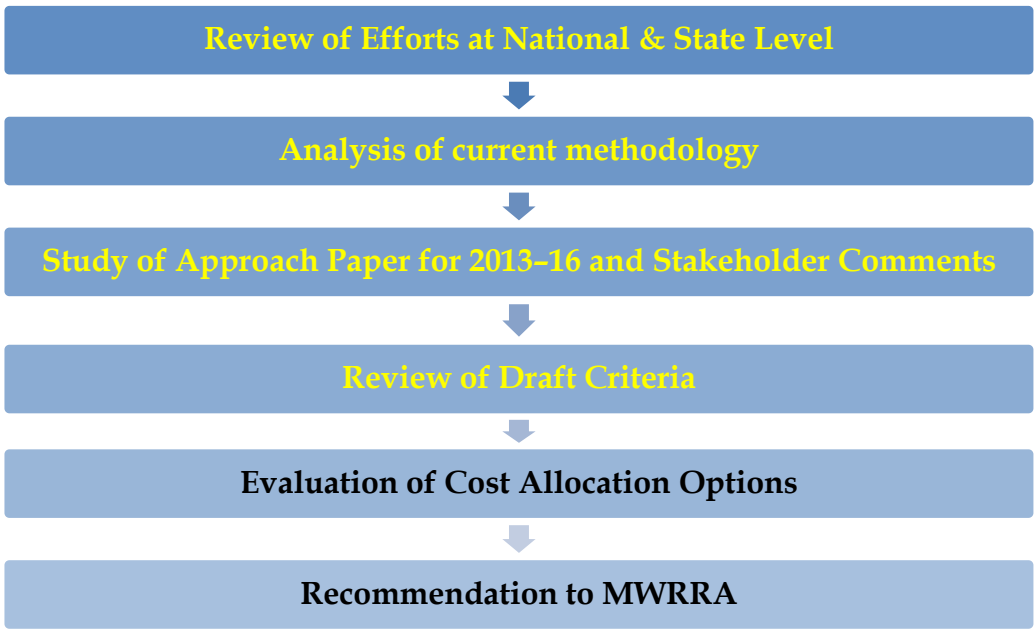

Figure **1:** Method of Study

National Effort on Water Pricing

Theories of pricing bulk water to recover these O&M costs have been developed and reported across the world. Such existing pricing mechanisms are studied in detail to understand the rationale for allocating O&M costs to various categories of users of bulk water. Based on their relevance to the current assignment and the authenticity of information, the following reports were consulted:

- National Water Policy, 2012
- 12th Five-Year Plan: Planning Commission
- Water Pricing as a Demand-Side Management Option
- 13th Finance Commission recommendations
- Non-Tax Receipt Audit Report

Highlights of the above reports and analysis of pricing aspects is covered under Chapter 2 of this Report. Brief recommendations and implication to MWRRA are summarized below:

Summary of key points relevant for MWRRA

Water Use Efficiency

1. Water pricing should be linked to water use efficiency.
2. Those user groups or associations that recycle or reuse water can be rewarded. In other words, efficiency can be a parameter for bulk water pricing backed with suitable financial incentives.
3. Resource conservation can be used as a parameter to frame bulk water tariff.

Empowering WUA

4. MWRRA can specify a minimum floor rate and let the WUA decide the price to be charged.
5. MWRRA can make WUAs aware of the Planning Commission's recommendations regarding collection of revenue that may eventually fetch grants.
6. Further, the current debate favours volumetric pricing based on the marginal cost method, and MWRRA may think of introducing marginal-cost-based pricing in future.
7. WUAs can be made responsible for collecting the ISF.
8. The grants won by WUAs can be used to upgrade water distribution infrastructure periodically without burdening consumers.

Other takeaways

9. MWRRA may introduce differential pricing to give high priority to water for drinking and sanitation and then for ensuring food security and supporting livelihoods for the poor.

10. Groundwater resources should be metered and accounted for.

11. It has been observed that Maharashtra has the minimum required recovery rate for applying for the central grant. These grants can be applied for in time every year, which can eventually lower the O&M cost.

12. Expenditure norms based on unit area (Rs/ha) can be based on the figures suggested by the 13th Finance Commission. However, the ratio of irrigated to non-irrigated potential needs to be increased.

13. Allocation of the costs for recovery should be worked out separately for each division and improved performance at the division level should be rewarded.

Water Tariff and Reforms in Maharashtra

In-depth understanding of the legal and regulatory framework governing the water sector is essential for developing a pricing framework for water. This framework defines the boundary within which the regulator has to operate. Regulatory framework assumes greater significance in sectors in which the market either does not exist or is not competitive—the significance is even greater in the water sector because it is linked to the day-to-day survival of all human beings.

Chapter 3 of this report seeks to present the legal and regulatory provisions currently applicable to the water sector in Maharashtra so as to develop a strong foundation for the framework for tariffs for bulk water proposed in this report.

The Government of Maharashtra (GoM) articulated the State Water Policy (SWP) in 2003 and enacted two laws, namely the Maharashtra Water Resources Regulatory Authority Act, 2005 and the Maharashtra Management of Irrigation System by Farmers Act, 2005. These were followed by the Maharashtra Groundwater (Development and Management) Act, 2007. The following principles emerge for cost allocation under bulk water pricing in the state of Maharashtra:

- The criteria for water charges to be fixed at the **sub-basin level, river basin level, and state level**

- Water charges to reflect the **full recovery** of the cost of irrigation management, administration, and O&M of a water resources project
- **Efficient use of water** to be promoted and wastage minimized
- **Cross-subsidies** to be **determined** between different categories of users
- **Priority** for equitable distribution of water available at the water resource project **to be determined** at the sub-basin level and river basin level during **periods of scarcity**
- Those who **pollute to pay**
- Water tariff to be levied on **volumetric basis**
- The **impact** of such charges on those **unable to pay** the complete charge to be **alleviated**
- Rates to be linked directly to the **quality of service** provided
- **Subsidy on water rates** to be provided to the disadvantaged and poorer sections of society
- **Quality of water to be restored** to the prescribed standards at the cost of the polluter

Draft Criteria for Bulk Water Tariff 2013–16

Based on the Approach Paper for 2013–16, MWRRA issued the draft criteria for 2013–16 in August 2012; the cost allocation matrix proposed is as follows:

The allocable O&M cost of Rs 100 for each of the three parameters is distributed to the three categories of users as shown in Table 1.

Table **1:** Cost Allocation Parameters 2010–13

Parameter	Agriculture	Domestic	Industry	Total
Affordability	12	10	78	100
Accessibility	30	25	45	100
Quantity and timeliness	30	25	45	100

The allocation of O&M costs with a weighting of 0.6 to affordability and 0.2 each to the other two parameters gives the allocation matrix shown in Table 2.

Table **2:** Cost Allocation Matrix 2010–13

Parameter	Agriculture	Domestic	Industry
Affordability	12 × 0.6 = 7.2	10 × 0.6 = 6	78 × 0.6 = 46.8
Accessibility	30 × 0.2 = 6	25 × 0.2 = 5	45 × 0.2 = 9
Quantity and timeliness	30 × 0.2 = 6	25 × 0.2 = 5	45 × 0.2 = 9
Total	19	16	65

Parameters Analysed for Cost Allocation

The parameters identified for cost allocation emerging out of the critical issues and challenges confronting the management of water resources in Maharashtra are discussed in this chapter. These issues have been discussed in several forums at the national and state level as seen in the earlier chapters. However, effective measures and guidelines need to be developed to overcome the shortcomings. Pricing of water and appropriate tariff determination can be used as a tool by MWRRA to make water supply and its use more efficient and also to generate revenue for water utilities. The MWRRA Act, 2005, also states that the objective of establishing MWRRA is to facilitate and ensure judicious, equitable, and sustainable management, allocation, and use of water resources and to fix the rates for the use of water for agriculture, industrial, drinking, and other purposes.

In view of the above, Idam Infra has analysed the following parameters in the present study (Figure 2).

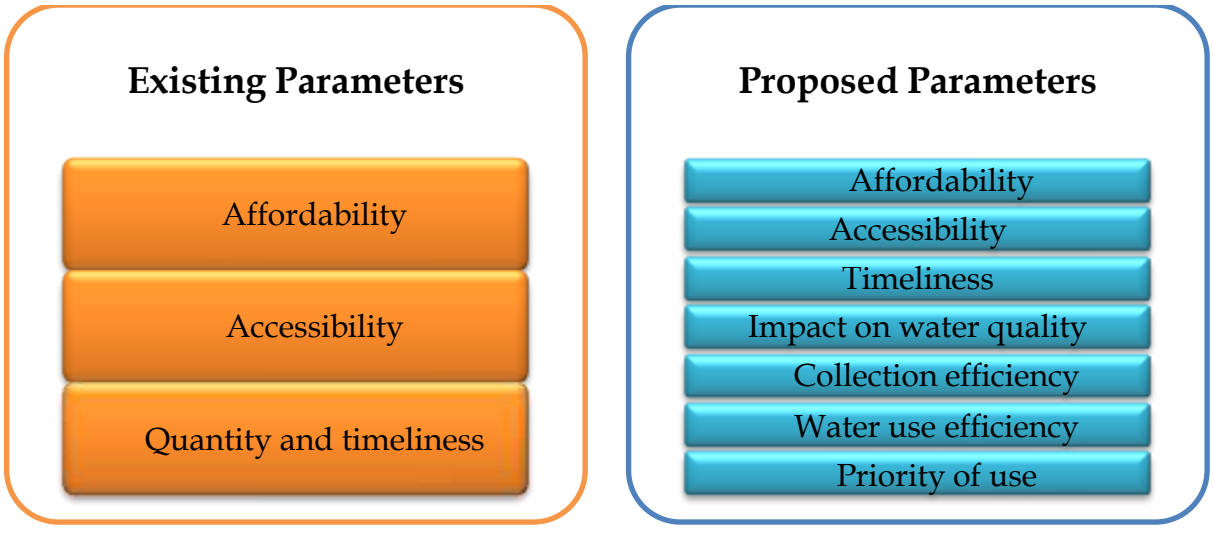

Figure 2: Parameters Analysed

Affordability

Affordability has been described and measured variously. In essence, affordability is a relative term and in general refers to how much a good or a service costs in relation to the spending power. International agencies have set their own affordability thresholds as follows:

- UNDP: 3% affordability limit
- The World Bank project 'Africa Infrastructure Country Diagnostic' cites 5% as the affordability threshold for expenditure on utility services (power and water)
- OECD: 4%
- African Development Bank: 5%

Rule of thumb for affordable water service expenditure for households is 3%–5% of their disposable incomes. The National Irrigation Commission (1972), namely that water tariffs for agriculture should be 5%–12% of the gross income from food crops or cash crops.

Affordability is computed using the following method for domestic, agricultural and industrial users:

1. Per capita consumption or requirement of water is assessed based on entitlements and past data.
2. The cost of water supplied is computed at the base rate tariff.
3. Income or revenue of the user is assessed at reasonable market rates (MSP for agriculture).
4. Based on the above, the cost of water at current tariffs is computed as a percentage (Table 3).
5.

Table **3:** Affordability Analysis

User	Usage	Cost of water per unit	Income or revenue	Cost of water (%)
Domestic	*Entitlement*		*Per capita income*	
Urban local body	150 lpcd	Rs 11.5 per capita	Rs 95339	0.01%
Rural	40 lpcd	Rs 1.9 per capita	Rs 44978 (lowest per capita, Nanded district, FY12)	0.01%

User	Usage	Cost of water per unit	Income or revenue	Cost of water (%)
Agriculture	*Yield*		*MSP*	
Cereal	1377 kg/ha	Rs 0.17/kg	Rs 9.8/kg	2%
Pulses	701 kg/ha	Rs 0.34/kg	Rs 9.8/kg	3%
Sugarcane	68460 kg/ha	Rs 0.02 /kg	Rs. 1.39/kg	1%
Cotton	322 kg/ha	Rs 1.40/kg	Rs 25/kg	6%
Industry	*Consumption*		*Market Price*	
Sugar	**15–40 litres/kg**	**Rs 0.13/kg**	**Rs 40/kg**	**0.32%**
Pulp and paper	270–450 litres/kg	Rs 0.96/kg	Rs 100/kg	0.96%
Thermal plant	5 m^3/year/100 MW	Rs 0.01 crore /100 MW	Rs 372 crore /100 MW	0.01%
Foods, snacks	150 kg/tonne	Rs 0.01/kg	Rs 200/kg	0.01%
Beverage	2.5 litres/litre	Rs 0.04/litre	Rs 40/litre	0.10%

Based on the above analysis it can be concluded that:

- As the cost of water for domestic consumers is 0.01% of the per capita income at bulk tariff level, and about 0.2%–0.3% at retail tariff, the cost should be increased to 15% in the cost allocation matrix.
- The cost of water for agriculture is 2%–3% (6% for cotton), depending on the crop and water requirement, but is generally 5%–12% of the GPV. Therefore, the allocation should be retained at the existing level of 15% in the cost allocation matrix.
- For industry, the cost of water is less than 1% of the revenue generated from the produce, which is marginal. Industries have been cross-subsidizing other user categories and need to be given some relief Therefore, the impact of increase in the affordability of domestic users be passed on to the industry.

Accessibility

Accessibility is defined here as 'reach' rather than mere availability. In other words, the variable factor is 'ease of access' rather than access itself, which would be more akin to availability. It is observed that for industry and domestic, water is drawn from the head of the reservoir, whereas for agriculture water is supplied through canals. Hence, of the three categories, the highest cost has to be borne on account of water supply to agriculture. The Government Resolution dated 2 July 2002 stipulates

that 30% of the O&M cost is associated with dams or reservoirs and 70% with canal maintenance. Thus, 30% is the cost incurred for supplying to all users, and 70% is the cost of canal maintenance mainly on account of water supplied to agriculture. However, as the actual cost incurred in supplying water to each user category is not available, water allocation from dams is considered an appropriate parameter for cost allocation on the basis of accessibility.

The O&M cost allocated under this mechanism is the maintenance and establishment cost of a project and should be billed to the users based on use. The Government Resolution dated 21 January 2003 provides for reservation up to 10% of storage for industries, 15% for domestic users (primarily as drinking water), and the rest for irrigation. These proportions indicate the quantum of water accessed by the user category from the project; therefore, the costs should also be allocated in the same proportion. The above discussion is summarized in Table 4.

Table **4:** Allocation of Accessibility Costs to Different User Categories

Parameter	Domestic	Industry	Agriculture
Location of access	Reservoir	Reservoir	Canal distribution
Maintenance cost of access	Only that of dam	Only that of dam	Dam and canal
Additional cost to access water	High	High	Low
Water allocation	15%	10%	75%

From the above analysis, it can be concluded that the WRD's cost of supplying water is the highest for agricultural users, followed by domestic users and the industry in that order. As majority of domestic and industrial users incur additional costs to access water, loading the high O&M cost on account of accessibility is not justified. Accordingly, water allocation is considered as the basis for allocating O&M cost under accessibility.

Timeliness

It is proposed to rename the parameter of 'quantity and timeliness' as only 'timeliness' under the cost allocation matrix with a weight of 10% as the parameter of quantity is covered well 'accessibility' and volumetric pricing. Instead, greater

importance is proposed to be given to timeliness and the frequency with which water drawn.

Day-to-day supply is essential for domestic and industry whereas variations in the time of supply can be absorbed to a considerable degree depending on the capacity of the storage facility available to the user. The slack is, however, reduced because of the time required to treat the water to make it potable.

For irrigation too, volume is vital but need to supply water in a timely manner is less acute than that for drinking water as crops can sustain minor delays in supply of water. In the absence of irrigation, rainwater usually makes it possible to take at least one crop, kharif or dry rabi. Thus, unlike drinking water, although there is no absolute level for the need for irrigation, the multiplier effect of volume and timeliness of supply would have an almost linear relationship with income because irrigation makes multiple cropping possible.

All manufacturing processes require water in some form or the other, although its marginal utility may decline as volumes increase beyond the requirement. Like drinking water, storage is available with industrial estates, but the level of treatment required makes timeliness a higher priority for industry than for drinking water. Thus, the highest cost allocation goes to the industry, followed by domestic and agriculture in that order.

Impact on Water Quality

It is proposed to add the parameter 'impact on water quality' under the cost allocation matrix with a weight of 20%, being aware of the need to improve water treatment and reuse of water by users. Idam Infra has analysed various issues, measures, and aspects related to the assessment and enhancement of the quality of water resources.

All those who are polluting the environment may not be polluting water or may not be discharging polluted water into freshwater sources. Industries dispose effluents in the sea or into creeks or effluents may percolate through the soil and affect groundwater quality (which is not under the purview of CBWT). Users may be polluting water but the water quality may meet the prescribed norms. Users who affect the quality of freshwater resources may vary in terms of the quantum of water polluted, and the extent of toxic pollutants discharged has varied impacts on the environment, for example higher or lower Biological Oxygen Demand (BOD).

Thus, the polluters of water need to be defined. But how are they to be defined?

- Are all water users to be regarded as polluters since water quality is affected because of their use of water?
- Are all those who use water and affect its quality but do not discharge polluted water into freshwater resources not to be regarded as polluters?
- Are all those who affect water quality but restore it before discharging the water into freshwater resources not to be regarded as polluters?
- What about those who discharge polluted water that exceeds the limits laid down by MPCB into freshwater resources?

To impose penalties under the polluter-pays principle, the impact on water quality should be controlled and monitored by considering the following.

- The quantum of water drawn by the user
- The quantum of water discharged that exceeds the limits (BOD and COD, or chemical oxygen demand) laid down by MPCB
- Water that can be reused, that is treated water (based on the capacity of the water treatment plant)

It is thus recommended that the polluter-pays principle be implemented on a case-to-case basis. Stringent norms should be developed and monitored effectively to penalize polluters. A whole category of users cannot be held responsible for polluting water resources, as it may also include users who treat the water before discharging it. Hence, the polluter-pays principle should be implemented under the tariff structure after considering the existing penalties discussed below.

Although the polluter-pays principle is targeted at the level of the individual user, it is essential for users to realize their responsibility to preserve and restore water. Therefore, this aspect is considered under the cost allocation matrix. In view of the above analysis, it can be concluded that quality of water can be compared across user categories based on three different parameters (Figure 3).

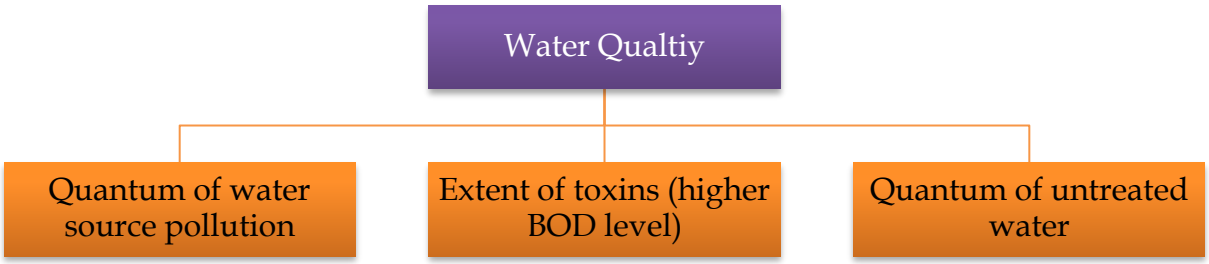

Figure **3:** Water Quality Parameters

The quantum of water resources polluted by discharging polluted water cannot be measured for different user categories, but the extent of hazardous toxic substances let into the water, that is the severity of pollution, can be measured using BOD, COD, pH, and other norms. The volume of untreated polluted water by the users can also be quantified.

In order to incorporate the impact on water quality, it is important to consider both the aspects, namely the quantum of untreated water and the severity of pollution. This will encourage setting up ETPs and also improve water use efficiency.

It appears that the domestic sector pollutes water sources much more than the industrial sector does. STPs and CETPs are unable to restore the desired quality as discussed earlier. The existing CETPs and ETPs were found to be inadequate to treat industrial effluents. A study conducted by NEERI reports that the domestic sector is responsible for significant pollution, followed by industry. Approximately 78% of the 6209 mld of sewage generated through cities goes untreated; 90% of this is generated by municipal corporations. Further Class B and C cities have virtually no treatment facilities at all. Of the 600 mld of effluent generated by industry, only 30% is treated: in other words, as much as 70% of the effluent remains untreated.

Thus, in our analysis, we have considered 78% of domestic sewage as untreated and 70% of effluents as untreated. The quantum of untreated water in agricultural is not known, but we have assumed that 5% of the total is polluting.

As the quality of river water is affected by effluents discharged into it by industries and domestic users and as the severity of such pollution by specific user groups is not known, equal weighting is given to both the users in terms of their impact on the pollution of river water. Agriculture is assigned a marginal contribution weighting of 5%.

The cost allocation with respect to the impact on water quality is shown in Table 5.

Table **5:** Impact on Water Quality

Parameter	Computation	Agriculture	Domestic	Industry
Quantum of untreated water (50%)				
Assumed quantum of water	A	80%	15%	5%
Percentage of untreated water	B	5%	78%	70%
Quantum of untreated water	C = A × B	4%	12%	4%
Allocation based on quantum of untreated water		**21%**	**61%**	**18%**
Severity of pollution (50%)				
Allocation based on severity of pollution		**5%**	**48%**	**48%**
Total allocation for the impact on water quality		**13%**	**54%**	**33%**

Collection Efficiency

After analyzing all the data submitted by WRD for all the circles of Maharashtra we have arrived at the following recommendations:

- Collection efficiency can be made a factor in the bulk water tariff bill to incentivize or penalize water users. Circles that meet or surpass a set target for efficiency should be rewarded whereas those that fail to meet the target should be penalized.
- It would not be appropriate to use collection efficiency as a parameter in the cost allocation matrix, which is based on more concrete and intrinsic aspects such as affordability, quality, and quantity. Collection efficiency reflects the willingness to pay—a factor very different from affordability.
- The incentives awarded to bulk water consumers can be used to upgrade water infrastructure or for any other measure that directly benefits consumers.

Water Use Efficiency

Water use efficiency has been identified as a key parameter under the regulatory framework and national level initiatives. In Maharashtra, irrigation consumes 75%–80% of water with the lowest efficiency: even a small improvement in water use

efficiency will make water available for other categories of users. About 90% of the total agricultural consumption of water is under area-based supply, which needs to be monitored.

Annual actual water use per hectare in many irrigation projects is 1.5–4 times that of the norms officially accepted for benchmarking. Actual irrigated area would be significantly different than the reported area if irrigation management in the state is streamlined and disciplined.

Municipal corporations draw about 70% of drinking water, and that use can be monitored and made more efficient. Municipalities can improve efficiency also by setting up sewage treatment plants for recycling and reusing water. Industries need to set up ETPs and use treated sewage from municipalities to reduce the burden on freshwater resources. Water as a resource needs to be brought under a regulatory framework for a holistic view of all the issues confronting the sector.

An appropriate mechanism should be developed to measure water use efficiency. It is important to include water use efficiency under the tariff structure so that the least efficient use is penalized and the most efficient use rewarded. Unfortunately, quantitative information is not available to define the weighting for this parameter and to allocate the cost among different user categories. However, given the significance of the parameter, it is proposed that water use efficiency be included in the cost allocation matrix for the subsequent tariff determination process. In the meantime, a **baseline study and benchmarking and demonstration projects for higher water use efficiency should be undertaken by WRD at the earliest.**

Priority of Use

Access to water is a basic human right, which includes drinking water, sanitation, wastewater service, and fire protection. It is the responsibility of the state to ensure that a basic minimum quantity of water of adequate quality is supplied to all people. Therefore, domestic use should get the highest priority and, consequently, should bear the maximum share in cost allocation.

Water is required for the survival of all living beings and of the environment. Agriculture, and particularly irrigated agriculture, is essential for food production and is considered a socio-economic good. Water is used as an economic good in industrial activities including industrial cooling and other purposes. However, water is not being treated as an economic good.

Hence, it is suggested that priority in water allocation should not be used as a parameter in allocating costs among different user categories.

Recommendations and Conclusion

Cost Allocation Matrix

The cost allocation parameters discussed in Chapter 5 are summarised in Table 6.

Table **6:** Criteria and Measures for the Criteria for Cost Allocation

Criterion	Performance measure
Affordability	• Ability to pay
Accessibility	• Cost of reaching the user
Timeliness	• Adequacy of supply • Timeliness of supply
Impact on water quality	• Polluter-pays principle • Quality of water outflow
Collection efficiency	• Penalty for inadequate revenue collection
Water use efficiency	• Quantity of consumed as per norms • Water conservation
Priority of use	• Concession to be given for essential usage • Charge for economic use

The recommended cost allocation matrix based on the above criteria is presented in Table 7 and the weightings for the parameter for each user category are shown in Table 8. The matrix shows how the allocable O&M cost of Rs 100 for each of the three parameters is apportioned among the three categories of users.

Table **7:** Proposed Cost Allocation Matrix

Parameter	Agriculture	Domestic	Industry	Total
Priority of use	-	-	-	**-**
Affordability	15	15	70	**100**
Accessibility	75	15	10	**100**
Timeliness	20	30	50	**100**
Impact on water quality	13	54	33	**100**
Collection efficiency	-	-	-	**-**
Water use efficiency	-	-	-	**-**

Table **8:** Weightings for Each Cost Parameter Apportioned Among User Categories

Parameter	Agriculture	Domestic	Industry	Weighting
Priority of use	0.00	0.00	0.00	0%
Affordability	9.00	9.00	42.00	60%
Accessibility	7.50	1.50	1.00	10%
Timeliness	2.00	3.00	5.00	10%
Impact on water quality	2.60	10.80	6.60	20%
Collection efficiency	0.00	0.00	0.00	0%
Water use efficiency	0.00	0.00	0.00	0%
Total	**21.10**	**24.30**	**54.60**	
Rounded off value	**21**	**24**	**55**	

Other Measures Recommended

- Measure and reward efficiency in water use.
- Offer adequate incentives to WUAs and ULBs to ensure improved collection efficiency.
- Ensure accounting and timely reporting of data to MWRRA as part of the move towards determining tariffs and performance efficiency separately for each division or circle.
- Create adequate capacity and awareness to ensure that the tariff order issued by MWRRA is effectively implemented, which includes assessing the tariff appropriately, offering suitable concessions, and imposing suitable penalties.
- Develop a rigorous system of data collection and information management system for better access to information on water resources.
- Collect data on each sub-category of tariff levied, concessions given, and penalties imposed separately to assess the impact of the regulations and to formulate a more informed process of tariff determination for the next control period.