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Setting water tariffs right

Considerations and approaches



- In brief:**
- Governments must ensure access to water for all citizens as it is a right with far reaching social, political and economic implications.
 - To facilitate sustainable access to quality water, an appropriate approach to water tariffs needs to be determined that considers various contextual challenges and opportunities.
 - This brief looks at the potential options for Mandalay City to help them better understand how to set tariffs for water in their municipality.
 - In order to improve this process, access to good data on the costs of running the system, including leakages, operations, and maintenance, is critical.

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Background: Water tariffs in Mandalay City, Myanmar

In March 2018, the Mandalay City Development Committee (MCDC) in Myanmar approached the International Growth Centre (IGC) to help them better understand how to set tariffs for water in their municipality. Mandalay City's urban area has approximately 90,000 water meters, of which 88,000 are residential and 2,000 are commercial. An estimated 8,000 - 10,000 of these meters do not function. Some were installed 30 years ago and more are being rolled out now, in particular to low income townships.

Strikingly, the MCDC is currently making a major loss in running its water system. Although there is not full data on the actual costs, they estimate that they are not yet covering even 50% of the operation and maintenance costs. This is without accounting for the need to expand and upgrade the system, much of which still stems from colonial times.

There are two different departments in the MCDC that deal with water related issues: One is responsible for infrastructure installation, operations, and maintenance and a second, which falls under the national Revenue Department, deals solely with water revenue. The latter department was established as water revenues represent one of the highest sources of revenue for the city. Water provision also accounts for some of the highest costs for the city.

The water tariffs in Mandalay are set by the MCDC's steering committee. There are two different tariffs: One is applied to meters that are installed in households and firms and is based on water consumption. The second tariff applies to those who collect water from the moat. The moat, which currently boasts 3000 connections, is charged via a flat tariff per quarter. This is based on the diameter of the pipe: For a half inch pipe the charge is 4000 kyat; for the 6 inch pipe it is 50,000 kyat; and the largest pipe, at 8 inches, is 70,000 kyat.

To date, Mandalay's water is not only the cheapest in Myanmar, but it also has some of the lowest tariffs in South East Asia. There have been attempts to rectify this. For example, in 2015, the tariff was raised to 85 kyat (approximately 0.06 United States Dollar/USD) and in 2018, the current Mayor of MCDC raised the price further to 200 kyat (about 0.15 USD) per unit, where 1 unit = 220 gallons¹ for households. The charges for commercial use changed to 110 kyat (approximately 0.08 USD) in 2015, and 260 kyat (approximately 0.19 USD) per unit in 2018.

There are a number of exemptions for institutions that do not pay for water overall; including government and religious institutions. There was an indication that this may still be under-pricing water, as according to MCDC, there was not much resistance to this price change, even though it was an over 100% increase. In determining the rate, the MCDC tries to benchmark tariffs with other cities in Myanmar. Outside from this, the rate itself is set relatively arbitrarily.

The Mayor would like to raise the tariff again, however, this time he would like to better understand and use best practices in setting the tariff. The city also estimates that there is a high price of non-revenue water in their system due to a number of leakages. Therefore, together with raising the tariff to an appropriate level, they want to ensure they have more income to provide better services to the residents of Mandalay.

¹ Other cities in Myanmar charge between 200 and 600 kyat (0.15 and 0.45 USD) per unit.

The importance of water tariffs

Up until the early 1990s, water pricing was not seen as an important issue, even in developed countries. Rather, water was seen as a resource that would be available in endless supply. It was also perceived to be more of a social good, which everyone should have unlimited access to. Over time, there have been great shifts in this thinking. This has helped countries and cities understand that setting tariffs right is extremely necessary to ensure water services are sustainable. This includes considerations from a conservation perspective, while recognising contextual challenges. For example, in many developed countries, water infrastructure is ageing and needs to be replaced, while in developing countries, much water infrastructure is not yet available and needs to be financed.

Water is a good that straddles both being a private economic and a public social and political good. It is a private good as it is characterised by being exclusive and rivalrous in use. Furthermore, specific consumers and their actual consumption of each unit of water can be relatively easily identified. It is also a social and political good because, as outlined by United Nations (UN) Resolution 64/292, water is a human right. Therefore, everyone is entitled to a sufficient, safe, physically accessible, and affordable supply of water.

This right to water highlights that it is not only about considering the quantity supplied but also the quality and safety. Water quality has major health implications.

Historically, cities that have made investments in their water and sewerage systems have enjoyed significant impacts on health outcomes overall. Therefore, it has the potential to exude positive externalities and can be regarded as a public good.

The recognition of water scarcity has also been key in evolving governments' thinking about water pricing. However, coupled with an initial lack of urgency, many governments have avoided setting water tariffs as they are highly visible and therefore highly political. That is, raising prices to reflect the true cost of water can have political consequences. Therefore, many saw this challenge as one to be outsourced to the remit of engineers, rather than economists, to find technological innovations that would allow for continued consumption.

It is only recently that demand management has been targeted, involving setting tariffs and having people pay the price for the water they consume. This requires good data on the costs, consumers, and consumption rates. What is more, water provision is best undertaken by monopolies for it to benefit from economies of scale. Therefore, tariff setting has to be undertaken from a macro-perspective. Therefore, this brief outlines government considerations when deciding how to price water tariffs, different ways this can be done, and the advantages and disadvantages of each of these methods.

Considerations when setting a water tariff

In most developed country city water systems, tariffs account for the majority of revenue from water, which is then reinvested in the system to cover operating, maintenance, and network development costs. Developing countries, on the other hand, generally rely more on taxes and transfers to finance water systems². This can be attributed to an absence of formal metering, rendering information of

² le Blanc, D. (2007). A Framework for Analyzing Tariffs and Subsidies in Water Provision to Urban Households in Developing Countries, New York: United Nations

individual consumption unavailable.

Furthermore, developing country governments have to consider affordability for very poor households. A well-designed tariff structure ensures that consumers pay for what they consume while taking measures to target low-income users, rather than keeping prices low overall. Ensuring users pay for what they consume improves the sustainability of the system to ensure everyone has the ability to consume sufficient water now and in the future.

An additional consideration in system design is the possibility of having higher income groups subsidise lower income groups to cater to different consumers' ability to pay. To do this well, the system must have the capacity to clearly identify what income group each consumer falls in otherwise there is the risk wastage, i.e. too many subsidies are given for people who may not require them, at a cost to the government. Furthermore, evidence has shown that subsidising tariffs alone is insufficient in helping low-income households access water.³

Tampering too much with tariffs without having sufficient data on the consumer can be administratively challenging to implement and lead to other inefficiencies in the system. Research has shown that another potential targeting mechanism for lower income groups, is to subsidise access through connections. This is particularly because their private willingness to pay for good quality water may not match the public health benefits, such as preventing cholera outbreaks, of everyone having a connection.⁴

There are a number of different factors that governments can take into consideration when setting the tariff. These include:

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- **User pays principle or cost recovery:** From an economic perspective, having users pay what they consume to cover the full cost of the system is deemed to be the most efficient, fair, accountable, and transparent way to price water. Cost recovery specifically refers to charging the users the full cost of water services.
- **Equity and equality:** Access to quality water is both a human right and a public good with positive externalities. Therefore, a tariff structure needs to ensure that everyone can meet their needs and access the necessary amount of quality on a daily basis to survive. This can be achieved through a variety of mechanisms, such as direct subsidies to the poorest households, cross- subsidising households within the tariff structure, or enabling access to the system.
- **Affordability:** International research has deemed that for water to be affordable, the tariff should be no more than 3-5% of average household income. However, it is important that tariffs should not be set too low otherwise there may be compromises on sustainability of the system overall.
- **Economic efficiency:** Achieving economic efficiency is linked to the overall sustainability in service provision. Overall, governments need to ensure the system is able to provide sufficient water today and in the future, while accounting for growing populations. Economic efficiency also relates to the network overall, such as minimising losses within the network and ensuring

³ Ashraf, N., Glaeser, E. and Ponzetto, M. (2016). "Infrastructure, Incentives and Institutions", American Economic Review, Vol. 106:5.

⁴ Ashraf, N., Glaeser, E., Holland, A. and Steinberg, B.M. (2017) "Water, Health and Wealth." NBER Working Paper 23807.

the efficient allocation of water throughout the network. It thus relates to covering all externalities of water provision.

- **Environmental conservation:** There is now consensus that the supply of good quality water is a finite resource. It is also a normal good so consumers will adjust their consumption behaviour based on the price. Therefore, one consideration when setting the tariff is whether you want to set it such that it discourages people from using too much of it.
- **Socio-political motives:** Some governments may have social or political motives for setting tariffs. However, as a general rule, using prices to achieve these aims is not the most efficient way to do this and could lead to adverse outcomes.
- **Full cost recovery:** There should be the appropriate mix of taxes, tariffs and transfers to ensure that the financing of water systems, and thus the provision of water over time, is sustainable. There is general consensus that full cost recovery is a desirable feature of a water system and should be taken into consideration when setting tariffs.

Understanding the exact nature of all the costs can be a challenge and is one of the key hindrances in ensuring full cost recovery. Furthermore, there is no consensus on what this entails or what costs should be covered by the revenues from tariffs. Costs that can be considered: include:

- **Direct costs:** Operation and maintenance (O&M) costs of the network, depreciation, investment and financing (including any costs that need to be serviced), rehabilitation and expansion of the network.
- **Indirect costs:** Wages of staff working with water related services, insurance of the system, and electricity.
- **Other costs:** The opportunity cost of water, environmental impact, system development, and institutional support.

Based on these costs, a tariff hierarchy can be developed to help determine how much and what costs are set to be recovered through the tariff. For example, the municipality may decide to only cover direct O&M costs, or they may want to fund rehabilitation and expansion of the system as well.

It should be noted that evidence from Africa shows that, in general, most utilities are only able to cover their costs if consumption is extremely low or extremely high but not as much at average level of consumption⁵. These do not include investment costs, which cannot usually be covered even at extremely high tariff levels. It is important to highlight that full cost recovery does not account for any externalities in water provision and therefore cannot necessarily be equated with full economic efficiency.

Approaches to water tariffs

There are two central components of most water tariffs: A fixed and a variable charge. The fixed charge should cover the basic metering costs within the network. The variable charge, which is the charge per consumption unit (usually measured in m³) is calculated to cover the operating costs of each of these units. These charges can then be adjusted based on the considerations outlined in the previous section.

It is also important to compare the final figure of the tariff to one that is calculated based on the

⁵ Banerjee, S., Foster, V., Ying, Y., Skilling H. and Wodon, Q. (2010). Cost Recovery, Equity and Efficacy in Water Tariffs: Evidence from African Utilities, Policy Research Working Paper 5384, World Bank: Washington DC.

assumption that the system is working at full efficiency. This can be used to make further adjustments. If this is not done, then the consumer may be taking on an unfair proportion of the charges solely as a result of the inefficiencies in the system.

Therefore, when deciding how to price water, a key issue is how to incorporate both the fixed and the variable costs of the system in the tariff. Furthermore, the level of the tariff, as well as the type of tariff used, will have differing impacts on the demand for water. For example, tariffs, if set correctly, can induce people to consume only what they really need and thus support environmental conservation efforts. Conversely, if water is overly subsidised and consumers are not facing the true cost, then there can be an over-consumption of water, which will affect the network's sustainability.

A typology of the different types of tariffs and their respective advantages and disadvantages is as follows⁶:

Type of tariff	Description	Advantages	Disadvantages
Single unit price per m³ without a fixed base charge	A charge solely based on the volume of consumption. It can be a different charge depending on the category of consumer (e.g. residential, commercial etc.)	It can be used to cover the operating costs of water.	Without a fixed base charge, it will be difficult to set this tariff to cover the basic metering cost of the networks. It also requires all users of the system to be connected and have a functioning meter.
Single unit price per m³ with a fixed base charge	A charge based on the volume of consumption in addition to a fixed charge paid by all consumers. This fixed charge is meant to cover metering costs. It can also vary by category of consumer.	The user pays for what they consume. In addition, there is a charge for the fixed costs of the network in total.	It requires all users to be connected and have a functioning meter. Additionally, if there are different tariff bands based on consumer type, this may become Administratively challenging to implement.
Flat tariff	A fixed charge levied on per unit of time (e.g. per month) to all consumers in the network. It does not vary by the category of consumer.	Administratively, this is the easiest charge to levy, especially if the network does not have functioning meters.	This tariff is not cost effective as the price does not correspond to individual consumption.

⁶ United Nations Development Programme/UNDP (2015). Tariff setting methodology for water supply and sewerage services in Bosnia and Herzegovina, New York: United Nations Development Programme.

<p>Marginal cost of tariff</p>	<p>These tariffs are based on the cost of producing an extra unit of water (i.e. the marginal cost).</p>	<p>It may support cost recovery. From an Economics perspective, this is pricing (P) at marginal cost (MC), which means it is an economically efficient form of tariff.</p>	<p>Setting tariffs solely determined by the cost does not consider affordability and what consumers are willing to pay. Furthermore, this is only efficient if the marginal cost is constant, which is a highly unlikely scenario.</p>
<p>Decreasing block tariff (DBT)</p>	<p>The tariff lowers as consumption of water increases. This is essentially the wholesale price of water.</p>	<p>DBT functions well for commercial and industrial businesses that have to use a lot of water. It is based on the premise that there are economies of scale in water production and consumption.</p>	
<p>Increasing block tariff (IBT)</p>	<p>The tariff increases as consumption of water increases. It allows for a first block with a lower tariff charge for poorer consumers, often subsidised, to ensure every household receives the minimum amount of water.</p>	<p>This is an effective demand management tool to lower the consumption of water and is therefore increasingly used if conservation is the aim of the tariff. It is more appropriate for residential consumers. There is a social advantage too: poorer consumers pay very little for a minimum basic amount of water. Richer and higher quantity consumers pay proportionally more.</p>	<p>These types of tariffs do not usually create enough revenue to maintain the system.</p>
<p>Seasonal-rate, peak-load rate, or excess use rate systems</p>	<p>An extra charge to the tariff in times of peak season or peak demand.</p>	<p>This functions as an extra cost for consumption when supply is scarcer. Therefore, it can be good for conservation.</p>	<p>From an administrative perspective, this increases the complexity in calculating each of the tariffs.</p>

As is the case in many cities, more than one tariff structure can be applied depending on whether there are meters installed. In Mandalay, for example, they have a flat tariff for the moat, based on the diameter of the pipe but not the type of consumer as there are no meters. Overall, where there are no meters, flat tariffs that do not vary by consumption are most common. Where there are meters, in households and commercial areas, a single unit price is charged (without a fixed base charge).

This is feasible as there are two ways of supplying water and the moats are not connected to meters, a single unit charge cannot be applied. In theory, this could also work with meters if you are able to identify which consumers should be getting which type of tariff i.e. one type of meter is installed for one profile of consumer and a different type for another consumer. One way that a few countries do this is to vary tariffs by the quality of the connection.

However, having more than one type of tariff on metered systems means a more complexity in the administration of tariffs, particularly in identifying and charging different tariff structures to different consumers. Furthermore, it also becomes less transparent for the consumer who needs to understand why they fall into a certain category. This has a high likelihood of decreasing the overall efficiency of the tariff.

Therefore, the majority of water utilities follow one type of tariff structure and vary the charge by consumption, thus charging different prices. This is why the increasing block tariff is popular in many developing countries. It allows for a first block with a lower tariff charge for poorer consumers, often subsidised, to ensure every household receives the minimum amount of water⁷. Tariffs can then be varied as consumption increases. For the highest consumers, tariffs can be set working towards cost recovery. A study by the World Bank of 20 African utilities found that the average first block was about 0.32 USD per m³. In about one-third of the countries, the top end the tariff was higher than 0.8 USD per m³.⁸

Recommendations: Improving data for better tariff setting

For any type of tariff to be effective, it needs to have sufficient data to both target and measure the objectives the government sets. Data that is pertinent includes average household income and how this differs by income groups, average household consumption, as well as what is a necessary minimum amount that will need to be consumed by each household per day. Furthermore, having access to good data on the costs of running the system, including leakages, operations, and maintenance, is critical.

A challenge in acquiring this data may be that the costs cannot be differentiated, i.e. they are amassed across different departments working on water. There may be other pieces of data that a government needs if it is trying to target specific objectives, such as environmental conservation. At the very minimum, the data listed here can help any government set their tariffs better and monitor how this is affecting consumption and income groups over time.

⁷ Ibid 4.

⁸ Ibid 4.

References and further reading

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