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WATER PAPER

REFORM OF THE WATER AND SANITATION SECTOR is occurring in many countries, and offers the potential to improve services to all. Of particular concern, however, is the situation of the poor, and reform must be designed so that they receive increased access to affordable services. A key issue in this regard is water pricing, which is one of the main variables affecting the distribution of benefits between different stakeholders. However, experience shows that water pricing, and the subsidies which are often delivered through water tariffs, can be a source of major inefficiencies in the sector.

While affordability has been one of the prime concerns of those setting tariffs and designing subsidies, there may be significant flaws in many common pricing strategies and subsidy delivery mechanisms. Rather than providing affordable water to the poor, these may in fact be leading to financial unsustainability of utilities, lack of access to services, and inequity. The reform process provides the opportunity to rationalize and reconsider the design of tariff and subsidy structures, and seek new ones which may provide better results.

This series of papers is designed to examine these issues in South Asia. It is designed to present the basics of tariff and subsidy issues, to disseminate recent research findings, and to stimulate debate on the subject.
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Many cities in South Asia are currently considering policy initiatives designed to improve the delivery of municipal water and sanitation services. An important part of these policy discussions is the reform of current water pricing practices and tariff structures, including the use of tariffs to deliver subsidies. This paper discusses the objectives of water tariffs, describes the main types of tariff structures in use around the world and their pros and cons, and examines the use of pricing structures to deliver subsidies. The paper concludes that it is difficult and challenging to design tariff structures which are consistent with the many conflicting objectives of the water sector (such as economic sustainability, efficiency, equity and affordability), and that in many cases existing practices introduce distortions and undesirable effects, particularly for poor users.

Water and Sanitation Program
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A water tariff is an important management tool. The pricing of water services is, however, controversial, and it is important for reformers to understand why there is so little consensus on water pricing issues. There are three main reasons. First, there is disagreement over the objectives of water pricing and tariff design. Water pricing decisions affect several different objectives or goals of policymakers, often in conflicting ways. This means that if one person is looking solely (or mostly) at the consequences of a particular water pricing policy in terms of one objective, and another person is looking at the same water pricing policy in terms of its impact on another objective, they may reach quite different conclusions about the attractiveness of the policy.

Water pricing decisions affect several different objectives or goals of policymakers, often in conflicting ways.

Second, there is disagreement over what would actually happen if different water tariffs were implemented. The empirical work is often lacking that would enable someone to know with reasonable confidence how changes in water prices would affect the quantity of water different customers would use and whether or not price changes would affect customers' decisions to connect (or stay connected) to the water distribution system.

Third, although there is often some competition in the water market, there is no market test for different water tariff structures. Many tariff structures are feasible and can partially accomplish some of the competing objectives of water pricing. There are typically an insufficient number of providers of piped water services for customers to reject inappropriate tariff structures. Bad ideas thus do not get weeded out of either the market or the policy discussion[1].

In the next, second section of the paper we discuss the objectives of water tariffs in order to clarify what needs to be accomplished. The third section of the paper describes the main types of water tariffs, while the fourth section does the same for subsidies.

Objectives of Municipal Water Tariff Design[2]

Setting water tariffs requires that one strikes a balance between four main objectives:

1. ***Cost recovery.*** From the water supplier's point of view, cost recovery is the main purpose of the tariff[3]. Cost recovery requires that, on aggregate, tariffs faced by consumers should produce revenue equal to the financial cost of supply. Moreover, the revenue stream should be relatively stable and not cause cash flow or financing difficulties for the utility.
2. ***Economic efficiency.*** Economic efficiency requires that prices signal to consumers the financial, environmental, and other costs that their decisions to use water impose on the rest of the system and on the economy. In practice, this means that the volumetric charge should be set equal to the marginal cost of bringing one additional cubic meter of water into a city and delivering it to a particular

[1]Even in different private sector participation arrangements, water tariff structures are typically set by the regulatory agency, and the private sector operator has to treat them as given and manage the system as best he can (given this constraint).
[2]For a more in-depth discussion of the ideas presented in this section, see Boland, John. "Pricing Urban Water: Principles and Compromises." *Water Resources Update*, Universities Council on Water Resources, Issue No. 92 (summer 1993), pp. 7-10.
[3]For example, the World Bank's Operational Manual Statement No. 3.72 emphasizes the importance of this cost recovery objective and the financial autonomy of the borrower.

customer. In many cities, the cost of bringing additional water is higher than the cost of supplying existing water, since the cheapest sources tend to be developed first. Ideally, the marginal cost should include not only the financial cost of the public works, but also the social cost of diverting water resources into public supply rather than using them for other purposes. An efficient tariff will create incentives that ensure, for a given water supply cost, that users obtain the largest possible aggregate benefits.

3. ***Equity.*** Equity means that the water tariff treats similar customers equally, and that customers in different situations are not treated the same. This usually means that users pay monthly water bills that are proportionate to the costs they impose on the utility by their water use.
4. ***Affordability.*** Water differs from many other commodities in that it has a major impact on health and well-being. Many people feel that water services are a basic right and should be provided to people regardless of whether they can pay for them. These considerations have led to recommendations that water prices be kept low, and that water be provided free or at minimal cost, at least to the poor, through systems of subsidies. However, in practice, somebody must pay for water services, and that 'somebody' is either the taxpayer, other customers (for example, industrial customers), or in some cases the international community (via development assistance).

Picture by Ajay Paul/WSP-SA

There are a number of trade-offs between different objectives and the average price of water supplied by the utility through domestic connections. For example, providing water free through private connections in order to achieve the objective of affordability conflicts with the objectives of cost recovery and efficient water use. Also, poor customers can sometimes be relatively expensive to serve (due to outlying location), and hence it might not be regarded as entirely equitable to charge them the same as, or less than, other customers.

An efficient tariff will create incentives that ensure, for a given water supply cost, that users obtain the largest possible aggregate benefits.

There are also additional objectives or considerations involved in setting water tariffs. For example, a tariff design should be easy to explain, understand, and implement. A tariff design should be acceptable to both the public and political leaders. This may require the tariff to conform to perceptions of fairness, often quite different from strict equity.

Water tariffs may be designed to discourage 'excessive' uses of water, thus promoting water conservation. A successful tariff design is one that is not controversial, nor should it become a focus of public criticism of the water supply agency.

Tariff Design Options

A tariff structure is a set of procedural rules used to determine the conditions of service and the monthly bills for water users in various categories or classes. Box 1 presents a simple typology of water tariff structures.

As shown, there are two main types of tariff structures used in the municipal water supply sector: a single-part tariff and a two-part tariff. With a single-part tariff, a consumer's monthly water bill is based on a single type of calculation. With a two-part tariff, a consumer's water bill is based on the sum of two calculations. The single calculation used in a single-part tariff can be one of two kinds: a fixed charge or a water use (volumetric) charge.

A tariff structure is a set of procedural rules used to determine the conditions of service and the monthly bills for water users in various categories or classes.

Picture by WHO/P. Virot

Fixed charges

In the absence of metering, fixed charges are the only possible tariff structure. With a fixed charge, the consumer's monthly water bill is the same regardless of the volume used. In many countries renters in multi-storey apartment buildings have unmetered connections

Box 1: Basic Types of Water Tariff Structures

1. **Single-part tariffs:**
   - A. ***Fixed charge*** - monthly water bill is independent of the volume consumed
   - B. ***Water use charge***
     - a. Uniform volumetric tariff
     - b. Block tariff - unit charge is constant over a specified range of water use and then shifts as the use increases
       - (i) Increasing block
       - (ii) Decreasing block
     - c. Increasing linear tariff - unit charge increases linearly as the water use increases
2. **Two-part tariffs** (fixed charge + water use charge)

to their unit and thus effectively pay a fixed charge for water (perhaps incorporated into the rent). Fixed charges are still quite widely used in industrialized countries, such as Canada, Norway and the United Kingdom (and until recently in New York City), where water has historically been abundant and hence metering is not widespread *(see Table 1 on page 10)*.

The fixed charge itself can vary across households or consumer classes depending on characteristics of the consumer. For example, historically a common way to charge differential fixed charges was to set higher fixed charges on more valuable residential properties, sometimes based on the assumption that people living in higher value dwellings tended to use more water and/or had a greater ability to pay for the water they use. It was also common for businesses to have a different fixed charge from households, based on the assumptions that (a) firms use more water than households, and (b) firms have a higher ability to pay for water than households. Another common approach is to charge different monthly fee depending on the diameter of the pipe used by the customer to connect to the distribution system.

From an economic efficiency perspective, the problem with a fixed-charge system is that consumers have absolutely no incentive to economize on water use since each additional cubic meter comes free of charge. From a cost recovery perspective, a fixed-charge system creates a potentially large problem for the utility (or operator) if all households do not have individual connections. This is because a single-part tariff based on a fixed charge allows customers with a connection to supply other water users (e.g., unconnected households, vendors) without a corresponding increase in their water bills. Moreover, because there is no incentive to economize on the use of water, a fixed charge that provided sufficient revenues at one point in time will become increasingly inadequate as the economy and incomes grow and water use increases.

Picture by Indo-USAID FIRE-D Project

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Volumetric charges

The second way to structure a single-part tariff is to base consumers' water bills on the amount of water they use. In other words, the monthly water bill is a function of the quantity of water a consumer uses. The precise formula used for the calculation of the water bill can differ. There are three main options: (1) a uniform volumetric charge; (2) a block tariff where the unit charge is specified over a range of water use for a specific consumer, and then shifts as use increases; and (3) an increasing linear tariff where the unit charge increases linearly as water use increases. All volumetric charges (for urban consumers) require that the consumer has a metered connection and that this meter works reliably and is read on a periodic basis.

Uniform volumetric charge

With a uniform volumetric charge, the household's water bill is simply the quantity used (e.g., cubic meters) times the price per unit of water (rupees or taka per cubic meter). This is the most common type of volumetric charge among water utilities in the United States, Australia and a number of European countries (*see Table 2 on page 11*) and is also very common for industrial and commercial users throughout the world. A uniform volumetric charge has the advantage that it is easy for the consumer to understand, in part because this is how most other commodities are priced. From an economic efficiency point of view, it can be used to send a clear, unambiguous signal about the marginal cost of using water.

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Block tariffs

Block tariffs come in two main varieties-increasing and decreasing. They create a step-wise price structure as illustrated in *Figure 1 (on page 9)*. With an increasing block tariff (IBT), consumers face a low volumetric per-unit charge (price) up to a specified quantity (or block); and then for any water consumed in addition to this amount they pay a higher price up to the limit of the second block, and so on. IBTs are widely used in countries where water resources have historically been scarce, such as Spain, and the Middle East. With a decreasing block tariff (DBT), on the other hand, consumers face a high volumetric charge up to the specified quantity in the first block, and then for any water consumed in addition to this amount, they pay a lower price up to the limit of the second block, and so on.

Picture by Indo-USAID FIRE-D Project

Thus for both an increasing and decreasing block tariff structure, the water bill is calculated in the following manner:

Let Q* = amount of water sold to a specific consumer

Q_1 = maximum amount of water that can be sold in the first block at price P_1;

Q_2 = maximum amount of water that can be sold to a consumer in the second block at P_2; and

Q_3 = maximum amount of water that can be sold to a consumer in the second block at P_3.

If $Q^* < Q_1$, then the consumer's water bill = $(Q^*)\ P_1$

If $Q_1 < Q^* < Q_2$, then the consumer's water bill = $P_1Q_1 + (Q^* - Q_1)\ P_2$

If $Q_{1+}Q_2 < Q^* < Q_3$, then the consumer's water bill = $P_1Q_1 + P_2Q_2 + (Q^* - [Q_1+Q_2])\ P_3$.

And so on for however many blocks there are in the tariff structure.

The rationale commonly given for an IBT structure is that, in theory, it can achieve three objectives simultaneously. It is argued that (1) an IBT promotes

affordability by providing the poor with affordable access to a 'subsistence block' of water (the 'lifeline' rate); (2) it can achieve efficiency by confronting consumers in the highest price block with the marginal cost of using water; and (3) it can raise sufficient revenues to recover costs[4].

The IBT structure has become so widely used in both OECD and developing countries that many professionals working in the water sector assume that it must always be the most appropriate tariff structure. This is not the case. In practice, IBTs often fail to meet any of the three objectives mentioned above, in part because they tend to be poorly designed. An IBT may provide more expensive water to poor households than to rich households, since in many cities the poor share connections, and in these cases high volumetric use results in higher prices for most of the water poor households consume[5]. Many IBTs also fail to reach cost recovery and economic efficiency objectives, usually because the upper consumption blocks are not priced at sufficiently high levels and/or because the first subsidized consumption block is so large that almost all residential consumers never consume beyond this level.

Picture by Indo-USAID FIRE-D Project

The DBT structure was designed to reflect the fact that when raw water supplies are abundant, large industrial customers often impose lower average costs because they enable the utility to capture economies of scale in water source development, transmission, and treatment. Also, large industrial users typically take their supplies from the larger trunk mains, and thus do not require the expansion of neighborhood distribution networks. Although it is still used in some communities in the United States and Canada, the DBT has gradually fallen out of favor, in part because marginal costs, properly defined, are now relatively high in many parts of the world, and there is thus increased interest in promoting water conservation by the largest customers. The DBT structure is also often politically unattractive because it results in high volume users paying lower average water prices.

Increasing linear tariff

The increasing linear tariff structure is rarely used. It is of interest largely because it illustrates that there are many ways that the water bill can be related to the quantity of water used. In this tariff structure, the price that a consumer pays increases continuously as the quantity of water used increases.

In other words,

water bill = $(Q^*)P^*$

where Q^* = amount of water sold to a specific consumer; and

$P^* = \alpha_1 + \alpha_2 Q^*$

and α_1 and α_2 are positive constants.

This tariff structure sends the consumer a powerful signal that increased water use is costly. Not only is each additional unit of water used sold at a higher price, but all the preceding units are sold at the last (high)

[4]Note that this argument assumes that the marginal cost of water is in fact higher than the first block price. But if a large expansion project has been recently completed, the short run marginal cost of water may be very low.

[5]See for example, Whittington, Dale. (1992). "Possible Adverse Effects of Increasing Block Tariffs in Developing Countries." *Economic Development and Cultural Change*. 41(1). pp. 75-87.

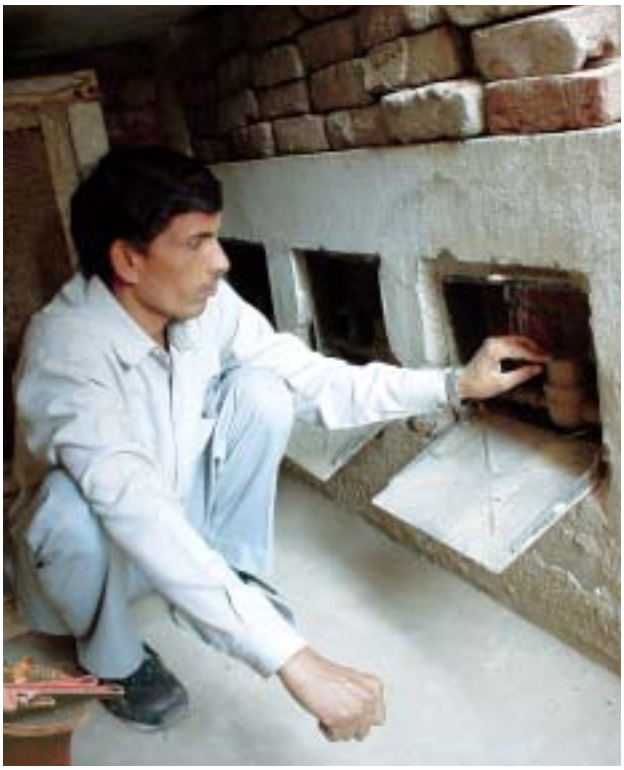
price. A related but different tariff structure would require that only the last unit used would be sold at the highest price; other units would be sold at the price associated with that lower quantity. It is important to recognize, however, that an increasing linear tariff cannot send the proper economic signal to a consumer about the marginal cost of additional water use. This is because the utility's marginal cost of providing water does not change appreciably as the water use of an individual household changes. An increasing linear tariff would thus be especially inappropriate if applied to large-volume industrial or commercial water users because it could drive the price they confront for increased water use far beyond the marginal cost of supplying them additional water.

Two-part tariffs have an important role to play in enabling water utilities to simultaneously achieve economic efficiency and cost recovery objectives.

Two-part tariffs

With a two-part tariff, the consumer's water bill is based on the sum of two calculations: (1) a fixed charge, and (2) a charge related to the amount of water used. There are many variations in the way these two components can be put together. The fixed charge can be either positive or negative (i.e., a rebate). The water use charge can be based on any of the volumetric tariff structures described above (i.e., a uniform volumetric tariff; an increasing or decreasing block tariff; or an increasing linear tariff).

In many cases, the fixed charge is kept uniform across customers and relatively low in value, and is used simply as a device for recovering the fixed administrative costs associated with meter reading and billing which are unrelated to the level of water consumption.



Picture by Roots Advertising Services

Two-part tariffs have an important role to play in enabling water utilities to simultaneously achieve economic efficiency and cost recovery objectives. If a large capacity expansion project has recently been completed, the short-run marginal cost of raw water supply may be very low. Economic efficiency requires that water be priced at short-run marginal cost. If this leads to a very low water price, it is likely that a single-part tariff will not recover the total cost of supply. If a two-part tariff is used, however, the necessary revenues can be raised with a fixed charge without distorting the price signal contained in the volumetric charge.

However, in periods of water scarcity (e.g., just before the construction of the water supply augmentation project), the situation is reversed. In this case, pricing at short-run marginal cost implies that the volumetric charge must include the opportunity cost to the user who does not receive water due to scarcity. This 'scarcity rent' causes the volumetric charge to be rather high, in order to ration the available water supply among competing users. Such high volumetric charges may produce revenues in excess of financial costs. This can be corrected by employing a negative fixed charge, providing customers with a rebate while the volumetric charge remains high enough to send the correct signal from an economic efficiency perspective.

Seasonal and zonal water pricing

In some circumstances the marginal costs of supplying water to customers may vary by season. Due to rainfall patterns and local water storage availability (reservoir capacity), a community may have relatively plentiful water supplies in the rainy season, but much more limited supplies in the dry season. In such cases, it makes economic sense for water tariffs to reflect the reality of the resulting cost structure. In other words, by charging higher rates in the dry season and lower rates in the wet season, water tariffs can be used to signal customers that the costs of water supply are not constant across the seasons. The dry season premium reflects the fact that, because water is scarce, water use by one user reduces the amount available to another. Chile is one of the few developing countries that currently uses seasonal water tariffs.

Figure 1: Price of water versus the quantity of water used for selected tariff structures

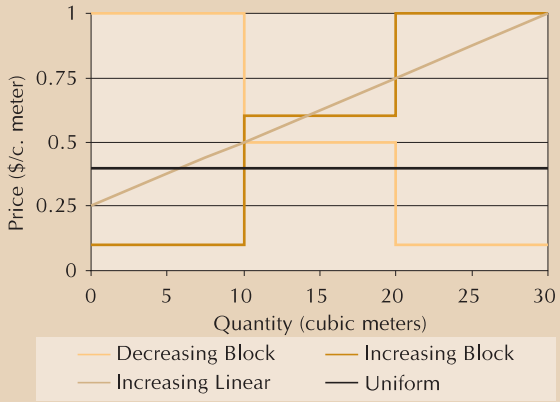
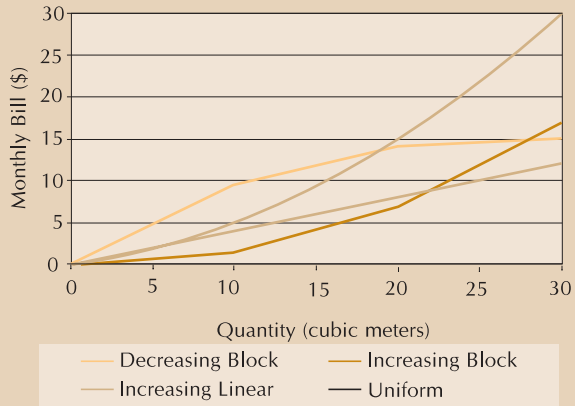


Figure 2: Monthly water bill versus the quantity of water used for selected tariff structures



Similarly, it may cost the water utility more to deliver water to outlying communities due, for example, to higher elevations and increased pumping costs. A zonal water pricing structure charges users who live in such areas more for their water because it costs the utility more to serve them. Zonal prices can be used to ensure that users receive the economic signal that living in such areas involves substantially higher water supply costs, and that such information is factored into customers' location and water use decisions. However, this practice is comparatively rare, in part because it requires the water supplier to collect detailed geographically referenced accounting information. This type of special tariff is only appropriate if the costs to serve the area are significantly higher than for the rest of the community – in fact costs vary among all users,

Table 1: Water tariff structures (as share of utilities)[6]

Country	Fixed Charge	Uniform Volumetric Charge	Increasing Block Tariff	Decreasing Block Tariff
Australia	-	68%	27%	5%
Canada	56%	27%	4%	13%
France	2%	98%	-	
Hungary	-	95%	5%	
Japan	-	42%	57%	1%
Netherlands	7%	90%	3%	-
Norway	87%		13%	-
Spain	-	10%	90%	-
Sweden	-	100%	-	-
Turkey	-		100%	-
UK	90%	10%		
US	2%	33%	31%	34%

It is clear that there is wide variation in tariff setting practices around the world, and that there is no consensus on which tariff structure best balances the objectives of the utility, consumers, and society.

and a practical tariff always reflects averaged costs to some degree.

Figure 1 (on page 9) illustrates how the price of water to the consumer changes as the quantity of water used increases for some of these tariff structures. *Figure 2 (on page 9)* shows how the customer's monthly water bill varies as the quantity of water used increases for selected tariff structures.

Table 1 shows the percentage of utilities in each of several countries that use one of the four most common water tariff structures. It is clear that there is wide variation in tariff setting practices around the world, and that there is no consensus on which tariff structure best balances the objectives of the utility, consumers, and society.

Finally, *Table 2* summarizes the performance of each type of tariff structure against the four key design objectives discussed above. In most cases, this performance depends not only on the choice of tariff structure but on the level at which the tariff is set, and whether or not some kind of subsidy scheme is built in to address the affordability issue.

Water Subsidy Design

Municipal water utilities are not necessarily a very good way of delivering subsidies to low-income households. However, in many countries where welfare systems are not fully developed, governments may find that they have few better options for helping the poor, and the judgment is made that the tariff structures of municipal water utilities should play a role in delivering subsidies to the poor. In such cases it is important to understand

[6]Source: Lee Travers, World Bank

Table 2: Summary of performance of alternative tariff structures against design objectives

Tariff Structure	Cost Recovery	Objectives		Affordability
		Economic Efficiency	Equity	
Fixed Charge	***Adequate*** Provides stable cash flow if set at appropriate level, but utility may be vulnerable to resale of water and spiraling consumption.	***Poor*** Does not send a message about the cost of use of additional water.	***Poor*** People who use large quantities of water pay the same as those who use little.	***Adequate*** If differentiated by ability to pay, but households are unable to reduce their bills by economizing on water use.
Uniform Volumetric Charge	***Good*** If set at appropriate level, moreover revenues adjust automatically to changing consumption.	***Good*** If set at or near marginal cost of water.	***Good*** People pay according to how much they actually use.	***Good*** Can be differentiated by ability to pay, and people can limit their bills by reducing consumption.
Increasing Block Tariff	***Good*** But only if the size and height of the blocks are well designed.	***Poor*** Typically little water is actually sold at marginal cost.	***Poor*** People do not pay according to the costs their water use imposes on the utility.	***Poor*** Penalizes poor families with large households and/or shared connections.
Decreasing Block Tariff	***Good*** But only if the size and height of the blocks are well designed.	***Poor*** Typically little water is actually sold at marginal cost.	***Poor*** People do not pay according to the costs their water use imposes on the utility.	***Poor*** Penalizes poor families with low levels of consumption.

what distinguishes a good subsidy from a bad subsidy because there are many different ways that subsidies can be incorporated into the design of water tariff structures. There are four important criteria that need to be taken into account.

- ***Genuine need***. All too often in the water sector, subsidies benefit users who are relatively well off. This is a waste of scarce resources, and it is therefore important to question from the outset whether any particular group of water consumers really merits a subsidy, and if so, why. Need is often difficult to test, but looking at whether an excessive percentage of household income is being spent on water or examining what people are able and willing to pay for improved water services through willingness-to-pay studies may be useful.

- ***Accurate targeting***. Even if a genuinely needy *group* of customers has been identified at an aggregate level, it is not always straightforward

to identify the *individuals* who belong to this target group. Some subsidy schemes have some kind of targeting variable that is used to identify households who are eligible to benefit. For example, this might be the level of water use (as in an IBT), the diameter of the connection or the neighborhood where the dwelling is located. However, if these targeting variables are not well chosen, subsidy funds end up being wasted on households who happen to meet the eligibility criteria but who are not genuinely needy. Experience demonstrates that it is extremely difficult to find good targeting variables for water subsidies[7].

Scarce subsidy resources may be more effectively used to reduce the initial cost of new connections, rather than to lower volumetric charges to existing users.

- ***Low administrative costs.*** While it is important to screen customers carefully for subsidy eligibility, the screening process can itself be quite costly in administrative terms. Thus, it is important to balance the need for greater targeting accuracy against the associated administrative costs.
- ***No perverse incentives.*** Using water tariff structures as a means of redistributing income between different customer groups can lead to serious conflicts with the efficiency objective identified above because it often introduces perverse incentives for households to use or not use water. For example, domestic consumers who receive water virtually free of charge may waste it. When industrial consumers face very high volumetric charges, they may disconnect from the water system altogether, leading to a serious loss of scale economies that is ultimately damaging to all customers. The potential negative consequences on the economic efficiency objective need to be carefully considered before any subsidy scheme is adopted.

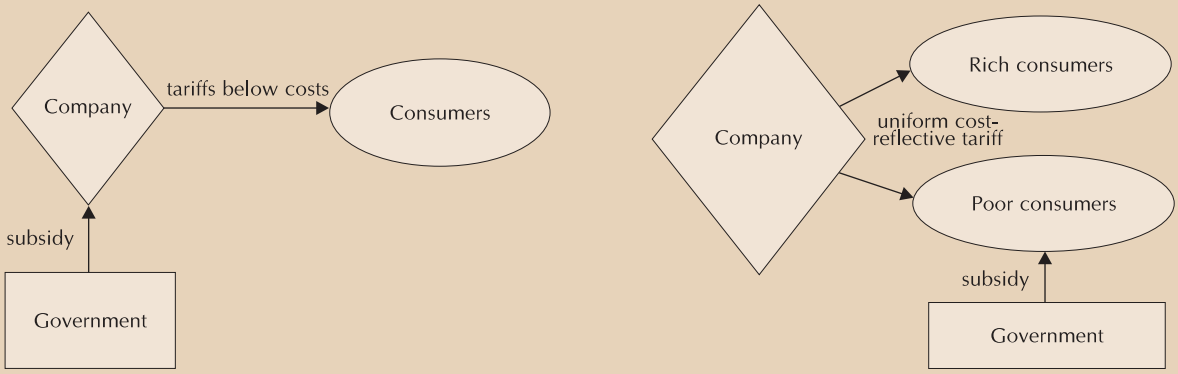
Picture by Indo-USAID FIRE-D Project

Service to be subsidized

The majority of subsidy schemes in the sector focus on lowering the volumetric charge for water. Yet many studies show that willingness to pay for high-quality water services from a private connection is high. At the same time, in urban areas the most indigent members of society typically lack access to formal utility connections and often pay more than ten times as much per cubic meter for water from private vendors as people using household connections. In some cases, the substantial capital charges levied by many utilities for new connections represent one of the main barriers for

[7]There are several reasons why this is the case, but the basic problem is that once built, water systems remain fixed in time and space while poor households move and change (they migrate, some become wealthier; others can be evicted from rental housing).

Figure 3: Schematic representation of direct subsidies



(a) Supply side **(b) Demand side**

these poor households to obtain access to utility service. If the goal is to ensure that poor customers receive water service from the piped network, this suggests that scarce subsidy resources may be more effectively used to reduce the initial cost of new connections, rather than to lower volumetric charges to existing users.

Finally, sanitation services may actually be more natural candidates for subsidies than water services. Willingness to pay for such services is often lower than for water services, and the wider social benefits in terms of both public health and surface water quality provide an economic rationale for subsidization.

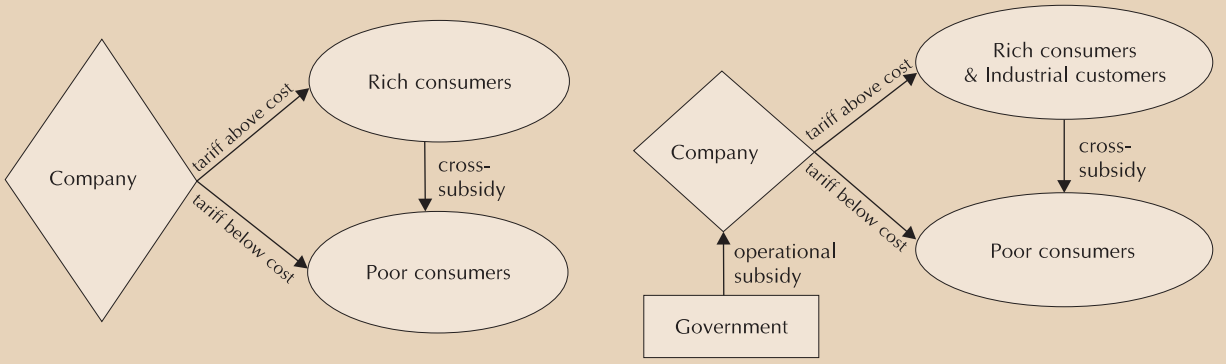
Picture by Indo-USAID FIRE-D Project

Financing mechanism

There are two principal ways in which subsidies can be financed. In the case of direct subsidies, the government, or some other external entity, makes resources available to cover the deficit between the costs of service provision and the level of the water bill *(see Figure 3)*. These resources can be transferred directly to the utility and delivered to customers through the tariff structure (known as 'supply-side subsidies'). Alternatively, they can be given directly to individual customers who are deemed to be eligible for special financial support (known as 'demand-side subsidies'); this is generally done outside of the tariff framework.

'Supply-side subsidies' have been the traditional approach used to subsidize water utilities. However, experience shows that they are problematic. On the one hand, the presence of major state transfers makes utility managers less concerned about controlling costs, and hence generates inefficiency. On the other hand, 'supply-side subsidies' tend to lower the general tariff level for all customers and hence often fail to reach the poor in the way that was anticipated. For both of these reasons, if subsidies are necessary, there is a growing preference for 'demand-side subsidies' that go directly towards covering the water

Figure 4: Schematic representation of cross-subsidies



(a) Pure cross-subsidies **(b) In combination with direct subsidies**

bill of the poor household rather than general budget support for the utility.

If government finance is not an option, cross-subsidies can be used whereby some groups of customers are charged more than the true cost of service provision, and this surplus is used to cover the deficit on another set of customers, who pay less than the true cost of provision. Effectively, the utility is undertaking a redistribution of income between these two groups. In practice, these two types of subsidies are not mutually exclusive, and a large number of public utilities use both simultaneously *(see Figure 4)*.

Various hybrid schemes are also available. One approach that has been tried with some success in other infrastructure sectors is to apply a uniform surcharge, of say one or two percent, on all customers bills and use these resources to finance any subsidies deemed necessary. Like a direct subsidy, this approach allows for direct targeting of subsidy resources. At the same time, it has the advantage of a cross-subsidy in avoiding the need to rely on external finance.

Targeting mechanisms

Broadly speaking there are three ways of identifying beneficiaries in order to target subsidies. The first, and perhaps most commonly applied in the water sector, is the amount of water a household uses. As noted above, IBTs are often proposed because they are expected to provide a low cost lifeline amount of water to poor connected households. One problem is that household water use is often not a very good indicator of poverty. Poor households may actually consume relatively large amounts of water, for example if they have larger families. Furthermore, IBTs provide this subsidy to all connections, regardless of household income-level. Another problem is that multiple poor families may share a single connection, thus dividing a single subsidy among a number of households.

The second approach is based on the characteristics of the household (e.g., geographical location, type of dwelling, the income level, or household eligibility for other government assistance programs). In practice, any criteria other than purely geographical ones may require households to be screened directly through an administrative interview procedure. Geographical

criteria only work in cities where there are well-defined localized areas of poverty, such as periurban slums. However, even then, it is often the case that a large proportion of the poor do not necessarily live in slums but are scattered throughout the city. Furthermore, geographical criteria quickly go out of date – an area primarily inhabited by poor people may become a much better off area within the space of a few years, or vice versa. Another is that the value of subsidies can be capitalized into property values and rents, and thus captured by landlords, not poor tenants.

The third approach is based on self-selection, and works in the following way. The utility provides two distinct levels of service, a high quality service that is offered at full cost, and a low quality service that is offered at subsidized cost. The idea is that only a genuinely poor person will choose the low-quality subsidized service, because anyone who could afford it would prefer the high quality service. An example would be to subsidize very narrow pipe diameter connections that only provide a limited flow of water into the household. The subsidization of public taps follows a similar principle.

The subsidization of narrow pipe diameters actually provides a good example of why urban water tariffs are such poor vehicles for the delivery of subsidies. There is in fact little difference in the capital cost of providing a household with a very narrow diameter connection and a normal connection. Thus, from a social cost-benefit perspective, the self-selection strategy has reduced the benefits of water use to one group of households (i.e., the poor) without any corresponding decrease in total system costs. Poor households have to wait longer to obtain a given amount of water from a narrow diameter connection, and thus waste time collecting water, just as if they were queuing at a public tap.

Picture by Indo-USAID FIRE-D Project

Conclusions

The design of water tariff structures is challenging precisely because there are a number of conflicting objectives involved; specifically cost recovery, economic efficiency, equity and affordability, among others. A tariff design that contributes to the achievement of one objective may be detrimental to the achievement of another. In order to resolve this conflict, policymakers need to decide which objectives are the highest priority and, where possible, use more than one instrument. For example, the water tariff can be used to meet cost recovery or economic efficiency objectives, while a parallel subsidy scheme can be used to address concerns about affordability.

A wide range of water tariff structures has been developed and is currently practiced around the world. Reliance on fixed charges, widespread in some countries, is the most problematic policy because it generally fails to achieve at least three of the four key policy objectives. Although increasingly popular, IBT structures have often failed to deliver on their promise of simultaneously meeting all of the different objectives of tariff design. This is partly due to poor design of block structures, but also reflects the fact that (a) low-income households are not necessarily small consumers of water, and (b) there are many situations in which several poor

households share a single connection. More importantly, IBTs convey incorrect pricing signals to some or all users. Uniform volumetric rates, whether as a single or two-part tariff structure, do comparatively well in meeting the different policy objectives.

If urban water tariffs must be used to deliver subsidies to poor households, subsidy schemes need to be very carefully designed, as all too often in the past they have failed to reach the majority of poor households and merely succeeded in creating a large financial drain for the sector and introducing serious behavioral distortions. A number of key questions need to be considered in subsidy design. Who is genuinely needy? Which services are the best candidates for subsidization? How will poor people be identified? How will the subsidy be financed? Even more fundamentally, it is important to evaluate whether piped water distribution networks are the best candidates for the delivery of subsidies to the poor. It does not follow that, because water itself is a basic need, that piped water distribution systems provide an efficient, effective way to deliver subsidies to the poor. After all, people also have basic needs for food, health services, and housing. The relevant question is 'Which subsidy mechanisms reach the poor most efficiently and effectively?'—not 'How can piped water services be subsidized most effectively?'

In many countries comprehensive water and sanitation sector reform will likely require a new institutional framework for the delivery of urban services, different from the one which currently exists. The political decisions necessary to effect the changes in the institutional arrangements for the delivery of water and sanitation services need to be informed by the substantive issues involved in tariff and subsidy reform. Without sound tariff and subsidy policy, institutional reforms cannot work. It is thus necessary that political leaders have a clear understanding of the options for tariff structures and subsidy schemes, are able to grapple with the need to balance conflicting objectives, and have a good grasp of the impact of their decisions.

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