

SUSTAINABLE DEVELOPMENT

# Municipal Water Pricing and Tariff Design: A Reform Agenda for Cities in Developing Countries

Dale Whittington

AUGUST 2002 · ISSUE BRIEF 02-29



**RESOURCES**  
FOR THE FUTURE

Resources for the Future  
1616 P Street, NW  
Washington, D.C. 20036

Telephone: 202-328-5000

Fax: 202-939-3460

Internet: <http://www.rff.org>

© 2002 Resources for the Future. All rights reserved. No portion of this paper may be reproduced without permission of the authors.

Issue Briefs are short reports designed to provide topical, timely information and analysis to a broad nontechnical audience.

## ***Introduction***

The urban water supply situation in many developing countries is bad and getting worse. Many households do not have private connections and have no choice but to purchase water from vendors or queue to collect water from public taps or wells. Many households that tap into a piped distribution system may share the resource with neighbors and have water for only a few hours per day. Urban households that can afford it often drill their own wells and install both in-ground and overhead storage tanks. They increasingly treat their drinking water, or buy bottled water. Households spend scarce resources on medical care for water-borne diseases that often result from contaminated groundwater leaking into the piped distribution system.

As urban populations in developing countries continue to increase, the situation in many cities is deteriorating. Lack of maintenance results in more broken pipelines, higher levels of contamination, and unaccounted-for water. In many cities the groundwater table is falling, and people have to drill ever deeper to reach it. Industry and agriculture compete for increasingly scarce water resources.

Gradual, piece-meal reform programs for the municipal water supply sector are unlikely to turn this deteriorating situation around. The urban population in most of the developing world needs to get on a path of serious municipal water sector reform. This policy brief describes a package of urban water pricing and tariff reforms that need to be an important part of such reform programs.

## ***An Overview of the Existing Water Pricing Situation in Many Cities in Developing Countries***

Current municipal water tariff practices in developing countries have several limitations. First, large numbers of households in many cities have unmetered private connections, which are charged a fixed amount per month for water regardless of the amount they use. The lack of incentive is a particular problem in areas where water supplies are scarce, forcing municipalities to turn to expensive, distant sources for new water supplies.

Second, even households that are connected to the piped distribution system often face a volumetric charge that sends the signal that water is *almost* free. For example, with the increasing block tariffs (IBTs) that are in place in many South Asian cities, the majority of households fall into the first or second block, and thus end up receiving heavily subsidized water. (With an IBT, consumers face a low volumetric per-unit charge (price) up to a specified quantity, or block; 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.) Because households perceive additional water use to be cheap, many use all the water they can get from the distribution system, and available supplies must be rationed by fewer hours of service. This in turn means that households must incur other costs (e.g. water storage tanks) to deal with the unreliability.

Third, low fixed charges and low average prices mean that the monthly water bill paid by the great majority of households with private connections (both those with metered and unmetered connections) is often very low. At first glance, this appears to be good for households and bad for the utilities, but low utility revenues rebound to adversely affect households. Low revenues mean that utilities lack the resources to provide high quality, reliable water services, and the financial incentives to serve unconnected households.

Most cities in developing countries have a substantial minority of households without private water connections. They rely either on shared connections, public taps, wells, surface water sources, rainwater, or water vendors. Low revenues not only mean that water utilities lack the incentives and resources to extend service to unconnected households, which are almost always poor, but also lack the ability to attract capital to finance the development of new water sources.

Fourth, to make matters worse for the poor households that share connections, the water bill for a group of households sharing a connection is often calculated on the basis of an IBT that was designed for the exclusive use of a single household. The more households that share a connection, the higher the total water use billed through that single meter and the higher the average cost of water used. Poor households sharing a connection thus typically pay higher average per-unit costs than middle- and upper-income households.

In short, the water tariffs in many urban areas are not accomplishing their principal objectives. They are not generating sufficient revenues to ensure that utilities can recover their costs. They are not sending the correct economic signals to households, namely, that water is scarce and must be treated as a valuable commodity. Many households do not have access to water from private connections, so service provision is inequitable. The water tariffs being used are not helping the majority of the poor households, many of who are not connected to the piped distribution system. Most of the subsidies benefit the middle- and upper-income households that are already connected to the piped distribution system.

### ***First Step: Expand the Revenue Base***

It is clear that municipal water-pricing practices need to be improved in many cities in developing countries. How should this process begin? It is often argued that municipal water prices must be kept low (that is, subsidized) so that poor households can afford to purchase sufficient water to meet their basic needs. The usual corollary is that households are unable and unwilling to pay much for improved water services. If households are not willing to pay for improved services, there is little point in trying to raise prices to generate revenues that can in turn be used to improve services. Higher prices will simply encourage households to disconnect from the piped distribution system (or stay connected but be worse off in terms of reduced income). Many will fall back on alternative water sources such as private wells, vendors, and public taps that better match their needs for cash flow flexibility.

But is it in fact true that most urban households are unwilling to pay a substantial amount for improved services? The available evidence raises doubts about this conventional wisdom. For example, in a recent survey in Kathmandu, Nepal, over 1500 households were asked how they would vote on a plan to engage a private water company to help with the management and operation of the municipal water supply system (see Whittington et al. 2002 in Further Readings). Households were asked to choose between a private connection to the present water system (with low prices and unreliable service), and a private connection to an improved water system (with 24-hour service, accurate water billing, and potable water quality). Almost 80% of the 991 respondents who already had a private water connection were willing to pay about four times more per month for the improved system (US\$1.50 versus US\$6.00). Households without private connections were willing to pay almost as much to be connected to the proposed improved system. These households' willingness to pay for improved service are consistent with observations throughout other

parts of the world that households are spending substantial amounts of money coping with intermittent, contaminated public water supplies (see Zerah in Further Readings).

The reform of municipal water pricing must thus start with an understanding of what would happen if prices were increased and services improved. In many cities it appears that most people—including the poor—would prefer to pay higher prices for better services. The next question is, what will different levels of improved services cost? Throughout the developing world, the provision of 24-hour, 7-day-a-week service will require major new capital investments in system rehabilitation. Without positive pressure throughout the distribution system on a 24-hour basis, the distribution system would still be subject to groundwater infiltration and contamination. If it appears that the likely costs associated with 24-hour, 7-day-a-week service are affordable by the majority of the urban population, then the possibility probably exists for a win-win situation. In other words, the municipal water utility (or a private operator engaged by government) can improve households' well-being and still recover its financial costs. The reform process can then move to the next stage of planning concrete actions to improve the municipal water tariff structure.

Assuming household demand is sufficient to support a reform process leading toward higher prices and 24-hour, 7-day-a-week service, the first priority is to implement a sound pricing policy. This requires that meters be installed on all private connections without them, and that meters be fixed where they are broken. Accurate bills can then be rendered to households and collected. If the available water supplies permit, unconnected households that want a metered private connection should be connected to the piped distribution system. All three of these tasks are things that private operators do well.

In the process of putting in place the ability to implement a sound pricing policy, reformers should tackle two big problems: (1) the common use of fixed charge (nonvolumetric) tariffs for calculating monthly water bills, and (2) the inability of many poor households to finance the connection charges to the piped distribution system. Unless unmetered private connections are eliminated as a first step in the reform process, they will become increasingly larger centers of revenue loss for the water utility as other reforms are undertaken; they will sharply limit what can be done to effectively and efficiently manage available water supplies.

There are several reasons why many poor households do not have private connections, but one of the most important is their inability to pay the lump sum or upfront connection charges. Many poor households cannot access credit at reasonable interest rates, and, without access to credit markets, connection charges can be a major obstacle to obtaining a private water connection. Because a well-run water utility should be able to access capital markets much more efficiently than most poor households, an important early step in pricing reform is for the utility to offer households the option to finance the capital costs of a private connection.

### ***Second Step: Change the Billing Formula***

Once the utility has established a large customer base, knows how much water most of its customers are using, and is billing and collecting, it is time to change the way that water bills themselves are calculated. Because the increasing block tariffs currently being used in many cities are not achieving their intended objectives, three changes are needed. First, shared connections should not be billed using an increasing block tariff. Owners of shared connections should be charged a

single volumetric rate for each unit of water used. This single volumetric rate should be at least equal to the average financial cost of supplying the water; from an economic perspective, it should reflect the marginal cost of additional water supply.

Second, the complex IBT structures common throughout the developing world for calculating monthly water bills of households with private, metered connections ideally should be discontinued. The new tariff structure should be three main objectives: (1) to send as many customers as possible the correct signal about the economic value of water, (2) to collect sufficient revenues to put the utility on a sound financial basis (but not more revenue than is necessary), and (3) to ensure that most poor households are better off than they were before the tariff reform. When demand for improved services is strong, this balancing task is often not as difficult as it might first appear.

The correct economic signal to send to customers will vary by location and season (that is, marginal costs may be either below or above average costs depending on local conditions). However, for many municipalities, particularly in water-scarce areas, the marginal costs of water supply are rising. The signal must be sent to consumers that water is a scarce economic good and must be treated as such. Sending this price signal does not need, however, to result in a household's bill increasing to an amount equal to this price times the quantity of water consumed. It is the price that customers pay when they decide to use additional water that is important for this signal, not the aggregate monthly water bill (the monthly bill is, of course, important for the financial solvency of the utility and the income of the customer).

When marginal supply costs are rising, there are two principal ways that the tariff can be structured so that households face the higher incremental costs of supply without having to pay water bills that generate revenues for the water utility far above costs. Option 1 is to calculate the water bill by multiplying a single uniform volumetric price by the quantity consumed, and then subtract a fixed amount from the water bill. This type of tariff has been termed uniform price with rebate (UPR) (see Boland and Whittington in Further Readings). Option 2 is a simple form of increasing block tariff. In this case, the number of blocks should be reduced to two. The size of the first block should be reduced to 5-6 cubic meters per month (a realistic estimate of basic needs for a household of 4-5 members), and the price of water in the second block should be set equal to the marginal costs of supply. Durban, South Africa, is one of the few municipalities that has adopted such a small first block to meet basic needs. If a marginal-cost pricing policy would generate more than enough revenues to recover the costs of the service provider, instead of returning these excess revenues to households with private connections, these funds could alternatively be used to subsidize the use of public taps by poor households (see below).

In many water-scarce regions, the marginal costs of supplying water will vary by season. The marginal cost will be higher in the dry season because water demand will be higher. Where water supplies are constrained, the cost of one user withdrawing water from the municipal system should include the opportunity cost to someone else of not getting that water. In such cases, it will make sense to adopt seasonal water pricing to allocate the available water supplies to high-value users and forestall the need for water supply capacity expansion created by the peak dry season demands. Chile is one of the few developing countries to use seasonal water tariffs.

Third, the common discrepancy between industrial/commercial and residential water tariffs should be eliminated. Industrial water use is typically much more price elastic than household water use. This means that prices to industrial customers must be raised a great deal to raise funds

for cross-subsidies, resulting in inefficient water use by industries. Moreover, charging industrial users more than the cost of providing them service often drives them off the distribution system altogether, thus eliminating the availability of any cross-subsidy. In the long run, charging industrial and commercial users prices above marginal cost probably increases the prices of their products and hurts their competitive position. There is little evidence that this practice of charging industries prices for water above cost actually helps the poor.

### ***Third Step: Protecting the Poor during the Reform Process***

In most cities, the pricing reforms outlined above will benefit the majority of poor households. Like wealthier households, poor households need reliable, high-quality water supplies. System-wide improvements in reliability and quality, and sound tariff reform, are thus an important means of serving the poor.

But what can be done to assist the minority of poor households that might not be helped by this package of pricing reforms? There are in fact a number of pro-poor policies that can be used to ensure that the poor have sufficient water to meet their basic needs at a reasonable cost without sacrificing the objectives of economic efficiency and cost recovery. The most obvious is simply to identify poor households and give them cash assistance to pay their water bills, which is essentially the approach now used in Chile. Even without such means testing and direct delivery of subsidies to households, there are three main sets of pro-poor policies that are appropriate:

#### **1. Subsidize connections, not volumetric water use**

Rather than subsidize volumetric water use, any subsidies that are available to the sector are more appropriately targeted at reducing the upfront connection costs than used to reduce volumetric charges. Such subsidies will reach many poor households because unconnected households are likely to be poor. Even if poor households can only afford to use a small amount of water, they will have ready access to a convenient, high quality source of supply, and will be clear winners from the reform process.

#### **2. Create a well-run system of public taps as a safety net for the poor**

Reformers need to look carefully at the system of public taps. In many locations, public taps will in fact become obsolete because when the majority of households have piped water connections, households without private connections will work out efficient ways of obtaining water from their neighbors at relatively low cost. (see Whittington et al. 1998 in Further Readings). This solution depends on improvements in the reliability of the piped distribution system so that connected households do not have to worry about running out of water if they give or sell water to their neighbors. Public taps will become relatively high-cost sources of supply compared to neighbors selling water because most unconnected households will have to walk farther to collect water from public taps than to neighbors, and because the fixed costs of an attendant at the public tap will be large relative to revenues if only low volumes of water are sold.

However, public taps still have an important role to play because they may serve as a water source of last resort for the very poor. In some cases, it is even possible to provide water free from

public taps without substantially reducing the revenues of the water utility. This can occur when free water from public taps does not affect the number of households desiring private connections for the exclusive use of household members, and when only small numbers of households cannot afford private connections. This is in fact the situation in many industrialized countries today. Water is often available free from public fountains, but the vast majority of households still demand private connections in their residence. (see World Bank Water Demand Research Team in Further Readings).

### **3. Preserve options for the poor**

Poor households are hurt most when they have few options to help themselves and when others have restricted their choices. One important way to protect poor households is to preserve their choices so that local mafia or other rent-seeking actors cannot exploit them. There are three main things that can and should be done.

***First, ensure that poor households (and others) can have a private water connection when they want it.*** Pro-poor policies should not trap poor households into always accepting a low level of off-site water service. If a poor household always has the option of choosing a private connection, when they can afford it, there are limits to the degree they can be exploited by rent seekers.

***Second, legalize water vending and selling water by neighbors.*** Vendors and neighbors with private connections create options for poor households because they promote competition in local water markets, limit the reach of spatial monopolies, and drive down water prices. The poor will benefit most from these lower prices.

***Third, do not give private operators exclusive rights to provide water within a service area.*** Contracts with private operators should not contain exclusivity clauses; these limit competition and typically end up restricting the choices of poor households. Small-scale providers can often lower the cost of providing piped water to poor households and should be permitted to operate within the contract areas of larger private operators.

### ***Concluding Remarks***

Table 1 summarizes the recommendations for municipal water pricing and tariff reform that will be applicable for cities in many developing countries. As shown, the recommended package of pricing reforms has three distinct parts: (1) expanding the customer base and making sure connections are metered so that sound pricing policies can be implemented; (2) changing the way water bills are calculated for households, and for industrial and commercial customers; and (3) putting in place the policies needed to protect poor households during the reform process.

But the question remains, who should tackle these pricing reforms? Comprehensive sector reform that includes delivery of urban services, such as water supply, will likely require a new institutional framework. The necessary changes in tariff levels and structure may be implemented by new organizations, including both regulatory agencies and private sector providers. There is something of a “chicken-or-egg” problem here: what comes first? Institutional reform, with pricing and subsidy reforms to follow? Or does a consensus need to be reached on pricing and subsidy reforms before institutional changes can happen?

**TABLE 1**

**SUMMARY OF RECOMMENDED ACTIONS**

<b>Goals</b>	<b>Recommended Actions</b>	<b>Comments</b>
A. Establish the ability to implement a sound pricing policy.	1. Install meters on all private connections.	
	2. Fix broken meters.	
	3. Establish a program to finance household connection charges.	Households currently off the piped distribution system should be connected.
	4. Eliminate fixed charge (nonvolumetric) tariffs.	This step requires the installation of meters.
B. Establish a tariff that balances four objectives: (i) cost recovery, (ii) economic efficiency, (iii) equity, and (iii) poverty alleviation	1. Discontinue the use of increasing block tariffs (IBTs) for calculating water bills for shared connections.	Shared connections should be charged a single volumetric rate at least equal to the average financial cost of supplying water.
	2. Discontinue the use of IBTs to calculate water bills for households with private metered connections.	If IBTs continue, they should be greatly simplified. The number of blocks should be reduced to two. The size of the first block should be reduced to 5-6 cubic meters per month, and the price of water in the second should be set equal to the marginal cost of supply.
	3. Eliminate the discrepancy between industrial (and commercial) and residential water tariffs.	In the long run, charging industrial and commercial users prices above average cost probably increases the prices of their products and hurts their competitive position.
	4. Set volumetric price of water from private connections equal to the marginal cost of water supply.	Revenues in excess of full costs can be returned to customers in the form of a rebate and/or used to subsidize the system of public taps (see below).
	5. Adopt seasonal water tariffs, charging higher prices in the dry season in order to reduce peak demands.	In water-scarce areas, peak loads will drive water system capacity expansions in the dry season.
C. Protect poor households during the reform process	1. Subsidize connections, not volumetric water use.	Such subsidies will reach many poor households.
	2. Create a well-run system of public taps as a safety net for the poor.	Public taps can serve as a last resort for the urban poor. In some situations, water can be free without substantially reducing the utility's revenues.
	3. Preserve options for the poor by providing access to private connections, legalizing water vending, and not granting private operators exclusivity.	Poor households are hurt the most when they have few options, and become vulnerable to exploitation.



It is my view that the political decisions necessary to effect the changes in the institutional arrangements for the delivery of urban services need to be informed by the substantive issues involved in tariff and pricing reform. Without sound pricing and tariff reforms, institutional reforms cannot work. Political leaders must therefore have a clear vision on the major elements of pricing and tariff reforms that will make the institutional reform process successful.

### **Further Readings**

Boland, John J., and Dale Whittington. 2000. The Political Economy of Water Tariff Design in Developing Countries: Increasing Block Tariffs versus Uniform Price with Rebate. In Ariel Dinar, ed., *The Political Economy of Water Pricing Reforms*. Oxford University Press, 215–35.

Whittington, Dale, Subhrendu K. Pattanayak, Jui-chen Yang, and Bal Kumar K.C.,

2002. Household Demand for Improved Piped Water Services: Evidence from

Kathmandu, Nepal. Forthcoming in *Water Policy*.

Whittington, Dale, Jennifer Davis, and Elizabeth McClelland. 1998. Implementing a Demand-Driven Approach to Community Water Supply Planning: A Case Study of Lugazi, Uganda. *Water International* 23: 134–45.

World Bank Water Demand Research Team. 1993. The Demand for Water in Rural Areas: Determinants and Policy Implications. *The World Bank Research Observer* 8(1): 47–70 (January).

Zerah, M.H. 2000. Water: Unreliable Supply in Delhi. New Delhi, India: Manohar, Centre de Sciences Humaines.

Dale Whittington, Departments of Environmental Sciences & Engineering, City & Regional Planning, and Public Policy; Mailing address: Rosenau CB#7431, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina 27599, USA. Email: [Dale\\_Whittington@unc.edu](mailto:Dale_Whittington@unc.edu).

The author would like to thank Vivien Foster, Vivek Srivastava, Clarissa Brocklehurst Om Mathur, John Boland, and Jan Janssens for helpful comments on an earlier draft of this paper.