Paying for water — urban water tariffs

by Richard Franceys

Cost recovery is an essential component of a sustainable water supply. Richard Franceys outlines the principles for setting tariff rates and shows the methods used by the Borno State Water Board in Nigeria.

PEOPLE NEED WATER for life. Water utilities need money to construct, operate and maintain abstraction, treatment and distribution facilities. These two statements suggest that although on one hand water is a basic need for which nobody should have to pay and which should be available by right, on the other the water utility has to do a job which is similar to a bottled-soft-drink producer but on a much larger scale— and nobody suggests that the soft- drinks producer should give their products away free of charge. Some people believe that water is a free gift for all in the same way that air is free; others feel that the cost of providing clean water for the benefit of poor people should be subsidized by the richer people through the government - but that the poorest should pay something towards the cost in order to understand the value of clean water.

Introduction to tariffs

In the past, governments have tended to subsidize water supply to the rich as well as to the poor by creating semi-autonomous water utilities with no clear financial mandate, and then covering the subsequent annual losses. This has led to the rich receiving more by way of subsidy than the poor as Cairncross (1988) noted when he found that the poorest people in Khartoum had to pay 120 times more for the water they purchased through vendors than the rich paid for their piped connections. The objective of tariffs (Laugeri, 1982) is to ensure that optimum use is made of scarce water resources whilst not compromising the financial situation of the water utility.

Current thinking on helping the poorest is summed up by Briscoe (1988):

> An integral and essential part of an effective strategy is to mobilize the community's own resources, both financial and non-financial. This is necessary to ensure that the community is truly in control, that systems remain operating, and that the limited funds available to governments are directed to wherever they are needed most.
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> A goal of every improvement effort should be to bring closer the day when the community can cover all of the costs of its water service from its own resources. Many communities could and should contribute more now to meeting their costs than they could have been expected to in the past. The primary role of government agencies and donors must change from that of direct providers and financiers of services to that of facilitators.

To meet the apparently conflicting demands of consumer and water utility, four principal objectives of tariffs may be described (IWES, 1983). Tariffs should be:

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Water tariffs may allow the water utilities to bring supplies closer to homes, eliminating transportation problems.

- **Adequate** A level of resources must be produced which will meet the financial commitments of the utility and provide some contribution towards future investment.
- **Fair** This level of revenue must be allocated between consumer groups in a fair and equitable manner, giving particular consideration to the needs of the poorer members of the community.
- **Simple and enforceable** The tariff should be simple to administer and easy for consumers to understand. For tariffs to be effective there has to be a political willingness to accept the need for disconnections when bills are not paid. This remains true even where the worst offenders are other government institutions.
- **Water conserving** The structure of the tariff should influence consumption to the extent that consumers will purchase enough water to satisfy their needs without being wasteful.

Ability to pay vs. willingness to pay

In trying to reconcile these criteria, it is commonly assumed that as long as water tariffs do not exceed the 'ability to pay, level of three to five per cent of household income, low-income communities will choose to abandon their existing water supply in favour of a new 'improved' system. Several reviews have shown that this simple model of behavioural response is usually proved incorrect (Briscoe, 1988). In many communities either the level of service is too low (that is, the community does not value the improved service and therefore will not pay for it) or the level of service is too high (that is, the community wants the service but not at the price that has to be charged).

Willingness, rather than ability to pay, therefore becomes the crucial factor in determining service levels. Factors influencing willingness are believed to be: perceived health benefits; convenience; amenity; time savings and economic benefits; level of service; existence of alternative sources; income; price; different uses; different determinants; value of women's time; and family size (Whittington, 1987).

Meters or flat rates

To meet the criteria of simplicity and water conservation there is a choice between using a flat rate charge or a metered charge. For household or individual connections tariffs have been charged according to:

- size of the connection pipe, with different flat rate charges for domestic, institutional, commercial and industrial users;
- property values;
- property characteristics, that is the number of taps, basins, showers or baths;
- the amount of water used, measured by household meters.

It is believed by many that the use of meters best fits the four objectives of tariffs. In the United Kingdom the newly privatized water utilities have to find an alternative to the old flat rate system of tariffs based on property values. First indications from their extensive studies suggest that the installation, reading and maintenance of meters is a very expensive exercise with few benefits gained from reduced water usage. Countries such as Indonesia have used flat rates with flow restrictors in the connection lines in order to limit water wastage.

Standposts

There are different problems associated with standposts where tariffs have been based upon:

- a flat rate charged on all surrounding households;
- a water rate charged as an addition to local council taxation or as a percentage of ground/property rent;
- an agreed water rate paid by government to the water utility as a social service;
- a meter on the standpost with the cost shared out in the community per family, per person, or by property value — but with considerable difficulties deciding who organizes the share out;
- an individual or community council concession or water kiosk where access to the standpost is controlled and water is sold at fixed rates, usually determined by government.

Ideas first developed as elements of community participation programmes in rural areas and later adopted in urban areas are described by Maheri (1990). A community association takes up full responsibility for the distribution of water in a defined area, making its own arrangements for collecting a suitable tariff from householders and paying the local council for bulk delivery of water to the distribution system. By this method the utility gains by not having to manage the many leaks and connection problems or a distribution system whilst only having to collect money from a single customer. The community gains by having much greater control over their own water supply and its extension to universal household connections.

Setting tariff rates

Whatever the method of charging, the fixing of tariff rates has considerable political implications, particularly where a high rate of inflation has, over a number of years, reduced the value of existing rates. There are various approaches to setting rates that can be considered:

- Increase the tariffs modestly in line with inflation — the resulting revenue may not be sufficient to enable the utility to do its job but at least it is more or less acceptable politically.
- Aim for full recovery of operation and maintenance costs, assuming that the capital costs were a donor gift to the people.
- Set tariffs to recover operation and maintenance costs plus full amortization of the capital costs, that is, paying back any loans, including interest.
- Aim for a target rate of return on fixed assets employed in addition to operation, maintenance and amortization costs — it is desirable for a surplus over and above the immediate cash requirements to be generated to provide a contribution to future investment; this will then give a measure of independence and reduces reliance on outside sources. It is also the method any commercial enterprise would use.
- Use long run marginal costing, also known as Average Incremental Cost (AIC); this is a method of charging the full life-cycle costs of extending the water-supply system to meet increased demand.

This last method is attracting increased attention from the funding agencies, who believe that it is beneficial if the rates charged signal to

the consumer the value of the resources used in providing the services. Rather than setting rates by reference to existing and historical costs, rates should reflect the cost of providing additional (incremental) services. Thus consumers are informed of the true costs of providing additional services, and through adjustments to their consumption can indicate their willingness to consume at that rate.

The marginal cost is the additional operating cost for an additional unit of output. Where extensions of capacity are required to allow for increased consumption, marginal cost includes the necessary investment costs over the long run. Strict application of marginal costing can cause large and sudden fluctuations in price — the donor agencies therefore favour AIC which sets the price equal to the average or long-run marginal cost.

As the cheapest nearby water sources are the first to be used, the marginal cost price will normally be higher than the price based on historical costs.

Variable block pricing

In order to meet the four objectives of tariffs it is not necessary to have a single rate, as determined by any of the methods described above. In particular it may be politically unacceptable to use the preferred Average Incremental Cost method for all consumers because it appears to lead to very high tariffs.

A compromise solution is to incorporate the marginal rate as the second or third block in a block rate structure. Initial consumption providing for basic needs at a household level of about $10m^3$ per month would be charged at a lower rate, estimated according to affordability. Higher or discretionary consumption could be charged according to consumers' willingness to pay at full historical costs or even at the long-run marginal rate.

Average tariffs

Tariffs from nine water utilities in Africa were investigated (Saquee 1986) finding an average tariff for metered domestic consumers of $\$0.22/m^3$. However, for low-income households where water is delivered through standposts, the charge is likely to be zero; where delivered by vendors the charge may be many times higher than the piped tariff. This compares with an average for fifteen European countries (Stadtfeld, 1988) of $\$0.53/m^3$, representing between 1 and 0.3 per cent of household income.

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The cost of providing a piped water supply is often less than the cost of water bought from vendors by the bucket.

Borno State Water Board

In practice, social and political considerations mean that a tariff structure has to be adapted to suit the particular situation. The example given here investigates an updating of tariffs for the Borno State Water Board in Nigeria. The Board was created in 1977, charged with the responsibility of development, operation, distribution and maintenance of drinking-water supplies in the state. The Board's income comes from monthly recurrent subsidies and capital subventions from the state government, in addition to water rates and charges.

Since 1982 the state subsidies and grants have been reduced, reflecting the decline in federal and statutory allocation. The income derived from charges is small compared to the cost of operating and maintaining the existing water systems. The existing tariffs are low and difficult to collect. (The average collection period for tariffs has improved from a low of 724 days to its present 202 days.) Furthermore the present tariffs are not related to the economic cost of producing the water. This financial situation has led to intermittent supply of water throughout the state.

The present tariff structure charges most domestic consumers a flat rate of $0.86 per month (7 Naira=$1) with a metered rate of $0.06/m^3, rising to $0.09/m^3 above 68m^3 per month only for high volume domestic users. Connection fees are approximately $17.50. Industrial and commercial metered tariffs are 0.14/m^3 and $0.15/m^3 for monthly consumption up to and over 2272m^3.

Calculated tariffs

As the price of water varies the amount used is also likely to vary (above the level of the most basic need). This price elasticity is defined as the percentage change in quantity, divided by the percentage change in price. Katko (1988) reports ratios of between -0.2 to -0.4 which suggests that as the price is doubled, consumption drops by between 20 per cent and 40 per cent. This information is important in the setting of proposed tariffs to ensure that the desired total revenue is achieved.

It has been determined (Usman 1988), that with a 6 per cent rate of return on fixed assets employed, the average water charge for Maiduguri, assuming 30 per cent wastage in the distribution system, should be in the region of $0.086/m^3. This represents a 40 per cent increase on the existing tariff. Using a price elasticity of -0.3 this would lead to a 13 per cent reduction in water usage.

In the case of Borno, however, because of considerable unfulfilled demand for water it may be assumed that the subsequent shortfall in total revenue does not have to be made up by an additional increase in tariffs.

The growing demand for water has led the Board to initiate a new surface-water project. This is expected to be commissioned in 1991, and initial capacity of 10,274m^3 per day and a 15 per cent annual increase in production up to 1977. With a total capital cost of $24.5m. and annual operating costs of $0.8m. in 1997, the AIC method of calculation suggests a tariff for water from the new works of $0.18/m^3 at an 11 per cent discount rate. This represents a 28.5 per cent increase over the existing initial industrial and commercial rates.

These computed tariffs may be seen as two blocks of an increasing-block pricing system. Low-income consumers would receive their water through standposts, paid for in Borno State by local government (at a rate equivalent to the historical cost with a 6 per cent return on assets) for reasons of social equity. Low-volume consumers with yard taps are assumed to use an average of 16m^3 per month thereby paying a flat rate of $1.40 per month. Medium- to high-volume domestic users, including all those with underground storage tanks, are metered, with the option of using AIC rates for the highest consumers. Industrial and commercial consumers should pay the long-run marginal cost of producing the extra water they demand.

Recommendations

Based on Usman's study it was recommended that:

- tariffs should be based on increasing block rates;
- connection charges payable by low-income households should be levied as a standing charge spread over many years;
- tariffs must be levied on all users of water;
- the system of charging should be widely comprehensible, fair and water conserving;
- metering can be a useful approach to meet these requirements and the Board should aim to meter all services to medium- and high-volume consumers in Maiduguri. These meters should be checked and consumption recorded monthly;
- charges for standposts should be paid by local government, deducting it from the monthly allocation they receive from the State Government;
- strict penalties should be imposed on the illegal resale of water and on the construction of private underground tanks;
- the Board should organize health education workshops with the assistance of the Ministry of Health in all towns so that the need for improved water supplies and its related costs can be understood by all.

Subsequently, Usman reports that the proposed tariffs have been accepted by the Board and approved by the state government.

A water utility has to receive an adequate level of funding if it is to provide the services that consumers desire and need. Where the government tax base cannot support the utility in the long term then finance has to be obtained through user-tariffs. Modern management ideas reject the concept of subsidization from other sectors of the economy because of the lack of control of income on the part of the water utility.

The poorest consumers can be supported effectively through differential pricing structures within the water sector, but long-term reliance on local authorities to pay for water delivered through standposts may not produce the desired benefits. The wastage that is apparent at most standposts devalues that water and lessens the potential for resulting health benefits. The process of extending utility management over the financial aspects of water supply will have to cover standpost users in addition to other consumers, either through community-association control or through vendor kiosks. ■

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