 <p>15th WEDC Conference Water, Engineering and Development in Africa Kano, Nigeria: 1989</p>	<p>Paying for water</p> <p>Bukar Usman and Richard Franceys</p>
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Introduction to tariffs

People view paying for water in different ways; some believe that water is free in the same way as air is free and nobody should have to pay for it; others feel that the cost of providing clean water for the benefit of poor people should be subsidised 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.

Governments have tended to subsidise 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 finding that one group of the poorest in Khartoum had to pay 120 times more for their water through vendors than the better off paid for piped connections.

Laugeri (1982) points out that the objective of tariffs is to ensure that optimum use is made of scarce water resources whilst not compromising the financial situation of the water utility.

Briscoe (1988) sums up current thinking on helping the poorest : "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 assure 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.

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."

Four principal objectives of tariffs may be described -

ADEQUATE - A level of resources must be produced which will enable financial commitments to be met and some contribution made towards future investment.

FAIR - This level of revenue must be allocated between consumer groups in a fair and equitable manner having particular regard 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. (IWES, 1983)

Ability to pay and willingness to pay

It is commonly assumed that as long as financial requirements do not exceed 3% to 5% of 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). For in many communities either the level of service is too low (ie 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).

Factors influencing 'willingness to pay' 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).

Metered or flat rate

For household or individual connections tariffs may be charged according to:-

size of connection pipe, with different flat rate charges, for domestic, institutional, commercial and industrial users; property values, assessed perhaps as in the UK rating system; property characteristics, that is the number of taps, basins, showers, baths; amount of water used, measured by household meters. This last method best fits the proposed four objectives of tariffs.

For standpost supplies tariffs may be based upon:- a flat rate charged on all surrounding households, coupled with the use of flow limiting devices; 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 of who organises the share out; an individual or community council concession or water kiosk. Access to the standpost is controlled and water is sold at fixed rates, usually determined by government.

Setting tariff rates

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:-

1. Increase the tariffs modestly in line with inflation - the resulting revenue may not be sufficient but at least it is more or less acceptable politically;
2. Aim for full recovery of operation and maintenance costs;
3. Set tariffs to recover operation and maintenance costs plus full amortization of the capital costs, that is paying back any loans including interest;
4. Aim for a target rate of return on fixed assets employed. 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).

5. Use long run marginal costing, also known as Average Incremental Cost (AIC) which is a method of considering future costs of proposed expansion schemes.

It is beneficial if the rates charged signal to the consumer the value of resources used in providing the services. Rather than set rates by reference to existing and historical costs, rates should reflect the cost of providing additional (incremental) services. Thus the consumer is informed of the true costs of providing additional services and through adjustments to his consumption can indicate his willingness to consume at that rate.

Marginal cost is the additional operating costs for an additional unit of output (short run). Where extensions of capacity are required to allow for increasing consumption, marginal cost includes the necessary investment costs (long run).

However, strict application of marginal costing can cause large and sudden fluctuations in price - therefore the donor agencies favour AIC which means taking the average or long-run marginal cost over a longer period of time.

This method is more practical and more acceptable - it sets the price equal to the average cost of producing water from the most recent or next feasible investment.

Average Incremental Cost is obtained by DIVIDING a) the present value of all incremental capital, operating and maintenance costs (net of taxes and duties, with corrections for foreign exchange price distortions caused by taxes, subsidies or an overvaluation of the national currency. BY b) the present value of the incremental consumption over the design life of the facilities to be constructed (Gilling, 1980).

The present values are determined by discounting the cash flows and consumption quantities at a discount rate which equals the opportunity cost of capital to the national economy. (Opportunity cost is the real value of resources used in the most desirable alternative).

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

Elasticity of demand

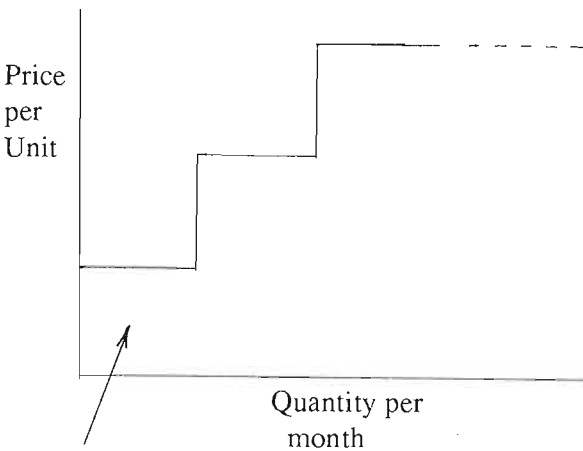
As the price of water varies the amount used is also likely to vary (above the level of the most basic need). This price elasticity is defined as the percentage change

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% and 40%. This information is important in the setting of proposed tariffs to ensure that the desired total revenue is achieved.

Variable block pricing

Using the preferred Average Incremental Cost method for all consumers may be politically unacceptable 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 is charged at a lower rate and higher or discretionary consumption at the marginal rate.



Lifeline block

Average tariffs in other countries

Saquee (1986) investigated tariffs from nine separate water utilities in Africa finding an average tariff for metered domestic consumers of \$0.22/m³. 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/m³ representing between 1% and 0.3% of household income.

Tariff structure for Borno State Water Board

The Borno State Water 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 reduced, reflecting the decline in the Federal and Statutory allocation. The income derived from charges is small compared to the cost of operating and maintaining 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.

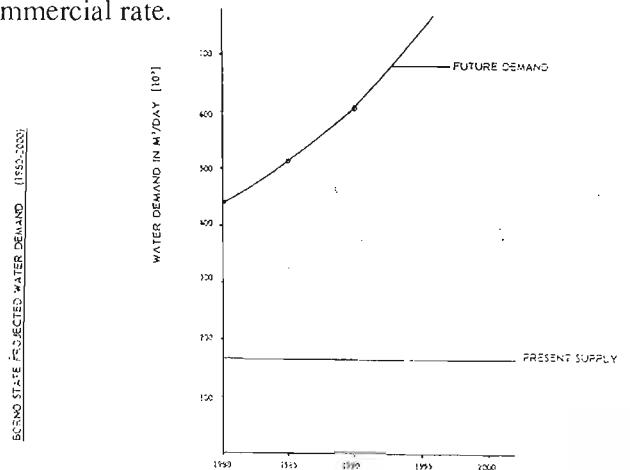
Existing tariffs

The present tariff structure charges most domestic consumers on a flat rate of \$0.86 per month (7Naira=\$1) with a metered rate of \$0.06/m³ rising to \$0.09/m³ above 68m³ per month only for high volume domestic users. Connection fees are approximately \$17.50. Industrial and commercial metered tariffs are \$0.14/m³ and \$0.15/m³ for monthly consumption up to and over 2272m³

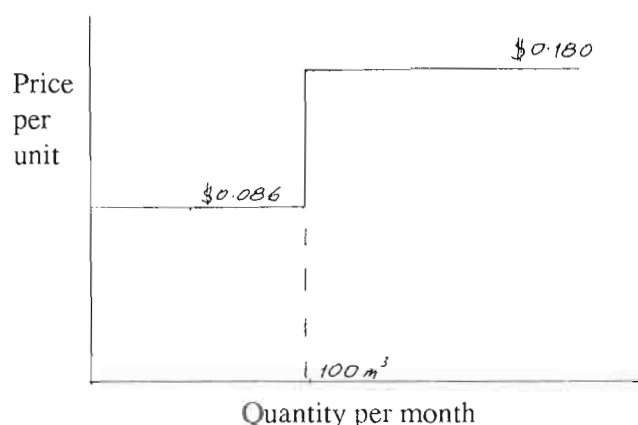
Calculated tariffs

Considering a 6% rate of return on fixed assets employed, the average water charge for Maiduguri, assuming 30% wastage in the distribution system, should be in the region of \$0.086/m³. This represents a 40% increase on the existing tariff. Using a price elasticity of -0.3 this would lead to a 13% reduction in water usage. Because of considerable unfulfilled demand 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, with initial capacity of 10,274 m³ per day with a 15% annual increase in production upto 1997. With a total capital cost of \$24.5M and annual operating costs of \$0.8M in 1997, the AIC method of tariff calculation for the new works is estimated to be \$0.18/m³ at an 11% discount rate. This represents a 28.5% increase over the existing initial industrial and commercial rate.



These computed tariffs may be seen as the two blocks of an increasing block pricing system. Low income consumers receive their water through standposts, paid for by local government (at a rate equivalent to the historical cost at a 6% return on assets) for reasons of social equity. Low volume consumers with yard taps are assumed to use an average of 16m³/month, thereby paying a flat rate of \$1.4/month. Medium to high volume domestic users, including those with underground storage tanks are metered. Industrial and commercial consumers should pay the long run marginal cost of producing the extra water they demand at a rate determined by the AIC method.



Possible block pricing system

Recommendations

Based on the experience gained from the study of existing systems it is recommended that:

Tariffs should be based on increasing block rates.

Means through which connection charges can be paid by low income households over some form of time payment plan should be made available to potential new customers.

Tariffs must be levied on all users of water. The system of charging should be widely comprehensible, fair and water conserving. Metering can be the best 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 civil servants living in government quarters should be included in deductions from their salaries at the end of each month.

Charges for standposts should be paid by local government by a deduction from the monthly allocation from State Government.

Strict penalties should be imposed on the illegal sale of water and on the construction of private underground tanks.

The Board should organise health education workshops with the assistance of the Ministry of health in all towns so that the need for improved water supplies and related costs can be understood by all.

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