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Water Pricing: A Key Issue in Sustainable Urban Water Management

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ABSTRACT: Water has been identified as one of the most important natural resources as it is viewed as a key to prosperity and wealth. Water price is the main instrument to control demand but designing a tariff is a complex process. The Water rates presently being charged from the users are highly subsidized and have resulted in low revenue realization. The urban water supply sector in India is entrapped in a vicious circle of poor tariff structure to poor cost recovery and hence poor service delivery to consumers. Therefore urgent steps are necessary for improving the management of urban water sector and thus ensuring sustainability. The focus of present paper is on issues in tariff fixation in urban local bodies. Basic objective of water tariff is cost recovery, economic efficiency, equity, and affordability. It is recommended that the long-term aim should be 100% metering coverage. Improving the quality of meters and reducing the frequency of faults which is essential in order to remove the commonly held perception that they are unreliable and that paying a fixed monthly charge is much better. In this paper proposed tariff structure is discussed.

INTRODUCTION

Since the Dublin conference on Water and the Environment (ICWE, 1992) it has become generally accepted among water resources managers that water should be considered an economic good (ICWE, 1992). To quote Merrett 1997, "Water has a high value of use but a low price, and the diamond has a high value in exchange and a low value in use. The question is how to determine the pricing of non-marked goods with an extremely high value in use". Water pricing is an important instrument to break the vicious circle of the "free water dilemma". The price should be reasonable, allowing for full cost recovery, but in line with the ability to pay by the consumers. Those who can pay an economic price (in industries and highly developed urban areas) should pay a high price and by doing so, cross-subsidize the poorer strata of society. It is possible to provide poor people with a minimum amount of water for free. Water pricing is a demand management tool. Demand management is a way in which the consumption of water is brought into balance with the supply by the use of price. Inadequate strategic and tactical planning leads to:

1. High unaccounted for water.
2. Low tariffs and inappropriate tariff structures and subsidy mechanisms.
3. Poor bill collection efficiency and poor service delivery.
4. Poor operation and management practices.

For proper tariff management in a distribution system, the metering aspects need to be carefully attended to ensure that the number of non-functioning meters is minimum and that correct reading is recorded and reflected in billing. Pricing automatically guides the consumer and the producer to appropriate level of use and supply. In India the water prices are highly subsidized since water is considered an essential public good. This encourages unsustainable use of the resources resulting in over expansion of water supply facilities to meet increases in water demand emanating from population growth, urbanization, global climate change and socio-economic factors. Anything scarce and in demand commands a price. Water is scarce so water pricing is increasingly seen as an acceptable instrument of public policy. India is noted for one of the lowest water tariffs in the world.

URBAN WATER SUPPLY PERFORMANCE IN INDIA

An analysis of information from water suppliers in 21 urban centres in India, representing 10 per cent of the urban population with city populations ranging from 17,600 up to 10,300,000, indicates that water is supplied on average for 6.6 hours per day to a claimed 85 per cent of the urban population. The quantity of water reported produced is 148 litres per capita per day with an average 27 per cent unaccounted for water giving 108 litres per capita per day water consumed.

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This average figure hides dramatic variations. Forty seven per cent of connections are metered but most meters are reported to be out of order. The average domestic tariff is Rs. 1.6/m^3 and the commercial/ industrial tariff is Rs. 4.3/m^3. The average operating ratio, that is, the ratio of operating costs to operating revenue is 2.5 which indicate that only 40 per cent of operating costs in these towns are being recovered. There is no recovery of capital costs. Average bill collection efficiency is reported as 75 per cent (Franceys and Sansom, 1999).

A conclusion from many demand or willingness to pay studies for water is that the demand for full-service supply (i.e. continuous, piped, potable and high pressure) is indeed high enough to enable full cost recovery (including the cost of capital). Poor consume much smaller quantities of water and since these represent absolute necessities they are a priority for even the smallest of budgets. To address equity and access (the so called "ability to pay issue") and to make tariff reform possible, a common strategy is to institute a block tariff system which supplies a basic need level of consumption (20–50 lcd) at a low or lifeline tariff. Higher levels of consumption attract increasing tariff rates, and the overall objective is to generate sufficient revenues from water sales to cover all the direct money costs and ideally, a target rate of return on capital (Choe and Varley, 1997).

Water in most Indian cities and towns is underpriced, with damaging long-run consequences for households who have limited and poor quality water services and for water supplying entities who are unable to invest and expand water coverage. Most water supply entities—be these the Public Health Engineering Departments (PHED), state or city-level water boards, or municipal governments, run at a loss, and cover the loss—defined as the gap between revenues from the sale of water and cost of water provision—from government subsidies and accelerated depreciation of capital. The result is a low-level equilibrium: low tariff, poor services, and constraints on access, especially of poor households.

The price of urban water is low in relation to the cost that is incurred on its provision. Recent city specific studies of Bangalore, Chennai, and Hyderabad show that the typical price charged for water for residential use is about Rs. 1.5 per cubic meter which is one-tenth of the operating and maintenance costs actually incurred (Raghupathi and Foster, 2002), raising serious concerns about the financial viability and sustainability of urban water utilities (The World Bank, 1995). Under pricing has resulted in poor service and reduced incentives to expand the spatial coverage of services. The cost of intermittent water supplies for households is said to be high; according to a recent paper, the average capital cost for installing pumps, water filters, tanks and other equipments is estimated at Rs. 2,620 per household (Rana, 2003.)

The Working Group set up to formulate the Ninth Five Year Plan for urban water proposed adoption of the principle of full cost recovery in order to enhance the financial viability of the water sector and full autonomy for institutions responsible for water supply in determining water tariff and tariff policy. It proposed that subsidies for the poorer sections should be selective, well-targeted, and transparent to ensure that there was no excessive cross-subsidization from other sectors like industry or commerce (Ministry of Urban Affairs and Employment, 1996).

Urban water is a state subject, institutional arrangements for its provision and management and systems of pricing including price structures vary across states. Absence of data on effective water demand and its sensitivity to price change remains an important handicap in formulating appropriate water pricing policy. Pricing of urban water as also other urban infrastructual services is a key failing in India. Apart from their legendary inadequacy, both in quality and quantity, the prices that are charged for them constitute a relatively small proportion of the long–run marginal costs. The institutions responsible for the provision of such services do not receive enough revenues to improve and maintain them adequately; resulting in poor service for those served and reduced incentives to extend water to additional population. Cheaper services encourage those with easy access to use them excessively. The existing pricing system and structures are inadequate and unsustainable.

TARIFF STRUCTURE

A water tariff is the set of rules and regulations regarding prices, charges, and taxes that utilities use to collect revenue (Komives *et al.*, 2002) Tariffs should be:

1. *Conserving:* Structure of tariff should influence consumption to the extent that customers will purchase enough to satisfy their needs without being wasteful.
2. *Adequate:* A level of resources must be produced which will enable financial commitments to be met.
3. *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.

4. *Enforceable and Simple:* The tariff should be simple to administer and enforce and easy for customers to understand.

As the price of water or other services is increased it is likely that consumption will fall to some extent. This is known as Price Elasticity and may have to be taken into account when finalising projected revenue. Price elasticity for water is usually believed to be between 0.6 and 0.8—known as 'inelastic'—that is if the price of water doubles then consumption will fall to between 60% and 80% of original demand. So as price rises, revenue also increases but not as much. A complete tariff structure might include consumption charge (marginal cost of producing, treating, pumping water per cubic metre), connection charge (marginal cost of connection, metering, billing), and development charge (capital cost of distribution network).

Variety of tariff structure can be used to meet the revenue requirements. Some of the rate structures that are considered fair as mentioned in Washington State Department of Health (2005):

1. *Increasing block rates:* Increasing block rate pricing increases the per-gallon charges for water as the amount used goes up. The first block of use is charged at one rate, the next block is charged at a higher rate, and so forth.
2. *High-use surcharges:* A higher rate is imposed on "excessive" water use, as identified by the water system owner. Generally, systems impose surcharges for water consumption considered higher than average.
3. *Seasonal rate:* Prices rise and fall according to water demand and weather conditions. Systems usually charge higher prices in the summer months when demand is highest and water supplies are reduced.

ISSUES IN TARIFF FIXATION

Provision of adequate water supply to the rapidly increasing urban population is becoming a problem for governments around the world. In many developing countries the publicly-owned urban water supply utilities are finding it increasingly difficult to meet the needs of people. The level of service provided in general declines with poor service leading to poor revenue collection, which then leads to low re-investment and an even poorer level of service. There is growing evidence that many urban and rural communities are willing to pay more than the prevailing rates for water and sanitation for better and reliable service. However, governments seem unwilling to match this with a willingness to charge consumers for these services and the result is a continuing cycle of low revenues, high costs, unsatisfactory services and financial crisis (UNDP World Bank). One of the reasons why setting water tariffs is so controversial is that in many cultures and countries water is seen as a resource that should be provided free; for many it is hard to give up this vision of free, abundant water even when faced with the reality that one lives in a world where water is becoming an increasingly scarce commodity.

People are already paying much more than the official tariff rate through informal channels and coping strategies, and they would be willing to pay the government even more to secure better services. In India supplies are only available, intermittently, for a short time each day and the price is very low in relation to the direct costs of supply. Econometric analysis suggests that increasing the tariff and metering would allow the poor to consume more, at a lower total cost than the present level of water consumption. There is low coverage of metering. Reports of broken meters or meters that have been tampered with are commonly noticed. In some smaller cities, water taxes form a very large proportion of total urban water supply earnings but their share in the larger cities is generally low. Most cities use a combination of both flat-rate charges and user charges based on metered use and when the meters are broken revert to flat-rate charges. Indian water tariff structures are extremely affordable, even for the poorest families. However, average tariffs are so low (Rs. 1.5 per m^3) that utility income does not cover the costs of operation and maintenance (Rs. 15 per m^3). Efficient and effective water pricing systems provide incentives for efficient water use and for water quality protection.

Altaf *et al.*, 1993 and Singh *et al.*, 1993 have concluded that if service is reliable, consumers are willing to pay substantial amounts for improved water supply. However, because urban water consumers view their existing intermittent water supply service as unsatisfactory, they are often reluctant to pay their water bills and revenue loss is usually high. Public officials often misinterpret this poor cost-recovery as an indication that prices are too high to afford or that consumers' willingness to pay is too low, rather than as an indication of unmet demand and dissatisfaction with the provided service. As a result, water utilities are in a predicament; to meet consumers' demand for a better service, revenue collection will have to increase but consumers often do not believe a better service will be forthcoming and will not tolerate increases. It is

difficult to persuade the public that increased tariffs are in their best interests. One way of breaking the vicious circle is to provide a convincing demonstration to the public that consumers can afford to pay the full cost for a commercial service. There is a transparent need for better water services and the poorest members of society want them and are willing to pay something, for a basic or lifeline supply (Choe *et al.*, 1996). The price of water in India is often around Rs. 3 per cubic metre—but the price is different from the cost. The operating cost is between Rs. 8 and Rs. 10 per cubic metre. That is the price is well below the operating cost and therefore even further below the real cost which has to include capital costs as well.

Level of subsidies in economy is around 15% of GDP and most of them generate no benefit apart from to their direct beneficiaries. Agricultural producers alone probably receive around Rs. 100,000 crore a year. Subsidies in Indian economy are large and untenable. But some subsidies are absolutely necessary. India has a fair number of very poor people and targeted subsidy is necessary to take care of everybody's food and non food needs. The key issue is levy of user charges particularly for water and power. Some subsidy will be necessary for drinking water (Pant, 2001).

COST ONE PAYS

People generally pay much less for drinking water supplied by Urban Local Bodies than they do for most other goods and services, such as cable television, telephone service, and electricity. Willingness to pay for safe and potable water can be seen by the facts that in railway station people pay Rs. 10 per litre for sealed bottle and Rs. 2 to 5 per litre for unsealed bottle, in hotels the same sealed bottle costs Rs. 30 to Rs. 100 per litre and at homes the cost is around Rs. 25 to 30 for 20 litre bottle. Wealthier households install pumps to extract water from the reticulated supply or their own bore wells. They have extra storage tanks. All these incur additional costs: the tanks have to be cleaned regularly. Pumps decrease supply pressure for everyone else at the same time. The water needs to be boiled to ensure it is safe to drink. The energy cost for boiling 20 litres of water in a typical domestic situation is around 5 rupees. Per boring initial cost is approximately Rs. 30,000 and running cost is around Rs. 300 per month. A water system's rate structure must produce sufficient money to operate in a financially sound manner so as to provide customers with a reliable and fairly priced supply of safe drinking water. Many factors can lead to increase in rates such as maintenance, repair, and replacement costs that increase with the age of a water system or its components, increased costs for water treatment due to contamination. Under the circumstance resistant to pay a reasonable tariff for water should not be there.

WATER PROVISION AND EXISTING TARIFF STRUCTURE IN ALLAHABAD CITY

Allahabd Jal Sansthan is responsible for the operations, billing and collection of charges, while the responsibility for capital works rests with the Uttar Pradesh Jal Nigam. Various aspects of water supply are related to the installed capacity, water released, volume of water charged, and distribution losses. It is common to observe differences, on the one hand, between water released and installed capacity, and on the other hand, between water charged and water released. The former being usually less than the water released on account of free water that city provides and distribution losses. In recent years quantity of non revenue water has risen enormously. Water provision in Allahabad city is given in table 1.

Table 1: Water Provision in Allahabad City

Sl. No	*Features*	*Value in mld*	*Value in %*
1.	Installed capacity	230	–
2.	Water released	210	91 (of installed capacity)
3.	Distributional losses	63	30 (of water released)
4.	Free water	58.2	28 (of water released)
5.	Water charged	117.6	56 (of water released)

Survey results show that the distributional losses are about 30–40 percent which is roughly twice the norms and standards. Free water supplied through public standposts accounts for 28 per cent in Allahabad. Metered versus unmetered water supplies are another important aspect that impinge on the pricing structures and consequently upon the overall financial health of water supplying organizations. In Allahabad, of the 86,000 water connections only 5–6 percent of the households have working meters. Therefore tariff is based on house tax for domestic user since 2000. Non domestic users are charged at the rate of 8Rs/kl. The structure of tariff followed by Allahabad Jal Sansthan is as follows:

Table 2: Existing Tariff Structure in Allahabad City

Sl. No	House Tax (Rs)	Water Tax (Rs)
1.	0–360	756
2.	361–2000	1418
3.	2001–3500	1701
4.	3501–5000	1890
5.	More than 5001	2646

Note: There is an increase in water tax by 7.5% till 2006 and after that 5%.

PROPOSED TARIFF STRUCTURE

The objective of providing suitable tariff to Indian society particularly or in general Asian or African society should be to take care of underprivileged poverty ridden and poorer section of the society. To achieve this system of cross subsidy has to be evolved. This means that some sections of the society would have to be provided water free of charge and some sections would have to be charged less than what they consume. Whereas affluent section of society would have to be charged at rate which are higher than the actual cost of supply. Based on this philosophy following tariff structure is shown in Table 1.

Table 3: Proposed Tariff Structure

Sl. No.	Daily Consumption Per Person (litres)	Monthly Consumption (m^3)	Family Consumption (assuming no. of person 4) (m^3)	Cost (Assuming Cost of supply 15 Rs/m^3/month)	Tariff (Rs/month)	
					Actual	Proposed
1.	<50	1.5	6	90	90	00
2.	Up to 135	4.05	16.2	243	243	200
3.	Up to 270	8.1	32.4	486	486	525
4.	Up to 350	10.5	42	630	630	724
TOTAL =					1449	1449

CONCLUSIONS

Water pricing should be devised in a manner that it follows the principle of allocative efficiency by way of recovering the operational costs, it is financially viable and may even generate resources for the extension of the water supply systems, and it serves the cause of equity through cross- subsidization of the poor by others. All the natural resources are properties of government. As such, the ground water being directly taken out and used by individual households, business establishments, institutions and industries, need to be charged for it. A system needs to be devised for this purpose because these sources are depleting and there is an associated cost of recharging of groundwater.

REFERENCES

Altaf, M.A. (1993). "Rethinking Rural Water Supply Policy in the Punjab, Pakistan", *Water Resources Research, Special Section: Water Resources Issues and Problems in Developing Countries*, Vol. 29, No. 7, American Geophysical Union, Washington, DC.

Choe, K.A. and Varley, R.C.G. (1997). "Conservation And Pricing—Does Raising Tariffs To An Economic Price For Water Make People Worse Off?" *Best Management Practice for Water Conservction Workshop*, Supported by Sa-USA Bi-National Commission. 7–10 September, 1997 Hermanus, South Africa.

Franceys, R. and Sansom, K. (1999). "The Role of Government in Adjusting Economies India: Urban Water Supply", p. 82.

ICWE (1992). "The Dublin Statement and report of the conference". *International conference on water and the environment: development issues for the 21st century*, 26–31 January, Dublin.

IIMI (1998), NEWS, Vol. 2, No. 1, 1998.

Kasrils, R. (2001). "The value and price of water (The women of Lutsheko)". *Water Science and Technology* 43(4), 51–55.

Komives, Kristen and Whittington, Dale (2002). "Tariffs and Subsidies in Clarissa Brocklehurst (Ed.) New Designs for Water and Sanitation Transactions: Making Private Sector Participation Work for the Poor", WSP and PPIAF, Washington D.C., USA, 50–56.

Merrett, S. (1997). "Introduction to the Economics of Water Resources—An International Perspective" UCL—University College London, 1997, 211 pages, ISBN 1-85728-636-7 HB, ISBN 1-85728-637-5 PB.

Ministry of Urban Affairs and Employment (1996), *Report of the Working Group on Urban Water Supply and Sanitation Sector for the Ninth Five Year Plan* (1997–2002), New Delhi.

Pant, K.C. (2001). Planning Commission Deputy Chairman, The Economic Times, page 7.

Raghupathi, U.P. and Foster, V. (2002). "Water Tariffs and Subsidies in South Asia", *mimeo.*

Rana, P.S. (2003). "Pricing of Water for Sustainability", *mimeo.*

Singh and Bhanwar (1993). "Rural Water Supply in Kerala, India: How to Emerge From a Low-Level Equilibrium Trap", *Water Resources Research, Special Section: Water Resources Issues and Problems in Developing Countries*, 29(7), American Geophysical Union, Washington, DC.

The World Bank (1995). "Urban Water Supply and Sanitation", quoted in UNDP-Water and Sanitation Program's, Water for India's Poor: Who Pays the Price for Broken Promises, October 1999.

Washington State Department of Health (2005), "Water Rates, Paying for drinking water." DOH PUB. #331–327.