URBAN WATER PRICING

SETTING THE STAGE FOR REFORMS

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DECEMBER 2003

NATIONAL INSTITUTE OF PUBLIC FINANCE AND POLICY
NEW DELHI

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PREFACE

Studies on the finances of municipalities have a long tradition in India. Most studies including those that have been conducted at the National Institute of Public Finance and Policy (NIPFP) have, in the past, focused on an examination of income and expenditure of municipalities and led to the now widely-held conclusion that their finances are in a shambles. Policy prescriptions that have emanated from such studies have not gone beyond suggesting that municipalities should improve the administrative efficiency of their tax regime, and use cost recovery mechanisms for augmenting their revenue base.

With support from the United Nations Development Programme (UNDP) under its Economic Reforms Programme (IND/98/410), the National Institute of Public Finance and Policy (NIPFP) have broadened the scope of municipal finance studies to address and reach out to the relatively unresearched areas, in particular, those that are concerned with (i) the potential of capital market financing of urban infrastructure, (ii) systems of pricing urban infrastructural services, and (iii) the scope of independent regulatory mechanisms in urban services. Specifically chosen for their relevance in the context of urban reforms initiated by the Government of India, these research concerns aim at developing frameworks for municipalities to effect sustainable improvements in their finances and functioning.

The National Institute of Public Finance and Policy (NIPFP) is pleased to submit herewith three studies, viz: (1) **Financing Municipal Services: Reaching out to Capital Markets**; (2) **Urban Water Pricing: Setting the Stage for Reforms**; and (3) **Urban Water Supplying Entities: Putting Regulatory Frameworks to Work,** prepared under the Economic Reform Programme. The studies have been conducted by a team consisting of Sanjukta Ray, Sandeep Thakur, and Sarika Chaturvedi, and Om Prakash Mathur, Professor at the NIPFP as leader of the team. Others who have made substantive contributions to the studies include Dr. Dale Whittington, Professor, University of North Carolina, who served as a short-duration consultant to NIPFP, Ms. Sujatha Srikumar, Senior Vice President, Infrastructure Leasing and

Financial Services Ltd. (IL&FS), and Mr. R. Raghuttama Rao, ICRA Advisory Services. Om Prakash Mathur also had the benefit of advice and valuable suggestions from Dr. Albert Breton, Professor, University of Toronto, and Dr. Kim Cuenco, Senior Urban Adviser, the World Bank, as also inputs from the participants of a UN-ESCAP Regional Workshop on Pro-Poor and Sustainable Urban Water and Waste Water Management held at Phitsanulok, Thailand, where results of studies were presented and tested, as also by other experts. On behalf of the NIPFP, I would like to express my gratitude to all of them including Ms. Rekha for word processing the study reports.

The National Institute of Public Finance and Policy (NIPFP) would like to place on record its gratitude to Mr. P. K. Deb, Joint Secretary, Department of Economic Affairs, Ministry of Finance, Mr. S. Banerjee, formerly Joint Secretary, Ministry of Urban Development and Poverty Alleviation, and Mr. Maurice Dewulf, Deputy Resident Representative and Dr. Pradeep Sharma, Assistant Resident Representative of the United Nations Development Programme (UNDP), New Delhi, for supporting the studies. We sincerely hope that support for such studies will continue.

The Governing Body of the NIPFP does not assume responsibility for the findings of the studies or of suggestions that are contained therein.

M. Govind Rao
Director

February 2004

A PREFATORY NOTE

This set of three complementary studies① Financing Municipal Services: Reaching out to Capital Markets; ② Urban Water Pricing: Setting the Stage for Reforms; and ③ Urban Water Supply Entities: Putting Regulatory Frameworks to Work grows out of the need to continue and deepen the process of urban sector reforms which began in India with the incorporation of Part IX A into the Constitution of India and which has since spread out to such spheres as reform of property taxation, capital market financing of urban infrastructural services, and public-private partnership in urban service delivery and management. Broad-based and, to an extent, even noteworthy from a historical perspective, these reforms have meant substituting the system of using rents for estimating the annual rateable value of properties with one that relies on either the area characteristics or capital valuation, relaxing the public sector grip over service provision and often even giving up the claim that urban services, on account of the externality characteristics, are necessarily to be provided by public sector organizations, and raising funds in the capital market by escrowing a part of revenue streams rather than being dependent on state assistance and sovereign guarantees. To provide support to these reform initiatives, the Government of India have inserted a new clause in Section 10(15) of the Income Tax Act, 1961 under which interest income from municipal bonds is exempted from income tax, and followed it up with the creation of three funds, namely, the Urban Reforms Incentive Fund (URIF), City Challenge Fund (CCF), and Pooled Finance Development Fund (PFDF). The purpose of the three Funds is to provide incentives to state and municipal governments and other city-based institutions to initiate and reinforce actions in such areas as repealment of the Urban Land (Ceiling and Regulation) Act, 1976, and amendment of rent control acts, and undertake reforms that would bring about improvement in existing service levels in a financially sustainable manner.

Although seemingly broad-based, these initiatives have, thus far, made little change in either the finances or the functioning of municipalities. Municipal revenues have, in the post 1992 period, not added much buoyancy; in 2001/02, municipalities in India raised about

Rs.127,500 million by way of their own revenue-raising powers, forming 0.71 per cent of the aggregate gross domestic product of states compared with 5-12 per cent in several Latin American countries, and 3.07 per cent of the total revenues raised by the three tiers of government. In proportionate terms, this scale of municipal resource-raising effort signals at best a marginal change from the pre-1992 era.

Urban service levels e.g., water supply, sewerage, solid waste disposal, citywide roads, and street lighting continue to be in an unsatisfactory state. According to the National Sample Survey, 59 per cent of urban households are connected to a private tap and others, i.e., 41 per cent of the total urban households rely on public or shared connections. Only about 30 per cent of houses in cities and towns are connected to sewerage and sewage disposal services. Nearly 20-25 per cent of the total garbage remain uncollected from roads and streets. City-wide road network is in a dilapidated state, and unable to absorb the fast growing traffic load. Street lighting is grossly insufficient to provide security to urban residents.

Notwithstanding a large unmet demand, investments in urban infrastructural services have remained within a narrow range of 2.25 to 2.5 per cent of plan outlays. Most infrastructural services are grossly unpriced, with no incentives with institutions responsible for their provision to link the cost of service provision with price or tariff. The studies owe themselves to these concerns, and addresses the following issues: what might be done by municipal governments to accelerate investments in urban infrastructural services; what considerations should govern pricing of urban services?; and what kind of a regulatory framework should be in place so as to improve the functioning of institutions that are responsible for urban service provision? The studies underline, in this regard, the importance of a responsible municipal fiscal and financial system, simplification of existing water pricing and tariff structures, and regulatory mechanisms which are able to balance the interests of the produces and consumes of urban services.

These studies are a part of the NIPFP's continuing research programme on local government finance.

Om Prakash Mathur
Professor

February 2004

ABSTRACT

Setting appropriate prices is indispensable to providing adequate water to India's growing urban population. 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. While the need for appropriate pricing of urban water has been long stressed and is widely recognized as central to broader urban sector reforms, what constitute water price reform remains an elusive and emotive issue. Moreover, the goals and objectives of water pricing are often conflicting. Using city-level experiences of water pricing, particularly in respect of the size of the consumer base, multiple instruments of charging, price discrimination between different water user groups, and price-cost linkages, this study titled as **Urban Water Pricing: Setting the Stage for Reforms**, provides a framework that spells out key areas of reform, objectives that may govern water pricing, and parameters of tariff rationalization.

1 THE IMPORTANCE OF URBAN WATER PRICING

"How is it that water which is so useful that life is impossible without it, has such a low price; while diamonds, which are quite unnecessary, have such a high price."

Setting appropriate prices is central to the reform of the urban water sector in India.[1] Current levels of water pricing in most Indian cities and towns are deficient in several respects. One: the price of urban water is low in relation to the cost that is incurred on its provision. Although firm estimates in respect of water price and costs are spotty, on average, prices or recoveries from the sale of water and other charges relating to water provision are approximately 22-25 per cent lower than the operation and maintenance costs. 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,[2] raising serious concerns about the financial viability and sustainability of urban water utilities.[3] Annual losses on account of operating and maintaining the urban water supply systems are conservatively estimated at Rs.50,000-60,000 million, placing an

[1] Water price reform is an important agenda in many developing countries. See the following quote. "The reformulation of tariffs and subsidy policies is central to the reform of water and sanitation services in developing countries. The traditional model of service provision has coupled public ownerships with tariffs that are set well below the cost of the service, justifying this in terms of the importance of water services for the health status of the poor. However, results have often been unsatisfactory. Service quality and coverage remain inadequate in many countries, and subsidies directed at public water companies have often benefited the middle classes rather than the poor, who remain unconnected to the public network. Reformers have proposed to break out of this low level equilibrium through a combination of private sector provision, full cost tariffs, and better targeting of subsidies." Ian Walker in Pricing, Subsidies and the Poor. mimeo undated.

[2] Usha P. Raghupathi and Vivian Foster, 2002. Water Tariffs and Subsidies in South Asia. mimeo.

[3] 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.

enormous burden on water supplying entities. Two: underpricing has resulted in poor service and reduced incentives to expand the spatial coverage of services. Although most cities and towns have been able to reach a reasonably high level of access to safe water – 90.01 per cent according to the Census of India, 2001, only about 50 per cent of the urban households have "tap water within premises". Access to tap water within premises is as low as 27.1 per cent in Bihar, 29.3 per cent in Kerala, and 34.9 per cent in Tamil Nadu. Most households face limited hours of service, and water services are uniformly sub-standard. 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.2620 per household.[4] In Delhi, the annual cost of reducing water supply unreliability is placed at Rs.844 per household.[5] The Government of India and the World Bank recently reported that urban water systems in India "deliver on average 50 to 60 per cent of their capacity to end-users, compared with 80 to 85 per cent in other countries. Poor, and sometimes non-existent, management leads to waste and inefficiency, with the resultant large claim on resources that could be redeployed for service improvements".

Tariff adjustments to achieve cost recovery are central to the water sector. Most water supplying entities in India operate at a loss. They finance the shortfall between tariff revenue and costs through operating and capital subsidies from the government and through depreciation of capital. The result is a low level equilibrium characterized by low tariff, poor service and limits on access, especially of poor households.

Three: the objective of large scale subsidization of water on grounds of lack of affordability by the poor has not been achieved. Much of the evidence points out that the poor pay more, often two-to-three times, if coping costs were included, and the price subsidy meant for them and built into tariff structures, e.g., in increasing block tariff (IBT) is appropriated by

[4] P. S. Rana, 2003. Pricing of Water for Sustainability. mimeo.

[5] Marie Helene Zerah, 2000. Water: Unreliable Supply in Delhi. Centre De Sciences Humains, New Delhi.

the non-poor households. Subsidies on private taps are poorly targeted, as no more than 30 per cent of the beneficiaries are poor. Moreover, a large proportion of urban poor households do not have private connections and are, therefore, unable to benefit from water subsidies. Such regressivity in the distribution of subsidies when poor do not have access to subsidized piped water service is a common phenomenon in Indian cities and towns. Four underpricing has affected the finances of sate governments who have either absorbed the losses of urban water utilities or adjusted the losses by reducing the capital account support to them for capacity expansion. Although the macroeconomic consequences of low water prices are difficult to assess, urban water services could cost the state governments the equivalent of 0.3 to 0.4 per cent of their gross domestic product.

When water tariffs are lower than the cost of provision, there is little incentive to expand the service, and fewer resources are allocated to water than would be optimal.

Urban water services are important to economic growth, productivity, and poverty reduction. The financial viability and sustainability of India's water supplying entities has been consistently emphasized in water policies enunciated in the successive five year plans. 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.[6] Apart from laying emphasis on the financial aspects of urban water utilities and considering that urban water has important implications for productivity and quality of life, the Ninth Five Year Plan underlined the importance of universal coverage of population by water supply, adequacy in terms of water consumption norms, integration of water supply with liquid waste management, recycling of waste water and sewage, and privatization and

[6] 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.

participation of the community in the management of water supply systems[7]. In a recent paper titled, Urban Water Supply and Sanitation, the World Bank has made similar observations, stating that water tariff setting must increasingly focus both on economic efficiency and financial viability, without losing sight of social affordability[8]. Tariff rationalization, according to the paper, is an essential pre-requisite to the financial viability of agencies responsible for water supply and for increasing the financial flows into the sector.

The Tenth Five Year Plan (2002-2007) has reinforced the water sector agenda as laid out in the Ninth Plan and other recent reports. While an assessment of issues relating to urban water supply is discussed elsewhere, it is important to reproduce the following quote from the Tenth Plan that sums up the water agenda: "the unfinished tasks in water supply in urban areas may be summed up as augmentation to reach the prescribed norms, higher degree of reliability, assurance of water quality, a high standard of operation and management, accountability to customers and in particular special arrangements to meet the needs of the urban poor, and levy and recovery of user charges to finance the maintenance functions as well as facilitate further investment in the sector. The achievement of these tasks depends to a large extent on the willingness of the state governments and ULBs (urban local bodies) to restructure water supply organizations, levy reasonable water rates, take up reforms in billing, accounting and collection, and become creditworthy in order to have access to market funding[9]. It further observes that the "reforms (in the water sector) relate to making the sector more professionally managed, with adequate autonomy and financial powers, and levy of user charges preferably determined by an independent regulatory authority. By the end of the Tenth Plan, the target would be to recover full operations and maintenance costs through levy of user charges[10]. Financial sustainability has been emphasized in the Government of India's National Water Policy, as may be seen in the following quote.

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7 Planning Commission, 1997. Ninth Five Year Plan, New Delhi.

8 The World Bank, 1999. Urban Water Supply and Sanitation, Allied Publishers, New Delhi.

9 Planning Commission, 2002. The Tenth Five Year Plan, New Delhi.

10 Ibid.

Box 1

Besides creating additional water resources facilities for various uses, adequate emphasis needs to be given to the physical and financial feasibility of existing facilities. There is, therefore, a need to ensure that the water charges for various users should be fixed in such a way that they cover at least the operation and maintenance charges of providing the service initially and a part of the capital cost subsequently. These rates should be linked directly to the quality of service provided. The subsidy on water rates to the disadvantaged and poorer sections of the society should be well targeted and transparent.

National Water Policy, 2002
The Government of India

This study on **Urban Water Pricing: Setting the Stage for Reforms** is in response to the need to further advance the above-stated agenda. The present position where the water supplying entities—be these theparastatal organizations or the municipal governments – run into losses by selling water below the cost and where their losses have to be either written off or adjusted against future grants or absorbed by the states or merely allowed to be kept on books is unsustainable. Underpricing of urban water, it is widely agreed, has not only affected the financial health of water supply undertakings,but resulted in wasteful usage of water, and as referred to earlier, impeded the expansion of water services and reduced the coverage of urban poor households.

Although the need for*getting the prices right* appears obvious and compelling, what is, in fact, an appropriate charge is neitherstraight-forward nor easy to determine. Literature suggests at least three sets of pricing mechanisms: i() long run marginal cost, (ii) short-rum marginal cost, and (iii) average costs. While in themselves they are unassailable, they do not help a water supplying entity in determining an appropriate charge for water which requires addressing a host of questions: what costs are incurred in water provision?; what is the nature of costs?; what are the different ways in which costs are possible to be recovered?; what instruments are possible to be used?; who should pay for the lost water?; and the like.

The agenda of appropriate urban water pricing asenunciated in the successive five year plans and other initiatives requires that at least the following issues be specifically examined and analyzed—

❶ instruments of water charging: in what alternative ways is urban water charged, and to what extent do these instruments meet the contemporary principles of water charging;

❷ existing pricing structures: what pricing structures are currently in use?; what objectives and principles underlie them?; and what are these based on?; and

❸ price-cost linkages: what part of the cost is recovered by prices?, and what is the impact of non-revenue water and implicit subsidies on cost recovery?

We examine these issues in this study, using the data drawn from Bangalore, Vodadara, Allahabad and Agra, as also the data from other on-going studies on the financial structures of municipalities and city-specific parastatal agencies responsible for water provision. It lays out a framework for pricing reforms in the water sector. It emphasizes the need to gather information about the structure of supply costs and consumer preferences. By understanding the latter, it is expected that water utility companies will to be able to offer price and service options to consumers that are efficient than the existing systems.

This study is laid out in four sections. Section 2 presents the key instruments of urban water charging and water pricing structures. In Section 3, we analyze the experiences with urban water pricing in four cities and supplement the same with other examples. In particular, this section examines the structure of costs in supplying water and the different charging instruments and the outcomes in terms of revenues and expenditures. Section 4 provides a framework for urban water charging together with a brief explanation of objectives that water price much aim to achieve.

Box 2

ADB'S WATER PRICING POLICY

Conservation of water and its sustainable use are increasingly critical factors in managing a scarce resource. Governments and civil society need to see water as an economic good. Financial incentives for optimizing water use will be strengthened through a mix of water charges, market-based instruments, and penalties. Public awareness programs will reinforce the incentives. The incentives include water use rights, licenses and charges, tradeable permits, effluent charges, water treatment fees, access fees, environmental liabilities, and tax incentives. Managing water demand is a function of efficient pricing, effective regulation, and appropriate reduction and awareness. ADB will promote tariff reforms through its water-related projects and programs to modify structures and rates so that they reward conservation and penalize waste.

ADB will consistently advise governments of the need to adopt cost recovery principles in their water policies and strategies. The expansion of access to water and the improved provision of water services require that capital costs be funded mainly from within the sector by accessing debt market and developing appropriate tariff structures. Consumers will be expected to meet the full operation and maintenance costs of water facilities and service provision in urban and rural water supply and sanitation schemes subject to subsidy considerations. ADB will also promote the inclusion of environmental externalities and the recovery of resources management cost in Tariff systems adopted by DMCs.

Subsidies are a controversial issue in the water sector. ADB will support subsides for water services in the following circumstances: (i) where treated water uses have beneficial external effects in preventing health problems, (ii) where the transaction costs of measuring usage are very high, and (iii) where a limited quantity of treated water for the poor is regarded as a basic human need.

Water for All
The Water Policy of the Asian Development Bank, 2001.

2 URBAN WATER PRICING: INSTRUMENTS AND METHODS

INSTRUMENTS OF URBAN WATER CHARGING

Three types of instruments are generally used for charging water. One is a connection fee or a fixed access charge. Such a fee is levied to provide to the user a connection to a municipal (public) water supply system. A connection fee or charge is based on the size of the plot or holding or the size of connection and ferrule or a combination of plot size and the size of the ferrule. It is unclear if the connection fee is designed to contain an element of capital cost that is involved in laying out the distribution network.

Two: a water tax for which provision exists in most municipal legislations. It is a tax which is unrelated to water use or consumption. It forms a part of property taxation, and is leviable on the annual rateable value of land and property and is meant to essentially serve as a general tax. Conditions under which a water tax may be levied are prescribed in municipal legislations which, among others, include categories of water users who may be exempted from payment of water taxes, ceiling on the rate at which water tax may be levied, and the use to which receipts from such a levy may be applied. For example, the Uttar Pradesh Municipalities Act lays down that a water tax may not be levied on properties which have an annual value of less than Rs.300; the Uttar Pradesh Municipal Corporation Act, 1959 lays down that the proceeds of water tax (and drainage and conservancy taxes) may be pooled and used for purposes connected with the construction, maintenance, extension, and improvement of the service. The Maharashtra Municipal Act 1965 provides for a general water tax as a part of the consolidated tax on property and a special water tax for water supplied by the municipal council. It further lays down that a municipal council instead of imposing a special water tax may fix rates for supply of water by measurement. The Bombay Municipal Corporation Act provides for a water

tax if the premises are not charged for water by measurement, and a water benefit tax which is in addition to water tax or water charges on all residential properties in Greater Bombay. Water tax and water benefit tax are applied to the annual rateable value of premises, with the tax rate discriminating between residential and non-residential properties.

Table 1
Water Tax on Annual Rateable Value: Brihanmumbai Mahanagarpalika

Nature of premises	Water tax rate (%)	Water benefit (%)
(1)	(2)	(3)
Residential	20	10
Non-residential	45	20

A third method of charging is a water charge. Conceptually designed as a charge on consumption, it is an ubiquitous instrument for charging both metered and unmetered water supplies. Besides a connection fee, a water tax, and a water charge, there are minor instruments such a meter rent, a license fee, a watercess, a meter maintenance charge where meters are provided by the water supplying agency, development charges,[11] and fixed charges for capital renovation[12] of the water system which are used for operating water supply systems. Many of the instruments yield little revenue, raising questions about the purpose for which they are being kept on statutes or rules.

WATER PRICING STRUCTURES

Marginal cost pricing is an indispensable aspect of water pricing rules.[13] A basic premise for the creation of autonomous water boards, for instance, was that they will be able to set tariff equal to the marginal cost of providing services to each category of consumers. However, few water supplying entities have control over price fixation. Further, implementing the principle of marginal cost pricing for water has proved to be difficult on account of the problems in using

[11] Development charges are meant to cover the cost of water and sewer lines, and are payable by plot holders. See the Schedule of rates of the Delhi Jal Board.

[12] Fixed charges for capital valuation are a feature of the water charging system in Rajasthan. See the Notification of the Public Health Engineering Department, dated the 28th May, 1998.

[13] American Water Works Association, 1991. Water Rates Manual, Denver, Colovado.

historical accounting data, estimating externalcosts, apportioning joint costs, and addressing equity-related concerns. These problems have impeded the use of marginal cost pricing by water agencies. The American Water Works Association contends in this regard that "the application of the theory of marginal cost pricing to water rates lack considerable practicality". Prices are efficient if they are set equal to the long run marginal cost of water provision.

Marginal cost pricing is an indispensable aspect of water pricing rules.

Water pricing structures in India are extremely complex and often even clumsy. At one level, price structures distinguish between metered connections and unmetered connections as also bulk provision from non-bulk, discrete provision. At another level, price discrimination is common with (i) categories of water users which comprise not only the principal categories of domestic users and non-domestic users but also the assorted categories consisting of water use for washing motor vehicles, cattle sheds, stables, and the like, and (ii) income groups of households, assumption being that low-income households use less quantities of water and high-income households have higher consumption levels. Water pricing may differ with the quality of water supplies, e.g., filtered, unfiltered, tube-well supplies, and the like. Cross-subsidy is central to the principle of price discrimination. As would be seen later, non-domestic users subsidize the domestic sector. High income households using larger quantities of water subsidize low income households, raising questions about the desirability of overloading certain categories of water users.

Water pricing structures are either volumetric or non-volumetric. Volumetric structures rely in one way or another on the volume (quantity) of water, and are used only under conditions of metered supplies of water. Non-volumetric structures are applied to other measures that are proxies to water consumption.

A tariff structure is a set of procedural rules that determine the service conditions and charges for various categories of water users. As stated earlier, charges for water are based on two components: the volume of water consumed, and a set of factors other than water use. Conceptually, it is possible to use one of the two components: thus, water can be charged on the

basis of the value of property (water tax) rather than the level of consumption. Alternatively, water can be charged on the basis of water use multiplied by the unit price. A variant which is more common is to use a mix of the two, i.e., a fixed monthly charge and a charge based on consumption.

Several types of water tariff are in use in Indian cities and towns:

Increasing block tariff (IBT): An increasing block tariff is a series of prices that increase in steps as consumption rises. The key feature of IBT is that it contributes to equity by allowing low-income households to pay lower rates for water than other households. An IBT structure is based on the volumetric component. A water user in a particular category, such as residential, is charged a relatively low price per unit for consumption upto a specific amount. This amount defines the size of the initial block. A user whose consumption exceeds the size of the initial block faces a higher price per unit for the additional consumption until he exhausts the second block, and then a still higher price until reaching the top block in the increasing block structure.[14]

To construct an increasing block tariff, three parameters are needed: (i) the number of blocks, (ii) size of the block in term of water, and (iii) price per unit in each block. The case for IBT is argued on several grounds. First: IBT provides equity as high-income households tend to subsidize the water usage of low-income households. It is based on the argument that the consumption levels of water among high income households is greater, and because a greater percentage of their water use occurs in the higher blocks they pay a higher average price for water. Second: IBT can promote water conservation and sustainable water use. This is because the price in the higher blocks carry high rates and they discourage wasteful water use. Third: an IBT is needed to implement marginal cost principles. It is argued in this regard that because marginal costs are expected to rise with total water use, prices should rise accordingly with individual household use. This has been the main justification for multi-block structures.

[14] In a survey of Asian countries, the Asian Development Bank (ADB) found that 20 out of a sample of 38 countries used increasing block tariff.

Thus, for an increasing and decreasing block tariff structure, a water bill could be calculated as under:

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 in the second block at P_2

Q_3 = maximum amount of water that can be sold in the third block at P_3

If $Q^* < Q_1$, then the consumers bill = $(Q^*) P_1$

If $Q_1 < Q^* < Q_2$, then the consumer water bill = $P_1 Q_1 + (Q^*-Q_1) P_2$

If $Q_1 + Q_2 < Q_3$, then the consumer's water bill = $P_1 Q_1 + P_2 Q_2 + [Q^*-(Q_1+Q_2)] P_3$

Water utilities in Delhi and Hyderabad use block tariffs for domestic and non domestic supplies in combination with other price structures. Delhi uses four blocks of 10 kls each, and the price per unit of water in the terminal block is 8.6 times that in the initial block. Hyderabad also uses four blocks of unequal sizes, and the price per unit of water in the fourth block is set 3.7 times higher than the price in the first block. What is important to note is that the size of the first block – be it 10 kls or 15 kls, is well above what would be a true "lifeline" block to meet basic human needs.[15]

[15] A family of five using 40 litres per capita per day for 30 days requires 6 kls in a month; most first block are higher than this. See Vivian Foster, 2001. "The Design of Pro-Poor Subsides in Urban Water and Sanitation Services in India".mimeo.

Table 2
Increasing Block Tariff for Domestic Use

City	Size of the initial block (kl)	Number of blocks	Water tariff/kl Rs.
(1)	(2)	(3)	(4)
Delhi	<10	4	0.35 paise plus 50% for the first block, rising to Rs.3 plus 50% per kl for the fourth block.
Hyderabad	<15	4	Rs.3.7/1000 ltrs with a minimum of Rs.55, rising to Rs.14 per kl for the fourth block.

Increasing block tariff (IBT) is commonly used in non-domestic metered supplies. Compared with domestic supplies, the price structure for non-domestic supplies is several times higher, although on account of the differences in the size of blocks, comparisons are difficult to arrive. In Delhi, the non-domestic tariff is placed at Rs.5/kl (plus 50 per cent per 1000 litres) up to a ceiling of 50 kls beyond which the tariff rate is doubled. In Hyderabad where the size of the initial block is 50 kl (like Delhi), the water tariff for the initial block is Rs.8/kl.

Uniform volumetric charge: A uniform volumetric charge forms an important part of water price structures in several Indian cities and towns. It is a fixed charge per unit of water consumption, which may vary with the category of users. Thus, water charge may be fixed at Rs.2/kl for domestic users and at another rate for commercial or industrial users. Like the IBT, a uniform tariff is commonly used in such cities as Kanpur, Indore, Surat and Madurai. The main merit of uniform tariff lies in its simplicity. At the same time, it provides no incentive to consumers to effect savings on water use, and may, in fact, violate the principle of water conservation.

Table 3
Uniform Water Tariff

City	Uniform (Rs./kl) tariff	
	Domestic	Industry
(1)	(2)	(3)
Kanpur	2.0	10.0
Indore	2.0	22.0
Surat	2.0	8.0
Madurai	5.0	20.0

Linear water charge: This is a charge which rises with consumption, not in blocks as is the case with IBTs, but every discrete unit of water consumption. Thus, a consumer in Kerala is required to pay a monthly charge of Rs.22 for consumption not exceeding 10kl, the charge increases to Rs.25 for connection level of 11kls, and rises in tandem, until it reaches 100kls for which the charge is Rs.550.

Table 4
Linear Water Charge, Kerala

Kl connection/kl	Charge including meter inspection charge (Rs.)
(1)	(2)
10	22
11	25
12	28
13	31
25	67
50	182
100	550

Two part tariff: A two-part tariff whereunder there is a minimum charge for a fixed quantity of water beyond which the charge may either follow a IBT structure or a uniform tariff. Conceptually, a minimum charge is in the nature of a rent payable by all users having a water connection, whether or not water is used. The minimum charges are so fixed that they are lower than the tariff rate laid down for the initial block, giving advantage of lower tariff to low water consuming households. A box on two-part tariff could be seen in the last section of this study.

Table 5
Two-Part Tariff, Hyderabad

Part	Rs.
(1)	(2)
Part 1	
Minimum/month	55.0
Part 2	
<15 kl	55.0
15-25 kl	3.75/kl
25-500 kl	6.00/kl
>500 kl	14.00//kl

Tariff for unmetered supplies: Price structures commonly used forunmetered supplies are either annual fixed charges as shown below, or charges that vary with the size of water connection. Separate pricing structures are applied tostandpoints connections where such charges are provided for under the rules.

Table 6
Pricing Structures of Unmetered Supplies

City	Annual flat rate (Rs./year)		Annual ferrule based prices		
	Domestic	Industrial	Ferrule size	Domestic	Non-domestic industrial
(1)	(2)	(3)	(4)	(5)	(6)
Vijayawada	480	-			
Surat	-	-	½"	120	
			1"	648	
			$1^{1/2}$"	1,296	
Belgaum	-	-	1"	1,155	10,375
Guwalior	720	1,440			
Nagpur			½"	300	1,200
			¾"	600	2,400
Patiala	20@	60*			
Kanpur++			½"	360-1200	
Gorakhpur			¾"	540-1800	

Note:
Town in Punjab ££ 50-100
* Per tap.
@ For the first tap; for the second and subsequent taps the rate declines.
++ In Kanpur, the annual tariff depends on (a) ferrule and (b) annual rateable value.

The above example demonstrates the complex nature of water price structures in Indian cities and towns. Variations are far too large to be able to test their adequacy with respect to the objectives that underlie in designing pricing systems and structures. Most pricing systems particularly those where water is a municipal responsibility are historically driven with little change having been effected in their format and structure. A typical example here is of the Kolkata Municipal Corporation where users have been divided into 49 categories for the levy of a connection fee. These categories comprise, among others, stables, cooling plants, flushing purposes in the market areas, fire fighting, medical practitioners, film actors and painters, owners of newspapers, estate agents, race horse jockey, persons engaged in profession of loading and unloading and the like. Attempts have, in recent years, been made to simplify the pricing structures and to periodically adjust them in line with costs. In Bangalore, tariffs have been revised six times between 1999-2000; the Bangalore Water Supply and Sewerage Board is

endowed with powers to adjust the tariff if it is warranted on account of an increase in power tariff rates; for adjustment of tariff on account of other factors like salary increase or additional maintenance costs, approval of the government is essential. The Chennai Metropolitan Water Supply and Sewerage Board has also taken steps to simplify the tariff system. Many progressive municipal corporations like Mumbai have also adjusted the tariff structure in order to meet the rising cost of water provision, although it retains the historically complex pricing regime.

Box 3

WATER TARIFFS IN LATIN AMERICAN COUNTRIES

In the systems studied in the present paper, the structure of the domestic water tariff has the following characteristics:

- *There was a fixed minimum volume, which is charged for regardless of whether it is consumed. This is 15 m^3 in most places; in Panama it is 30 m^3 for residential consumers and lower amounts for low-income areas.*
- *The marginal per-meter charge for consumption above the minimum is a progressive function of the total volume consumed. In EI Salvador there were 3 ranges; in Nicaragua there were 9; in Panama 5, and in Venezuela 4. The degree of progressiveness related to volume varies considerably from place to place.*
- *There are regional variations, which aim to capture differences in costs and/or in social conditions. These normally specify a higher tariff for the metropolitan system. In Venezuela there were seven "types" of tariff; in EI Salvador there were two (metropolitan and other); in Nicaragua there were two geographical distinctions within the capital city according to the distance from an historically important source and the regions paid less than the capital; in Panama there were four regional or spatial variants in the tariff.*
- *There was normally a special tariff for "social" cases. Sometimes this only applies to standpipes (EI Salvador); in other cases it applies generally to informal settlements (Managua, Panama, Venezuela).*
- *In all these systems, the coverage of micro metering is relatively low; in some of them, it is simply non-existent. In such conditions, the water company's discretionary estimates of each user's water consumption are crucial to tariff setting. This discretion is often used with the intention of trimming the bill to what the company thinks each part of the market will bear.*

Ian Walker, ibid

3 WATER PRICING EXPERIENCES: A FOUR-CITY SURVEY

INTRODUCTION

Urban water in India is a state subject; the central government's responsibility in respect of water which is defined in River Board Act, 1956 and Inter-State Water Disputes Act, 1956, is limited to the regulation and development of inter-state rivers and river basins and provision of support for such programmes as the accelerated urban water supply, low cost sanitation, and establishment of water monitoring systems. The functions in respect of this sector stand allocated to the Public Health Engineering Department (PHED), e.g., in Rajasthan; a state-level agency with state-wide jurisdiction like the Kerala Water Authority and Delhi Jal Board; state-level parastatals such as those in Karnataka and Uttar Pradesh (Karnataka Water Supply and Sewerage Board and Uttar Pradesh Jal Nigam), metropolitan-level agency like in Bangalore, Chennai and Hyderabad, and municipal corporations and municipalities in such states as Gujarat, Madhya Pradesh and Maharashtra. It is not uncommon to find existence of arrangements wherein capital works are dealt with by a state-level agency (PHED), and the operation and maintenance of water supply systems being conducted by a city-level agency or municipality.

For the reason that urban water is a state subject, institutional arrangements for its provision and management and systems of pricing including price structures vary across states.

Participation of the formal private sector (excluding the production of bottled water) in urban water provision and management is negligible, although several cities in India have

witnessed the emergence of small scale water providers. Small scale providers are engaged in providing water to slum and squatter settlements who are unserved by public supplies.

Box 4

Depending upon the specific situations, various combinations of private sector participation in building, operating, leasing and transferring water resources facilities may be considered.

National Water Policy

Private sector participation will be encouraged in various aspects of planning, investigation, design, construction, development and management of water resources projects for diverse uses, wherever feasible. Private sector participation will help introducing corporate management in improving service efficiency and accountability to users. Depending upon specific situation, various combinations of private sector participation in building, owning, operation, leasing and transferring of water resources facilities will be considered.

Karnataka State Water Policy

Chart 1
Institutional Set-Up for Operating Urban Water Systems, Illustrative

Institution	Example	Spatial Jurisdiction
Public Health Engineering Department (PHED)	Rajasthan	State-wide
State-level parastatal agency	Kerala, Delhi	State-wide UT (excluding NDMC)
Metropolitan agency	Bangalore, Chennai, Hyderabad	Metropolitan-wide
City-level specialized agencies	Uttar Pradesh Jal Sansthans	Lucknow, Varanasi, etc.
Municipal Corporations	Gujarat, Maharashtra	Mumbai, Ahmedabad, etc.
Municipalities (small)	Andhra Pradesh, Uttar Pradesh, Tamil Nadu	

The sample cities namely Agra, Allahabad, Bangalore, Pune, and Vadodara display the same diverse arrangements; the municipal corporations are responsible for water provision in Pune and Vadodara, while this function is discharged by the Uttar Pradesh Jal Sansthan in Agra

and Allahabad. A Water Supply and Sewerage Board provides and maintains the water supply system in Bangalore. It also maintains the responsibility for capital expansion of the system.

Chart 2
Institutional Framework for Water Provision

City	Institution
Agra	Uttar Pradesh Jal Sansthan / Jal Nigam
Allahabad	Uttar Pradesh Jal Sansthan / Jal Nigam
Bangalore	Bangalore Water Supply and Sewerage Board
Pune	Pune Municipal Corporation
Vadodara	Vadodara Municipal Corporation

Water provision comprises (i) capital improvement work and asset creation, (ii) operations and maintenance, and (iii) billing, levy and collection of water charges. Capital improvement works include source development, installation of plants and pumping stations, and laying of the distribution networks and the like. Operations and maintenance functions relate to the running and maintaining the system and ensuring a proper distribution of water. Minor capital works include repairs to the system which also form a part of the operations and maintenance expenditure. Levy and collection of charges for providing access to water and selling water constitute an important responsibility of water supplying entities.

Pune and Vadodara Municipal Corporations and the Bangalore Water Supply and Sewerage Board hold responsibility for all functions relating to the provision of water. On the other hand, the Agra Jal Sansthan and Allahabad Jal Sansthan are responsible for the operations and billing and collection of charges, while the responsibility for capital works rests with the Uttar Pradesh Jal Nigam.

WATER PROVISION: KEY FEATURES

The sources of water supply to the sampled cities comprise rivers in the case of Agra which draws water from the river Yamuna, and Allahabad which also draws water from the same source combined with water from nearly 130 tubewells, dams, and borewells. Agra and Allahabad do not have any assessment of water demand; demand is assumed to be co-terminus with the quantity of water that is released from the system. The Bangalore Water Supply and

Sewerage Board (BWSSB) is able to supply close to 90 per cent of water demand, and Vadadara Municipal Corporation is also reported to be meeting 98 per cent of the city's water requirements. Bangalore is supplied water from Cauvery river, Arkavatty-T.G. Halli and Hessaraghatta rivers with a capacity of 540 mld , 140 mld, and 25 mld respectively. Pune also has three sources namely, Khadkwasala dam, Pavana dam, and Pashan lake each with a capacity of 160 mgd, 5 mgd, and 5 mgd respectively. Absence of data on effective water demand and its sensitivity to price change remains an important handicap in formulating appropriate water pricing policy.

Absence of data on effective water demand and its sensitivity to price change remains an important handicap in formulating appropriate water pricing policy.

Other aspects of water supply relate 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 (few cities would release the entire volume of water held in the system), and on the other hand, between water charged and water released, the former being usually less than the water released on account of firstly, free water that many cities provide, and secondly, distributional losses. In recent years, the quantity of non-revenue water has risen enormously.[16] Key statistics in respect to these features are in table below.

Table 7
Water Provision in Sampled Cities

Features	Agra	Allahabad	Bangalore	Pune
(1)	(2)	(3)	(4)	(5)
Installed capacity (mld)	280	230	705	790
Water released (mld)	250(89%)	210(91%)	645(91%)	NA
Distributional losses (mld)	75(30%)	63(30%)	213(33%)	176(22%)
Free water (mld)	37.5(15%)	58.8(28%)	NA	NA
Water charged	137.5(55%)	117.6(56%)	432(67%)	517(65%)

[16] Non-revenue water comprises free water, distributional losses, and unaccounted for water, an euphusism for water that is drawn illegally.

Survey results show that the distributional losses are, on average, 30 per cent which are roughly twice the norms and standards. Free water supplied via public standposts accounts for 15 per cent in Agra and 28 per cent in Allahabad, whereas in Bangalore, the city corporation buys water from the Bangalore Water Supply and Sewerage Board for free distribution among urban poor communities. The water charged ranges between a low of 55 per cent in Agra and 56 per cent in Allahabad and a high of 65-67 per cent in Bangalore and Pune. These facts, as we show later, have an important bearing on the financial viability of water supplying entities.

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 Agra, of the 110,000 connections, 80 per cent are reported to be non-functional with the result that water billing is done on a minimum annual charge basis. This is a particular characteristic of domestic meters; non-domestic meters are reported to be functional where it has been possible to bill on the basis of water consumed.[17] However, in view of the fact that domestic supplies account for 80 per cent of the total water consumption in Agra which carries a fixed annual charge, stagnancy is observed in the revenues earned from water sales.

The position in Allahabad resembles that in Agra: of the 86,000 water connections only about 55 per cent are metered, and of these, 90 per cent of the metered connections are not in working condition. In other words, 5-6 per cent of the households in Allahabad have working metered connections, who pay according to the tariff fixed for them. In Pune, properties connected to metered connections account for 41 per cent of the total number of properties, and properties with unmetered connections account for 27.7 per cent. A noteworthy feature of Pune Municipal Corporation lies in water connections among slum households.

CHARGING INSTRUMENTS

As indicated in earlier, there are different ways in which water is charged. In Agra and Allahabad, five instruments are used for charging water: a water tax using the annual rateable

[17] It should appear that low tariff is a disincentive to keeping the meters in a working condition. The government requires that water be supplied even when meters are not in a working condition.

value (ARV) as the base; water charge on all metered and unmetered water connections; meter rent on metered water connections; development charge/fee for connections which is akin to a connection charge; and service and supervision charge on all connections. Stand posts are not charged in Agra and Allahabad. An important feature of the charging system in Agra and Allahabad is that the charges discriminate between different categories of consumers: thus, the charges vary between domestic consumers and non-domestic consumers, with non-domestic consumers being further categorized into special industry categories (Rs.15/kl), business (Rs.7.5/kl), government and semi-government institutions (Rs.6.0/kl), army cantonment board (Rs.4.5 kl), and municipal works (Rs.3.0/kl).[18] Charge for special industry is five times that of water for domestic users. Rate structures are given in Table.

Pricing policies usually do not distinguish between access and usage. Subsidies are generally on prices on water, but access charge (at least in some cities) tend to be high as when they are linked to possession of built-up space. As a result, the subsidies are perverse and anti-poor.

The Bangalore Water Supply and Sewerage Board (BWSSB) makes use of a connection fee which is different with floors (high for upper floors in comparison with ground floors), and also with the users where the domestic users pay a lower fee as compared with the non-domestic users; a water consumption charge where domestic consumers in high-rise apartment buildings and government institutions are charged at bulk rates and others according to rates for different slabs; and meter hire charges. In Pune where water provision is the responsibility of Pune Municipal Corporation, water charging instruments comprise a water connection charge, a water tax, a water benefit tax, volumetric water charge, and fixed charges for new unmetered connections in slum settlements. Thus, water is charged in different ways, consisting of (i) a one-time charge, invariably for a connection, (ii) an annual charge or a tax, often leviable on the annual rateable value (ARV), and also a meter rent, leviable generally once a year; and (iii) a water consumption charge collected on a monthly, bi-monthly or an annual basis.

[18] Figures in parenthesis are the per kl charge for each category in Agra.

A water charge from unmetered household is more in the nature of a fee, rather than a charge. It promotes inefficient consumer behavior.

Table 8
Water Connection Charge, Pune

Diameter of the pipe (in inches)	Charges (Rs.) 1999/00
(1)	(2)
0.50	500
0.75	1,000
1.00	2,500
1-2.00	5,000
2-3.00	7,500
3-4.00	10,000

Table 9
Water Connection Charge, Bangalore

Type	Fee (Rs.)
(1)	(2)
Domestic (ground floor)	1,620
Domestic (ground and first floors)	2,220
Domestic (ground and two floors)	2,820 + prorata charges @ Rs.70/sq.meter
Non-domestic	1,050 + provata charges @ Rs.120/sq.meter

Table 10
Annual Water Benefit Tax, Pune (Rs.)

Basic	1996/97	1999/00
(1)	(2)	(3)
Annual rateable value	2%	2%

Table 11
Water Charge for Metered Connections, Pune

Type	1996/97	1999/00
(1)	(2)	(3)
Domestic	2.00	2.50
Non-domestic	10.00	16.00

Table 12
Annual Water Charge for Slum Settlements, Pune

Year	Rs.
(1)	(2)
1996/97	175.0
1997/00	250.0

Table 13
Volumetric Domestic Water Tariffs, Bangalore

Consumption stab (kl)	Tariff Rs./kl*
(1)	(2)
<15	5.00
15-25	6.50
25-50	10.00
50-75	25.00
75-100	30.00
>100	30.00

* A minimum payment of Rs.75/month.
* A minimum payment of Rs.75/month for each apartment in high rise building.

Table 14
Water Charges for Domestic Use in Agra and Allahabad (Rs.)

Annual rateable value	Size of meter connection					
	15 mm		20 mm		25 mm	
	Agra	Allahabad	Agra	Allahabad	Agra	Allahabad
(1)	(2)	(3)	(4)	(5)	(6)	(7)
<360	360	480	540	720	840	1080
360-2000	720	900	1080	1080	1620	1200
2001-3500	1080	1080	1620	1200	2400	1680
3501-5000	1380	1200	2040	1680	3060	2040
>5000	1800	1680	2700	1800	3600	2400

STRUCTURE OF COST

Water provision which includes production and distribution of water entails costs. These comprise, in the main, establishment cost which includes salaries and wages; electricity charges; chemicals for treatment of water; general repairs and maintenance of plant and machinery; cost of raw water where applicable; and interest payments. For the reason that water is drawn from

different sources and distances, the structure of costs varies between different cities, often even widely. We give below the structure of costs for five sample cities.

Table 15
Structure of Cost Incurred on Water Provision, Per cent of Total Cost, 1995/96

Structure	Agra	Allahabad	Bangalore	Pune	Vadodara
(1)	(2)	(3)	(4)	(5)	(6)
Establishment	50.2	65.7	17.7	22.1	18.0
Electricity	18.8	4.0	56.9	44.6	20.4
Chemicals	13.7	10.4	-	2.2	-
General repairs	4.3	8.5	7.8	10.0	29.8
Raw water	-	-	-	16.4	-
Interest payments	-	-	17.6	4.6	31.4
Others	13.1	11.3	-	-	0.4
Total	100.0	100.0	100.0	100.0	100.0

Table 16
Structure of Cost Incurred on Water Provision, Per cent of Total Cost, 1999/00

Structure	Agra	Allahabad	Bangalore	Pune	Vadodara
(1)	(2)	(3)	(4)	(5)	(6)
Establishment	48.6	78.7	20.1	19.0	24.2
Electricity	14.8	1.2	59.5	47.8	48.5
Chemicals	19.5	4.5	-	1.9	-
General repairs	2.3	9.6	7.6	8.8	13.9
Raw water	-	-	-	16.3	-
Interest payments	-	-	12.8	6.2	13.3
Others	14.9	6.1	-	-	0.1
Total	100.0	100.0	100.0	100.0	100.0

Figures show a great heterogeneity in the structure of cost of water provision which may reflect the joint effect of local factors such as geography and system and operational inefficiencies. In Agra and Allahabad, establishment costs account for anywhere between 50-70 per cent of the total cost; the same, however, is only about 17-20 per cent in Bangalore, Pune, and Vadodara.[19] Electricity costs are a major cost in Bangalore, Pune and Vadodara, and negligible in Allahabad. Electricity has become an important component of cost in the production and distribution of water. Energy costs are particularly high in Bangalore on account

[19] Data on the quantity of electricity used for water production and distribution are not known. In France, with centralized treatment and distribution, per cubic mt. consumption of energy is 0.5 to 0.6 kw.

of sources that are distant and energy is spent on abstraction, diversion, and transport. Also, electricity costs are exogenous to the water supplying entities.[20]

Energy costs reflect the three dimensional arrangements of water source, reservoirs and treatment plants in a given topography, and abstraction, and recharge.

We show below the per unit costs of water production and distribution. It shows the per unit (kl) cost to be varying between a low of Rs.3.22 in Pune, Rs.2.67 in Allahabad, and Rs.3.69 in Agra, and a high of Rs.12.98 in Bangalore. The per unit costs for Agra and Allahabad are inclusive of unpaid electricity charges. Of these, as shown earlier, electricity is the principal cost item in Bangalore and Pune, and establishment being the main cost item in Agra and Allahabad. Most costs on a unit basis have risen over time, with the rates of rise in electricity costs being greater compared to other cost items.

Table 17
Per Unit/kl Structure of Cost in Water Provision, 1999/00 (Rs.)

Structure	Agra	Allahabad	Bangalore	Pune
(1)	(2)	(3)	(4)	(5)
Establishment	1.54	1.66	2.61	0.61
Electricity	0.47	0.03	7.72	1.54
Chemicals	0.62	0.10	-	0.06
General repairs	0.07	0.20	0.99	0.28
Raw water	-	-	-	0.53
Interest payments	-	-	1.66	0.20
Others	0.47	0.13	-	-
Subtotal	3.17	2.11	12.98	3.22
Total (including outstanding electricity charges)	3.69	2.67	12.98	3.22
Water installed capacity (mld)	280	230	705	790

[20] Low component of electricity charges in Agra and Allahabad may be explained, in part, by non-payment of electricity charges by the two corporations, and in part, by easy access to water from river sources like Yamuna.

RECOVERIES FROM THE WATER SECTOR

The instruments of water charges and charging methods have been stated above. The water supplying entities recover the cost incurred on water provision in different ways including a connection charge, water tax, fees, charges etc. The recoveries in the case of the sampled cities are shown in the following Table.

Table 18
Water Account Recoveries

Recoveries	1995/96 per unit/kl, Rs.				1999/00 per unit/kl, Rs.			
	Agra	Allahabad	Bangalore	Pune	Agra	Allahabad	Bangalore	Pune
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Sale of water	1.61	0.94	7.75	1.56	2.94	1.90	13.29	2.27
Other receipts	0.13	0.17	0.30	0.05	0.16	0.38	0.59	0.12
Total	1.74	1.11	8.04	1.61	3.10	2.28	13.79	2.40

Per unit/kl recoveries from the sale of water are Rs.3.1 in Agra, Rs.2.28 in Allahabad, Rs.13.79 in Bangalore, and Rs.2.40 in Pune. Over the four-year period, per unit recoveries have risen at an annual rate ranging between 9.9 per cent in the case of Pune, 13.5 per cent in Bangalore, and 18.1 and 14.5 per cent in the case of Allahabad and Agra respectively. An important point to note is that the recovery from water sales has risen at a faster rate over the 1995/96 to 1999/00 period compared to expenditure on water provision, perhaps signaling that price adjustments have found acceptance as a necessary tool for achieving financial viability among water supplying entities.

Price of water as manifest in recoveries, however, does not cover the cost incurred in water provision in Agra, Pune, and Vadodara. In these three cities, the price is able to cover 97.9 per cent, 48.3 per cent, and 74.4 per cent of the cost respectively in Agra, Vadodara, and Pune. On a per capita basis, annual losses are Rs.2.69 in Agra, Rs.64.5 in Pune, and Rs.121.1 in Vadodara. Although the losses have declined, the position is still unsustainable.

Table 19
Water Price – Cost Linkage
(expressed in per capita Rs. terms)

Cities	Recoveries from sale of water		Cost incurred on water provision		Recoveries as a % water provision	
	1995/96	1999/00	1995/96	1999/00	1995/96	1999/00
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Agra	65.98	128.46	84.02	131.15	78.53	97.94
Allahabad	52.75	101.45	63.11	93.91	83.59	108.03
Bangalore	349.58	537.11	387.07	505.35	90.32	106.29
Pune	146.40	187.63	158.24	252.15	92.52	74.41
Vadodara	61.63	112.90	187.00	233.91	32.95	48.26

* Unpaid dues for electricity not included in costs.

Table 20
Water Price – Cost Linkage
(expressed in per unit/kl Rs. terms)

Cities	Recoveries from sale of water		Cost incurred on water provision		Recoveries as a % water provision	
	1995/96	1999/00	1995/96	1999/00	1995/96	1999/00
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Agra	1.74	3.10	3.04	3.17	57.2	97.8
Allahabad	1.11	2.28	1.86	2.11	59.7	108.0
Bangalore	8.04	13.79	8.91	12.98	90.2	106.2
Pune	1.61	2.40	1.74	3.22	92.5	74.5

Box 5

What is capacity to pay for urban water?

A household in France spends approximately 1.4 per cent of income or 5 days of income on water. It is nearly 1 euro/day for consumption level of 120 m^3/year or 10 m^3/month.

In India, below an income level of Rs.2,000/month, the per cent of income for water expenses would be significantly higher than in the developing countries. In Rajkot, on the basis of an average monthly income of Rs.5,000, the costs are approximately 4 per cent of income, with an average consumption of 65 lpcd. In Vijawada, the water budget is 5.2 per cent and the average consumption is 100 lpcd.

Alain L Dangeard
Dematedee, mimeo, undated.

A few concluding observations are offered at this stage.

❶ Urban water is charged in many ways – a connection charge is a one-time levy; a tax and other rents like meter rents are payable annually, while other consumption charged are either paid every month or at a pre-determined time. For this reason, the accounting of revenues of water supplying entities assumes a complex character, particularly when the life of the water system is unstated or unspecified.

❷ On the cost structure, fixed costs are shown in the form of interest payments or debt charges for those cases where a water supply system has been upgraded or augmented. Thus, in Agra and Allahabad which have not added any new capacity, these do not form a constituent of cost. Further, a perusal of cost structure shows that, on the one hand, there are non-discretionary expenditures in the form of salary payments and interest and debt charges, and, on the other hand, it consists of electricity charges that are determined exorgeneosly.

❸ With the exception of Banglore where tariff revisions have led to a marginal surplus, other water supplying entities run into losses with the usual consequences for service delivery, expansion of water networks, and the like. It means that the most basic requirement of any water tariff, i.e., to raise enough revenues to cover the cost of service provision is not met in most India cities. Also, since most households in cities which use an IBT fall into the first or second block, end up receiving large subsidy on water.

❹ High proportion of non-revenue water is a common feature in India cities and towns. It should be evident that to the extent it can not be brought down, non-revenue water will impede any attempt to rationalize water tariff structures.

4 WATER PRICING: SETTING THE STAGE FOR REFORMS

A FRAMEWORK FOR REFORMS

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,[21] even when its adverse consequences are widely recognized. First: 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. Second: cheaper services encourage those with easy access to use them excessively. Third: such policies adversely affect distribution, as low–income and poor households pay a higher price than other higher income households.

Financial viability and tariff-setting are linked throughout the country's water sector. Current approach to tariff-setting has resulted in tariff levels often far below the basic operation and maintenance levels, let alone full cost recovery. Tariff reforms are also constrained by lack of rational tariff structures which match the costs and charges in relation to the incidence of benefits; low current tariff levels in most cities make a transition to full cost recovery politically difficult, due to the high initial revision requirements; lack of customer consultation in service planning which is needed to link investment decisions to effective demand; inadequate accounting systems which do not make it possible to assess the real costs of services; and lack of a system of indexation which would enable revenues to keep up with the rising cost of inputs.

[21] The Bangalore Water Supply and Sewerage Board recently estimated the long–run marginal cost of water to be supplied by Cauvery at Rs. 43/kl. As against this, the weighted monthly average tariff is about Rs.14.

The existing pricing system and structures are thus inadequate and unsustainable. Price reform under these circumstances would seem not only desirable but essential. An efficient system of urban infrastructural services is crucial for the economy of cities and national economy. Cities hold the key to economic growth. The competitiveness of nations, as evidence from many developing countries shows, depends on the competitiveness of cities. Price reform of urban water and city bus transport is thus a crucial agenda. The issue is *what should prices reform in respect of these two services consist of?*

Past work in India on water pricing is limited and focused on (a) the adequacy of water tariff, and (b) issue of leakages. In the case of water, the merits of intermittent supply versus a regular supply have also been examined alongwith the cost of metering. An upward revision of water tariff to the point of full cost recovery and an indexation mechanism to allow for general price increase, reduction of leakages, change over from unmetered to metered supplies in the case of urban water, and greater efficiency in revenue collection have been highlighted in the agenda for improving the operations of water services. These are important components in the financial viability of urban water utilities.

The limited analysis of the finance data of urban water utilities undertaken for this study has discerned several areas which, in a way, point to some directions in developing a framework for reform. Five areas are underlined here. The first is of primary importance and relates to the relevance and effectiveness of the existing pricing system and structures. The pricing structures especially of urban water are in several parts which are differentiated according to the nature of users, quality, quantity, and several other factors. Apart from the clumsiness of structures which was demonstrated by giving an example from the schedule of water rates of the Kolkata Municipal Corporation, what tariff rate is appropriate for which part or sub–part, and which charging instrument is appropriate for which part stands neglected in most earlier work on pricing matters. It needs to be emphasized that the existing pricing structures do not make it possible to assess if they can achieve full cost recovery or even partial cost recovery. The pricing structures are obsolete, and need to be replaced with structures that are simple, easy to apply, and transparent.

Current pricing structures are obsolete, and need to be replaced with structures that are simple, easy to apply, and transparent.

A second issue which has received surprisingly scant attention is concerned with the user or consumer base which is limited, which is narrow, and which is possibly over–exploited. Only 30–40% of urban households pay for water and other similar services; and if this proportion is held in other urban areas as indeed appears to be the case, the likelihood of any price reform to achieve financial sufficiency and economic efficiency would be dim.

Expanding the user base is an important component of water reform agenda.

A third issue is linked to the unbalanced revenue base of water utilities, with much of the burden currently being borne by the non–domestic sector. The finance data of urban water utilities has clearly brought out the extent of cross–subsidies that exist in the water sector. It has two adverse impacts: (a) the non–domestic users, mainly industry and commerce, pass on the costs associated with higher tariff to domestic users in the form of higher prices of their products, (b) lower prices for households mean larger wastage of water. It is imperative for water utilities to move towards a more rational pricing structure which may mean price increases for the domestic users and price decreases for the non–domestic sector. A rational structure may yield a positive net benefit as the non–domestic users may be expected to pass on the cost savings associated with lower water prices in the form of lower output prices. Fourth: a necessary condition for establishing efficient prices for goods such as water is the complete accounting of their costs. Although this study has utilized the finance data, there exists uncertainty whether all costs attributable to service have been accounted for. Doubts arise on account of the indivisibilities of cost components.

Finally, there is the complex issue of metering of urban water. While the merit of metering is accepted as it is said to allow households to determine how much water they are prepared to pay for, the issue is: how much difference does metering make to revenues in practice. In countries where these have been empirically examined, metering is said to have

reduced consumption among some, relatively better-off households; in others, particularly low-income groups where consumption levels were low, consumption registered an increase reflecting the unmet demand of the period when water was unmetered and rationed. Experiences of other countries suggest that metering should form an integral part of the overall price reform agenda, rather than being taken up in isolation.

Metering should be promoted on the basis of fairness and as a means of improving operating efficiency and lowering costs.

INTERNATIONAL PRACTICES

Examples of "best practice" in this sphere are fewer than in other areas such as decentralization and private sector participation. From the available limited evidence, there appears to be some attempt at rationalization of tariffs in developing countries. Protection of the poor has been attempted through a life-line block which is cross-subsidized by other higher consumption blocks. In order to overcome the problem of high rate revisions required for full cost recovery, a phased introduction of full cost pricing is adopted as was done in Guinea. The service delivery in Guinea was a commercial operation exercised by a private operator. Politically feasible increases in tariffs were made possible through external credit which was phased, in order to recover full costs from customers over a pre-determined period.

Innovative examples of infrastructure charges for provision of block level distribution and collection networks are available from Brazil, where under a condominial financing system, "households pay for the on-lot costs, block pay for the block sewers and decide what level of service they want from these". Policymakers in Brazil are considering developing water markets to allocate water. Water markets are uncommon in Brazil, but it has existed in Cariri region. While the Cariri market is a small isolated system, it provides indications of the value of water, the possibilities of allocating and enforcing water rights, and the willingness of water users to pay and cooperate to assure a secure water supply.

A World Bank study of water pricing experiences classifies countries as high, medium, and low according to what it calls a "water pricing progress index". It prepared the index using two criteria, viz., current pricing practices, and current mode of funding.[22] Those countries who used some economic pricing method or at the very least, recovered full operation and maintenance costs and a portion of capital and maintenance costs and a portion of capital costs from users were grouped in high progress category. Countries which financed water systems with governmental resources were categorized as low progress countries. The findings of the study are shown in table below.

Chart 3
Relationship between Pricing Reforms and Selected Country Characteristics

	Rank	High	Medium	Low
		Gross National Product		
WPPI	High	Australia, France, New Zealand, Spain, United States	Botswana, Namibia	
	Medium	Israel, Italy, United Kingdom	Brazil, Portugal, Tunisia	Madagascar
	Low	Canada		India, Pakistan, Tanzania, Uganda
		Water Availability		
WPPI	High	Australia, Botswana, New Zealand	France, Namibia, Spain, United States	
	Medium	Brazil	Italy, Portugal, United Kingdom, Madagascar	Israel, Tunisia
	Low	Canada	India, Pakistan, Tanzania, Uganda	
		Budget Deficit		
WPPI	High	Australia, France, Namibia, Spain, United States	Brazil	Botswana, New Zealand
	Medium	Israel, Italy, Portugal, Tunisia, Madagascar	United Kingdom	
	Low	Canada, India, Pakistan, Tanzania, Uganda		

Other overseas experiences suggest that, in some circumstances, it is possible to charge for actual usage at levels higher than at the individual household. In others, participation of stakeholders to decide on standards and investment priorities in relation to cost and prices is found to be useful in water resource planning. In recent concession contracts for water services,

[22] The World Bank, 1997. Water Pricing Experiences: An International Perspective. World Bank Technical Paper No.386.

participation of the private sector has helped to also reduce the average tariff levels. This is largely due to the significant efficiencyimprovements which have been possible with the entry of the private sector. In Manila, the tariff proposed by the winning bid for half of the city was almost a fourth of the existing tariff. This clearly highlights the link between efficiency improvements and financial viability with acceptable tariff levels, all three criteria of which much be satisfied for the tariff structure to be effective.

OBJECTIVES OF WATER PRICING

Setting water tariffs requires striking a balance between four main objectives.[23]

Revenue sufficiency: From the point of view of water supplying entities, the main purpose of tariff is cost recovery. The revenue from water users should be sufficient to pay the operation and maintenance cost of water utility's operations, to repay loans undertaken to replace and expand the capital stock, and to provide a return on capital at risk. The revenue stream must thus be adequate to attract both equity capital and debt financing. Ideally the revenue stream should be relatively stable and not cause cash flow or financing difficulties for the utility.

Economic efficiency: Economic efficiency requires that prices be set to ensure that consumers face the avoidable costs of their decisions. In other words, water prices should signal to consumers the financial and other costs that their decisions to use water impose on the rest of the society. From an economic efficiency perspective, a tariff should create incentives that ensure, for a given water supply cost, that users obtain the largest possible aggregate benefits. This means that volumetric water charges should be set equal to the marginal cost of supplying water. In practice it is commonly assumed that the marginal cost of supplying water can be approximated by the average incremental cost (AIC), i.e., the average cost of water from the next water capacity expansion project. Alternatively, the AIC of additional water may be the unit cost of reducing unaccounted-for-water (UFW).

[23] Adopted from Dale Whittington, 2002. Municipal Water Pricing: Getting Started on Tariff Reforms and Subsidies in South Asia. National Institute of Public Finance and Policy, New Delhi.

Equity: Equity means that the water tariff treats similar customers equally, and that customers in different situations are not treated the same. This would usually be interpreted as requiring users to pay monthly water bills that are proportionate to the costs they impose on the utility by their water use.

Poverty alleviation: Water services are often seen as a "basic right" and their access as necessary regardless of whether or not people can pay. This objective leads many people to recommend that water services be provided free, at least to the poor. Providing water free through private connections can conflict with the objectives of cost recovery and efficient water use.

TARIFF RESTRUCTURING

Given the objectives, the first step in rationalizing tariff structures is to establish a link between tariff and cost by introducing separate charges, for—

(i) connections: (i) a connection fee to cover the direct cost of connecting to the municipal mains; in case of a multistoreyed system at the block level, it may include the cost of on-site networks; and (ii) a charge for management, billing and metering, which may cover the fixed cost of maintaining the connection;

(ii) distribution systems: an infrastructure development charge to cover the cost of developing or augmenting the secondary and tertiary distribution systems;

(iii) consumption: (i) a consumption charge for water, on a volumetric basis to cover the cost of creating and maintaining water abstraction capacity and the primary distribution system, as well as the economic costs of water procurement and operating cost of supply. All other charges are of no revenue significance.

The key to pricing, however, is consumption charge for water. What charging method would ensure compatibility with the objectives? It is necessary to underscore the role of the

'equity' objectives in water tariff fixation. Secondly acceptable tariffs require that adequate service levels are provided and maintained for the poor within their affordability limits. Typically, it has meant fixing lower than optimal levels of pricing, ignoring the financial viability considerations. Instead of lower tariffs, it is useful to base tariff levels on financial viability criterion and then managing affordability issues through mechanisms such as—

(i) a lifeline block in the tariff structure for consumption-related tariff;

(ii) providing explicit subsidies to the poorer sections for connection and infrastructure development charges. Under the existing system, subsidies for slum settlements and special social groups are available from the state and central government Plan allocations. It is essential that such subsidies are made explicit, pooled and allocated in relation to the overall size of the problem;

(iii) developing and using appropriate credit systems to spread the payment for infrastructure and connection charges over time;

(iv) separation of water supply accounts and budgets and a complete assessment and valuation of all its assets. Such provisions already exist in Maharashtra as per the Section 95 of the Maharashtra Amendment pursuant to the 74th Constitution Amendment Act;

(v) clear guidelines on the cost to be included in determining the different charges;

(vi) measurement of unaccounted for water and collection efficiency of different charges with a clear indication of their (i) impact on average tariff levels, and (ii) measures to reduce inefficiencies; and

(vii) indexation of average tariff.

An important decision in respect of tariff restructuring is to make a choice between a two-part tariff and an incremental block tariff (IBT) structure. The IBT structure has been questioned on the ground that it gives households with private connections much more water than what is needed at a very low price.[24] To the extent initial block can be fixed at levels which correspond to a level equal to a household's essential water needs, an IBT structure is an effective method of water charging.

Financial viability requires that, over time, revenues equal expenditure, both operating and capital. It is essential to recognize and reduce inefficiencies related to excess manpower, poor collection of revenues, and high levels of water leakages in the system. It is imperative that strong incentives are introduced to reduce these inefficiencies. A critical aspect in sustaining financial viability over time is to introduce indexation of charges so that the revenues keep up with increases in cost of those inputs which are beyond the utility's control. In addition, it is important to structure tariffs in ways which do not create disincentives for metering. One alternative would be to introduce group meters in specific settlements. It is likely that, given the historically low level of tariffs, many cities will be able to achieve financial viability only over time. Such a time frame needs to be determined and, in the interim, subsidies provided to support the transition process as is implied in the City Challenge Fund (CCF).

Another important aspect concerns the possible externalities from water and sewerage services. The environmental and health benefits, especially from improved water quality and sewage collection and treatment, generally accrue to larger groups and are more public in nature. Subsidies may be necessary to achieve these benefits. Any such subsidies should be internalized at appropriate levels, such as a city, and group of cities. Ideally, these groups need to jointly decide on appropriate service levels, investment and resultant tariff levels. This requires that the level of subsidies be predictable and allocated in a transparent manner.

The need for price reform in water is evident and compelling. The implications of water underpricing are well-understood. But more needs to be learned about the structure and

[24] Of the 17 water utilities in a ADB's data set that use increasing block structures, only two had a first block of 4-5 m3 per month or less. Most of the others had initial blocks of 15 m3/month or more.

distribution of demand, the cost structure, and the magnitude of external costs associated with urban water supply. This is a perspective that goes beyond pricing of services.

Box 6

TWO-PART TARIFFS AND BENEFITS FOR THE POOR

Water is a peculiar good in that it is essential to life. Therefore the utility it contributes at low levels of consumption is very high. But it has many non-essential uses, and at high levels of consumption the contribution to utility of the marginal unit may be very low. Demand is inelastic at low levels of consumption but very elastic at high level.[a] *This has clear implications for the pricing of water. Figure B12.1.4.1 develops a simple example with one rich (R) and one poor (P) consumer. The rich consumer has income level Y_R and the poor Y_P. Y can be measured in terms of time available, with the assumption that time can be translated into income.*[b] *Indifference curves are drawn for each type, showing the combination of water and consumption of other goods O, which would keep the consumer at the same level of utility. The indifference U_O is the reservation level of utility. It originates on the Y-axis when other goods consumption O equals income. Initially the indifference curve is steep, the consumer is willing to give up large amounts of other goods when water consumption is low. The curve also approaches the X-axis asymptotically since water consumption can be very large at a low price in terms of other goods foregone.*

Water is priced through a two-part tariff consisting of a fixed payment (F), which entails some free units of consumption, and a price per unit of additional consumption of water, he is able to reach a level of utility higher than his reservation level. Now suppose in period 1 there is no charge for the poor consumer, but he is subject to rationing of water. The implicit cost of queuing, etc. he is subject to, F_P^1, drives him to his reservation utility U_P^O. This F_P^1, is a net welfare loss since it does not go to the service provider but is a real coping for the poor consumer.

The rich consumer is charged a fixed cost F_P^1, which covers consumption of some water units along the horizontal section, and pays a low price P_1 per unit of additional water he consumes. The budget line gives the rate at which he can convert other goods consumption of $Y - F$ into extra units of water. The fixed cost is measured on his reservation utility curve and the price line starts from the point on U_O^R giving free consumption at the fixed cost charged. His water consumption is at Q_R^1 where his budget line is tangent to his indifference curve. A fixed cost that does not extract all surplus and his ability to adjust his commodity consumption at the margin take him above his reservation utility U_O^R. Since he is on the elastic portion of his demand curve, he consumes a large amount of water but derives a low utility from the marginal unit.

a. *Samuelson in his famous textbook had used this paradox to illustrate the difference between total and marginal utility. He pointed out that diamonds, which are not essential to life, have a very high price, but water whose contribution to total utility is much higher has a very low price. The reason is that water is supplied to the point where its marginal utility is very low. Like air it is almost a free good. But in modern communities delivering potable water to every doorstep is quite expensive, and costs have to be recovered. See Morris (2001) for an earlier treatment which does not, however, analyze two part tariffs.*

b. *T. C. Anant made the point that the poor may not be able to convert time into income. Indeed this belief is the reason that queuing is used as a means of targeting the consumption of the poor. But the poor cannot afford to be unemployed and often have multi-activity going on so that there is an income loss in queuing. Since water is essential to life high time costs of collecting it can have very large opportunity costs. I know of one poor family who, since it took a large amount of time to collect their daily requirement of water, and the mother had a job, withdrew their daughter from school to perform the task.*

Contd...

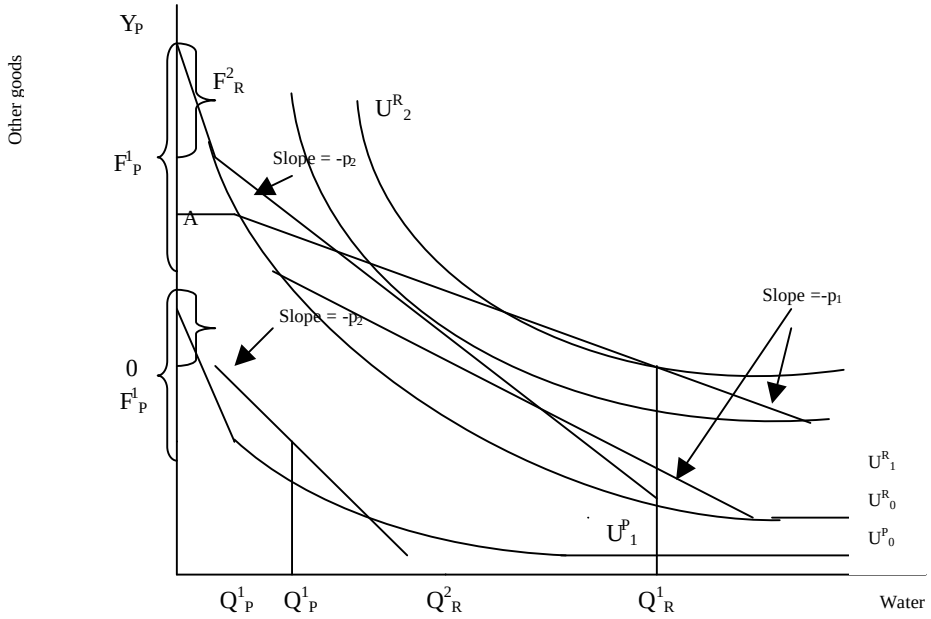

Figure. Price Reform and Welfare

Now consider a price reform in period 2 where both consumers are charged a higher unit volume price P_2, but lower fixed costs than they were paying in period 1. Thus the rich consumer pays FR2 > FP2. The consumption of the poor consumer goes up QP2, but he remains on the inelastic part of his demand curve, and he reaches a higher level of utility, U1P. Although he is paying a small fixed cost, lower than his earlier coping costs, his choice of additional units of consumption is voluntary, and takes him to a higher indifference curve. A French student of BMC's water supply reported that in the current rationing regime consumption is taken to be 240 lpcd for the rich consumer and 45 lpcd for slums.[c] The changes proposed would improve water equity and the welfare of the poor.

The consumption of the rich consumer falls much more. But since he was on the elastic part of his demand curve, the total utility loss from the marginal units of consumption is not very high. A high fixed and low volume charge turns all rich consumers into high volume consumers. If the fixed cost he was paying earlier was high, he may continue to be on the same utility level U_1^R. If the fixed cost he was paying earlier was lower at Y_R^A ($<F_R^1$) his utility level may fall from U_2^R to U_1^R, after the change, but he would continue to be above his reservation utility.

Moreover, social welfare will rise since the consumption of the rich falls about double the rise in the consumption of the poor. Assume that there are constrains in expanding the supply of water, and that earlier some poor were uncovered. Now enough water is released to cover two poor consumers. The move is revenue enhancing, since a higher price is paid per unit of water, and the fall in fixed costs charged

Contd....

the rich consumers is more than made up by the smaller fixed cost now actually paid by double the number of poor consumers. Although in order to simplify the diagram we kept P2 the same for rich and poor consumers, the poor could be charged a lower price that varies with the consumption slab. Such differential pricing is common. If the coping strategies of the poor earlier included puncturing pipes, and stealing water, these changes will reduce such wastage, and further improve revenues for the water suppliers.

c. Presentation at IGIDR by a French engineer from Cerna in 2002.

India Infrastructure Report, 2004

GLOSSARY

Average incremental cost (AIC): The average cost of future water supply projects. The average incremental costs can be calculated by dividing the discounted value of future supply costs by the (similarly discounted) amount of additional water.

Depreciation: A reduction in the value of an asset through wear and tear. The consumption of capital assets is one of the costs in generating revenues, and should therefore be taken into account when calculating total costs.

Discounting: A deduction from face value of future costs and revenues. Fundamentally, future costs are less burdensome than present costs, and present benefits (or revenues) are preferable to future benefits (or revenues). It is therefore necessary to adjust for these "time preferences" in order to obtain a true present value.

Environmental sustainability: The need to follow a path of development that is environmentally sustainable, in which the scarcity of water resources is recognized.

Financial viability: The need for water service authorities to recover from water users all the costs associated with the provision of water services, including the cost of capital, refurbishment and replacement.

Marginal cost pricing: Setting the unit price of all goods equal to the cost of producing and supplying the next or last unit.

Social equity: The need to redress the imbalances of the past with respect to the provision of adequate access to water supply services.

Water supplying entities: Refers to municipal authorities, state-level and city-level parastatal boards, Public Health Departments, and who have either the statutory responsibility for the provision of water services or are de facto providers of water.

REFERENCES

Charles T. Andrews and Cesar E. Yniguez, 2004. *Water in Asian Cities*, Asian Development Bank, Manila.

Asian Development Bank. *Water for All*, The Water Policy of the Asian Development Bank, Manila.

John J. Boland and Dale Whittington. *"The Political Economy of Water Tariff Design in Developing Countries: Increasing Block Tariffs versus Uniform Price with Rebate"*, in Ariel Dinar. ibid.

Penelope J. Brook and Alain Locussol. *"Easing Tariff Increases: Financing the Transition to Cost-Recovering Water Tariffs in Guinea"*. Mimeo (OBA Book Homepage).

Ariel Dinar, 2000. *The Political Economy of Water Pricing Reforms.* Oxford University Press, Washington D. C.

Vivian Foster et.al. *"Water Tariffs and Subsides in South Asia: Can Subsidies be better Targeted"*. mimeo. undated.

Government of India, 2002. *National Water Policy*, New Delhi.

Infrastructure Development Finance Company, 2004. *India Infrastructure Report.* 3i Network. Oxford University Press, New Delhi.

Planning Commission, 2002. *Tenth Five Year Plan, 2002-2007*, New Delhi.

P. S. Rana. *"Pricing of water for Sustainability"*. mimeo. undated.
Ian Walker, et.al. Pricing, Subsidies and the Poor. Demand for Improved Water Services in Central America. mimeo. undated.

Dale Whittington, 2002. *Municipal Water Pricing: Getting Started on Tariff Reforms and Subsidies in South Asia.* National Institute of Public Finance and Policy, New Delhi. mimeo.

The World Bank, 1997. *Water Pricing Experiences: An International Perspective*. World Bank Technical Paper No.386, Washington D. C.

Marie-Helene Zerah, 2000. *Water: Unreliable Supply in Delhi*. Centre De Sciences Humains, New Delhi.