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Paul D Madhale
Research Scholar, Shivaji
University, Kolhapur

DM Kumthekar
Professor, VPIMSR, Sangli

Water Pricing Experiences in India: An Insight

Paul D Madhale, DM Kumthekar

Abstract

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. 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.

A few concluding observations are offered

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 charges 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.

With the exception of Bangalore 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 Indian cities.

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

Keywords: Water pricing, water tariff, revenue water

1. 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. 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 un served by public supplies.

Correspondence
Paul D Madhale
Research Scholar, Shivaji
University, Kolhapur

Table 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,	Metropolitan-wide
City-level specialized agencies	Uttar Pradesh Jal	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.

Table 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 tube wells, dams, and bore wells. 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 Vadodara 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, Khadakwasla 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.

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. Key statistics in respect to these features are in table below.

Table 3: 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%)

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 stand posts 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. 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 rate able 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). Charge for special industry is five times that of water for domestic users. Rate structures are given in Table.

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 livable on the annual rate able value (ARV), and also a meter rent, livable generally once a year; and (iii) a water consumption charge collected on a monthly, bi-monthly or an annual basis.

Table 4: 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 5: 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 6: Annual Water Benefit Tax, Pune (Rs.)

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

Table 7: 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 8: Annual Water Charge for Slum Settlements, Pune

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

Table 9: 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 10: Water Charges for Domestic Use in Agra and Allahabad (Rs.)

Annual rate able 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 11: Structure of Cost Incurred on Water Provision, Per cent of Total Cost, 1995/96

Structure (1)	Agra (2)	Allahabad (3)	Bangalore (4)	Pune (5)	Vadodara (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 12: Structure of Cost Incurred on Water Provision, Per cent of Total Cost, 1999/00

Structure (1)	Agra (2)	Allahabad (3)	Bangalore (4)	Pune (5)	Vadodara (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. 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 of sources that are distant and energy is spent on abstraction, diversion, and transport. Also, electricity costs are exogenous to the water supplying entities.

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

Structure (1)	Agra (2)	Allahabad (3)	Bangalore (4)	Pune (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

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 14: Water Account Recoveries

Recoveries (1)	1995/96 per unit/kl, Rs				1999/00 per unit/kl, Rs			
	Agra (2)	Allahabad (3)	Bangalore (4)	Pune (5)	Agra (6)	Allahabad (7)	Bangalore (8)	Pune (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 15: 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)	(6)	(7)	(4)	(5)
Agra	65.98	128.46	78.53	97.94	84.02	131.15
Allahabad	52.75	101.45	83.59	108.03	63.11	93.91
Bangalore	349.58	537.11	90.32	106.29	387.07	505.35
Pune	146.40	187.63	92.52	74.41	158.24	252.15
Vadodara	61.63	112.90	32.95	48.26	187.00	233.91

* Unpaid dues for electricity not included in costs.

Table 16: 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

Conclusions

A few concluding observations are offered at this stage.

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