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Review of current practices in determining user charges and incorporation of economic principles of pricing of urban water supply

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CHAPTER 1 Introduction

The Urban Water Supply and Sanitation (UWSS) sector in India is characterized by inefficient delivery of services (including high-unaccounted water and intermittent water supplies) and inadequate coverage with piped water supply, especially for the urban poor. In addition poor cost recovery has rendered most of the water utilities in the country as financially unsustainable. One of the reasons for such a scenario is that water utilities in India are not operated independently and are not managed on principles of accountability and transparency, and are loosely regulated. An equally important factor is that prices for water are not determined based on economic principles and are based on socio-political considerations rather than costs involved in producing and delivering water. Therefore, revenue from tariffs is inadequate to contribute to new capital investment. Thus there arises a need to review the existing practices in determining water tariffs in UWSS sector, the influencing factors and come out with ways to incorporate economic principles of pricing in the process.

In this background, The Energy and Resources Institute (TERI) has been awarded a study by the Ministry of Urban Development (MoUD) under the Ministry's Centre of Excellence (COE) to "Review the existing guidelines of determination of user charges for water and sanitation services and to incorporate economic principles of pricing in urban water supply sector in India". The main objective is to draw from review of present practices, key bottlenecks, and then prepare guidelines for setting price for urban water by addressing these bottlenecks keeping in mind economic principles for tariff setting. The recommendations are based on study of existing scenarios across various Indian states, lessons drawn from review of international case studies and pricing reforms in electricity sector in India.

Scope of work

The Terms of Reference of the study awarded to TERI are given below:

1. Review the urban water supply sector in India and the existing tariff structure and guidelines for determination of user charges for water supply
2. Examine principles of determination of user charges followed in the water sector internationally
3. Examine the applicability of tariff setting guidelines/ principles followed in electricity sector in India
4. Recommend the broad principles of tariff determination to be followed in determining user charges for water

Based on detailed discussions with the MoUD, the following were identified as the key deliverables of this project:

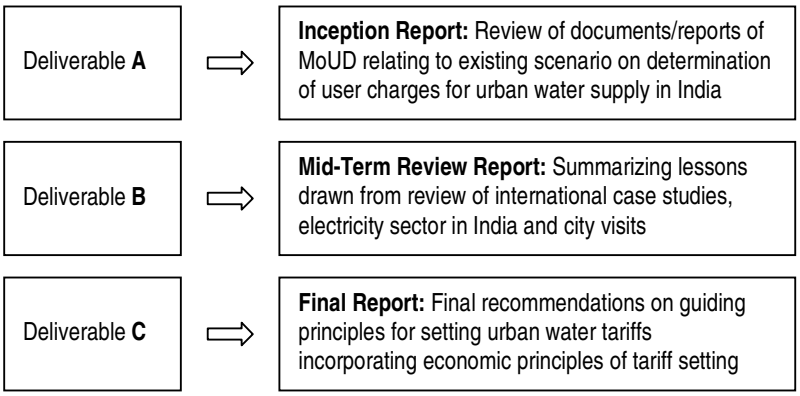

Figure 1.1 Key deliverables of study

Methodology of study

The methodology adopted for completion of the study and achievement of its objectives is summarised in figure 1.2 and described briefly later.

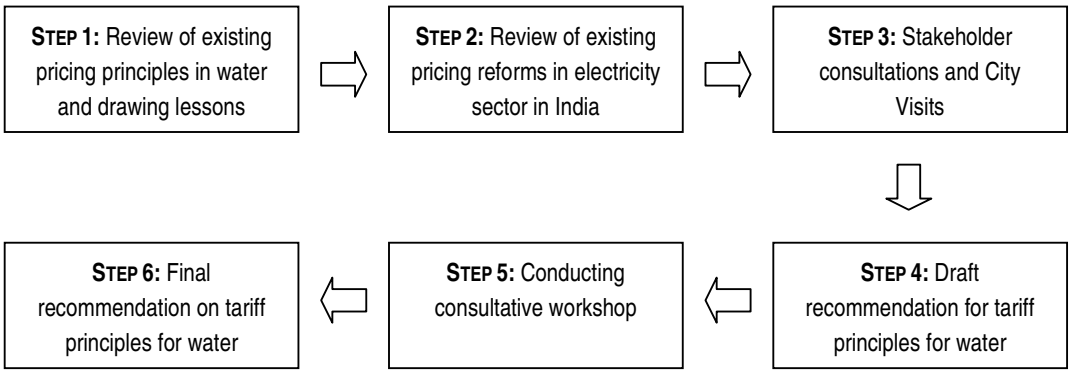

Figure 1.2 Methodology of study

Step 1: Review of existing pricing principles in water sector in India and drawing lessons from international case studies

The objective of the study is to recommend broad principles of tariff determination to be followed in determining user charges for water and sanitation services. For this, it is important to study in detail the present status of water sector in India. It covers the institutional and policy framework, regulatory reforms and pricing aspects. The literature review also constitutes the study of existing practices in pricing of water services in various Indian cities and internationally in United Kingdom, Australia and city of Metro Manila and drawing key lessons for Indian cities.

Step 2: Review of pricing reforms in electricity sector in India

For determining principles of tariff determination for urban water services in India, it is important to review the pricing principles followed in other key sectors such as electricity, where significant progress has been made in the area of pricing policy and principles.

Step 3: Stakeholder consultation and city visits

In addition to literature review, interactions with stakeholders have been carried out by the project team during city visits to Ahmedabad, Raipur and Bangalore. A list of stakeholders visited is provided in annexure 1. This helped in assessment of actual ground level situation in water sector and major issues in setting water tariffs which has been summarised in the review of existing tariff practises of various Indian cities in chapter4.

Step 4: Recommendation of tariff principles for water services

Broad principles for tariff for water and sanitation services are recommended based on the following:

- Review of national and international experience in pricing of water services
- Study of pricing principles in electricity sector
- Discussions with water sector experts and other relevant stakeholders

Step 5: Consultative workshop

Draft tariff principles are to be discussed and validated in the larger stakeholder consultative workshop. Detailed discussion on the tariff principles will be carried out which will help in finalizing the tariff principles and ensure wider acceptance.

Step 6: Final recommendation on incorporating economic principles in setting water tariffs

Preparation of final recommendation on tariff principles for water tariffs would be done in consultation with MOUD and after incorporating suggestions made during consultative workshop.

Structure of Report

This report is structured into 7 chapters. Chapter 1 provides an introduction to the study, scope of work, methodology adopted for completion of the study and achievement of its objectives and the structure of report. Chapter 2 briefly summarises the existing legal, regulatory, policy, institutional and pricing structure in urban water sector in India. Chapter 3 presents the lessons drawn from review of the international case studies on pricing of urban water in United Kingdom, Australia and city of Metro Manila. Similarly, Chapter 4 reviews the existing tariff setting practices in urban water sector in major cities in India including Ahmedabad,

Delhi, Chennai, Hyderabad, Bangalore and Raipur and summarises key findings at the end. Chapter 5 provides a review of tariff reforms in electricity sector in India and key lessons that can be drawn for water sector. Chapter 6 describes the economic principles for determining urban water tariffs and covers a range of topics including need for economic pricing, principles of pricing, alternative models for tariff setting, pricing strategy, approach for tariff determination and category-wise tariffs. Chapter 7 summarizes the recommendations on incorporating economic principles of pricing in setting user charges for urban water supply.

CHAPTER 2 Overview of urban water sector in India

This chapter briefly describes the institutional, policy, regulatory and pricing framework of urban water sector in the country. While, detailed review of existing pricing practices in various Indian cities is presented in chapter 4 of this report.

Institutional framework

At the central level, the Union Ministry of Water Resources (MoWR) is responsible for development, conservation and management of water as a national resource. It also oversees the regulation and development of inter-state rivers. These functions are carried out through various central government organizations. The government institutions involved in taking care of various roles and responsibilities at central level in the water sector are indicated in Table 2.1.

Table 2.1 Central Government Institutions responsible for UWSS sector

Ministry	Institution	Responsibility
Planning Commission	Planning Commission	Planning and allocation of central government funds through five year plans
Ministry of Water Resources (MoWR)	Central water Commission (CWC)	Central policy making
	Central Ground water Board (CGWB)	Regulatory activities of ground water concerning quality and overexploitation
Ministry of Environment and Forests	National Rivers Conservation Directorate (NRCD)	Responsible for river bodies
	Central Pollution Control Board (CPCB)	Pollution watch
Ministry of Urban Development (MoUD)	Central Public Health Environmental and Engineering Organization (CPHEEO)	Standards setting and harmonization between states
Ministry of Health and Family Welfare	National Institute of Communicable Diseases (NICD)	Research and advocacy, particularly with civil society
Others	Housing and Urban Development Corporation (HUDCO)	Funding for housing and other infrastructure sectors
	Life Insurance Corporation (LIC)	Development funding

SOURCE The World Bank. 2006

Water being a state subject, the State Governments has primary responsibility for use and control of this resource. The administrative control and responsibility for development of water rests with the various State Departments and Corporations. The various state level institutions in the UWSS sector are summarized in Table 2.2.

Table 2.2 State-level institutional arrangements in the urban water supply Sector

Agency type	Jurisdiction	Responsibility		Examples
		O&M	Capital Works	
State-level Specialist Agency (SSA)	Entire state		SSA	Kerela
	Large Cities	City-level specialist Agency	SSA	Uttar Pradesh
	Small Cities	Local Government	SSA	Karnatka, Maharashtra, Tamil Nadu, UP, Delhi
Public Health Engineering Departments (PHED)	Entire State		PHED	Rajasthan
	Small Cities	Local Government	PHED	Andhra Pradesh
Municipal Departments	Large municipal corporations	Municipal Department	Municipal Department	Gujarat, Tamil Nadu, Andhra Pradesh
Metropolitan-level Specialist Agency (MSA)	Metropolitan centers	MSA	MSA	Bangalore, Chennai, Hyderabad
Specialist Municipal Undertaking (SMU)	Metropolitan centers	SMU	SMU	Mumbai

SOURCE Urban Water Supply and Sanitation - World Bank Group Strategy; May 2000

Even though the city level function of water supply is to be devolved to municipalities and other urban local bodies under the 74th Amendment Act of 1992, very few out of the 5000 plus municipalities, have been assigned this function by state governments. A few metropolitan cities, like Delhi, Chennai, Hyderabad and Bangalore have semi-autonomous Water Supply and Sewerage (WSS) boards with limited functional autonomy. In the cities of Calcutta and Mumbai, separate departments of the Municipal Corporations (MCs) handle WSS operations. In some cities, like Amritsar and Ahmedabad, the municipal corporation handle the operations and maintenance of WSS while the capital works are the responsibility of the state level para-statal. In large cities of Uttar Pradesh, while the capital works are handled by the state level agency, the O&M is given to a city level local body.

Policy framework

Central Government policies address issues of access to WSS, water resources management and decentralization of management responsibilities. Provision of WSS services has been included in the first five-year plan as a developmental priority, but it was not until the first National Water Policy of 1987 was formulated that drinking water was given priority over other water uses. In 2002, New Water Policy was introduced which again emphasized on priority of drinking water, private-public partnership, commercialization and cost recovery. Evolution of Government of India (GOI) WSS sector policy has been summarized in Box 2.1.

Box 2.1 Major Central Government WSS Policies

National Water Policy (1987): This policy assumed a holistic view of the water sector and advocated for the development of integrated information systems, conservation of resources, emphasis on multipurpose projects, and periodic groundwater assessment. It also prioritized drinking water over other water uses and stated that water rates should not only convey the value of scarcity but also cover a portion of fixed costs and the annual maintenance and operation charges.

National Water Policy (2002): The policy stipulates the progressive new approaches to water management including Re-enforcement that drinking water is the top priority over competing water uses, monitoring and limitation of ground water exploitation, monitoring and enforcement of water quality measures, and increasing awareness of conservation measures and water scarcity. One of the most notable features of the 2002 Policy is the proposal to increase private participation in the sector and access to commercial borrowing.

9th Five-Year Plan: Some of the major policies highlighted in the Plan included extending water services to the entire population and sanitation services to reasonable levels, reinforcing the Constitutional Amendment that decentralized responsibility to ULBs, enhancing financial viability through full cost recovery, and enhancing social and environmental sustainability through eco-friendly and inclusive programs.

10th Five-Year Plan: Major policy components of the Plan include prioritizing water service to the currently uncovered populations, emphasizing participation of stakeholders in planning and implementation of schemes, integrating water and sanitation programs to emphasize conservation, and recommending the use and provision of subsidy of select latrine technologies.

SOURCE The World Bank.2006

In addition to the above central government policies, the government has engaged in various UWSS programs aimed at extending the UWSS infrastructure and developing new capacity. Two most important programs launched by the government are Accelerated Urban WSS Program (AUWSP) and Public Health Engineering Training, Research and Development Programs. The AUWSP program was launched in 1993-94 and aimed at extending the WSS services to households of class IV to VI cities and towns. This programme is now merged with Urban Infrastructure Development Scheme for Small & Medium Towns (UIDSSMT) and aims at improvement in urban infrastructure in towns and cities in a planned manner for next seven years beginning 2005-06. The objectives of the new scheme are to:

- Improve infrastructural facilities and help create durable public assets and quality oriented services in cities & towns
- Enhance public-private-partnership in infrastructural development and
- Promote planned integrated development of towns and cities

The Public Health Engineering Training, Research and Development Programs were initiated in 1956 by CPHEEO, and this centrally-managed program aims at training employees of states, ULBs, and mega-cities about Public Health Engineering (PHE) components of WSS projects. Between 1989 to 2002, Rs.100 million has been allocated to the programs with approximately Rs.83 million already spent.

Pricing structures

The tariff structures used in urban water supply also vary across states like the institutions involved in its provision. A 'tariff structure' is a set of procedural rules used to determine the conditions of service and monthly bills for water users in various classes or categories. The water charged could be in form of non volumetric flat rate tariff, non volumetric water tax, uniform metered tariff, metered block tariffs or a combination of above.

Non volumetric flat rate is usually charged in absence of metering wherein the monthly water bills are independent of water consumed. Flat rate could be charged either on the basis of size of the ferrule or could be set by the concerned authority on its own judgment. As per a study conducted by NIUA in 1999 in 260 class I and II cities in the country, ferrule based flat rate were charged in certain metropolitan cities and it varied from Rs.120 (Surat) to Rs.750 (Pune) per year for a ½" domestic connection and the average payment for ½" ferrule size was approximately Rs.296 per annum (NIUA.2005). Non ferrule based flat rate varied from Rs. 240 (Madurai) to Rs. 1680 (Hyderabad) per year with the average charge worked out to approximately Rs.668 per year.

In case where the water is charged through taxes there could be separate water tax or the water charged could be linked to property tax as in case of Ahmedabad wherein the 30% of property tax is taken as water charges. Property tax is linked to the physical characteristic of the property and depends on the annual rental value and thus the quantum of water charges collected would also vary accordingly.

Another way of charging for water is based on consumption i.e. volumetric tariffs which could either be uniform metered tariffs or increasing block tariffs. Uniform metered tariff is a single part tariff wherein the consumer water bills depend on their level of consumption while under increasing block tariffs also water bills depends on consumption, but charges are lower for lower blocks and higher for high levels of consumption. 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. The NIUA study found that 38 cities used IBT as water tariff structure. The number of blocks in IBT generally varied from 3 to 6. For instance Jaipur and Nagpur had 3 block tariff; Chennai and Chandigarh had 4 block tariff structure whereas Bangalore had 6 blocks of water tariffs. Further, many cities used a combination of volumetric and

flat rate based rates. For instance, in Chandigarh, the metered consumer categories were charged volumetric tariffs and the un-metered consumer paid the monthly flat rate.

Regulatory reforms

So far, no regulatory reforms in terms of setting up an independent regulator have been carried out in this sector at central level like in electricity sector. This is because water is a state subject and a central level regulatory body like for example in electricity sector, namely Central Electricity Regulatory Commission (CERC) may not work in water sector[1].

At the state level, some steps have been taken to set up independent autonomous bodies to regulate the sector or at least provide a link between governments and utilities in a transparent manner. In 1997, Government of Andhra Pradesh passed The Andhra Pradesh Water Resources Development Corporation Act with a view to set up an autonomous body for promoting and operating irrigation projects, command area development and schemes for drinking water and industrial water supply to harness the water of rivers of the state and flood control. The authority was not able to achieve its objectives as scope of its activities was too large and generic in nature. On the other hand, Government of Maharashtra in 2005 passed The Maharashtra Water Resources Regulatory Authority (MWRRA) Act with a view to set up an independent regulatory authority for water to regulate bulk water supply and also to provide guidelines for fixing water rates for use of water for agriculture, industrial, drinking and other purposes. The Authority has been functional since 2005, and has brought out guidelines for fixing bulk water charges (Box 2.2).

The Government of Arunachal Pradesh also enacted The Arunachal Pradesh Water Resources Management Authority (APWRMA) Act in December 2006 on similar lines of the MWRRA Act 2005. The Act is not yet operational, but the authority once formed under the Act, would have the power to fix water tariffs for both irrigation and non-irrigation purposes, based on the principle of full recovery of the cost of irrigation management, administration and O&M of the project. The Authority will also review and revise the water charges every 3 years. While Arunachal Pradesh has passed an Act, Government of Gujarat on the other hand has drafted a bill to set up a

[1] This is because electricity is a concurrent subject under the constitution and both central and state have powers to regulate it, while in water sector the issues and problems are state or city specific and a state level regulator deems more appropriate.

regulatory body for water sector; however it has not been enacted yet.

More recently in 2008, Government of Uttar Pradesh has passed the Uttar Pradesh Water Management & Regulatory Commission (UPWMRC) Act with a view to setting up a regulatory commission which would regulate state water resources, facilitate and ensure judicious, equitable and sustainable management, allocation and optimal utilization of water resources. It would also fix the rates for water use for agriculture, industrial, drinking, power and other purposes and carry out flood control activities in the state.

Box 2.2 Maharashtra Example in Water Regulation

MWRRA is quasi-judicial body established under the MWRRA Act 2005 passed by the state legislature and brought into force on 8th June 2005. The Authority would regulate sectoral allocation, water rates, changes in water use/ diversion of water use and compensation for such changes in water use. Its main objective is to establish an institutional framework to:

a) Regulate water resources within the state
b) Facilitate & ensure judicious, equitable & sustainable management, allocation & utilisation of water resources
c) Fix rates for use of water for agriculture, industrial, drinking & other purposes

The MWRRA, under the MWRRA Act 2005, has a mandate to rationalise and fix bulk water tariff through a consultative process for industry, drinking water and agriculture uses. The main responsibilities of Authority relating to tariff as given in Act are as follows:

"11. (d) to establish a water tariff system, and to fix the criteria for water charges at sub-basin, river basin, and state level after ascertaining the views of the beneficiary public, based on the principle that the water charges shall reflect the full recovery of the cost of the irrigation management, administration, operation and maintenance of water resources project;
11. (r) to determine and ensure that cross-subsidies between categories of use, if any, being given by the Government are totally offset by stable funding from such cross-subsidies or government payments to assure that the sustainable operation and maintenance of the water management and delivery systems within the State are not jeopardised in any way;
11. (u) the Authority shall review and revise, the water charges after every three years;"

The Authority at present has come out with an Approach paper on 'Preparation of criteria for bulk water pricing in the state of Maharashtra' and has invited comments from various stakeholders to finalise the guidelines. Once these guidelines would be finalised, Maharashtra would be first state in India to bring out guidelines for setting bulk water rates.

Though few states have passed legislations to set up autonomous bodies to regulate water sector, in order for regulatory reforms in the sector to succeed, all states and city authorities in water sector need to show willingness to set up such independent bodies and provide them with enough power to carry out their activities. However, unlike electricity or telecom sector, water is a state subject, and within every state it is the city-level civic agencies like municipal corporations or municipalities or Public health engineering departments or independent water boards which take care of supplying water to end users. Thus it would be very

difficult for state level water regulatory authority to set water tariffs for each city-level water utility like in power sector and even more difficult to set up an independent water regulatory authority for each city within the state. Hence, in case of water sector, it would be ideal to create state-level water regulatory authorities with an overall responsibility of setting guidelines for setting water rates for use of water which can be adopted by various city-level utilities. The authority can also set standards and operational norms for city level utilities. Other than this, monitoring and adhering to guidelines and advising state governments on equity issues should be other major functions of state-level regulatory authority in water sector.

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CHAPTER 3 Review of present practices in urban water pricing - International Experience

This chapter summarizes the practices in urban water pricing in various countries and cities. We have selected countries like Australia, United Kingdom and city of Metro Manila due to diversity of experience in institutional/regulatory/pricing regime in water sector in these countries.

United Kingdom (UK)

The water industry in England and Wales has developed over the last century; from small organizations serving local communities to large integrated companies in private ownership, overseen by a government regulator, namely The Water Services Regulation Authority or more commonly known as OFWAT.

Institutional Framework

Before 1973 the water and sewerage industry in UK had a highly fragmented structure, mainly organized on local basis. The 1973 Water Act reorganized the industry and established ten state-owned Regional Water and Sewerage Authorities (RWAs) responsible for water supply, sewerage and environmental services. Moreover, 29 privately owned Water Only Companies (WOCs) supplied water within the boundaries of the RWAs. Table 1 summarizes the main service providers responsible for providing urban water supply across UK.

Table 3.1 Responsibilities of provision of Water Services in UK

Region	Water Supply	Sewerage
England & Wales	10 Water and Sewerage Companies and 29 Water Only Companies (WOCs)	Water and Sewerage Companies.
Scotland	Water Authority	Water Authority
Northern Ireland	Departmental Water Service	Departmental Water Service

SOURCE Peter Bailey.2002

Regulatory Framework

The reform process began with the privatization of the RWA's. The government considered that more efficient management could obtain important savings, and this would best be achieved by the private sector. In 1989, the government decided to privatize the whole sector without modifying its structure. This included 10 Water and Sewerage Companies (WACs) and 29 Water-Only Companies (WOCs). OFWAT was set up, whose duty was to promote the public interest and provide the correct economic incentives to the industry.

The present status of regulation in UK is as follows:

- OFWAT regulates 21 regional monopoly water companies in England and Wales, of which 10 provide both water and sewerage services; and 11 are water only companies.
- It ensures that the companies provide customers with a good quality, efficient service at a fair price;
- It monitors the companies' performance and takes action, including enforcement, to protect consumers' interests; and
- It sets the companies challenging efficiency targets.

Forms of Tariff Charged

Water is charged in different ways depending on whether the property is metered or not. The charging methods are:-

- Unmeasured charge based on the rateable value of the consumer's property wherein the water supply charge is calculated as an amount in pence per pound of the rateable value. This amount varies between companies
- Unmeasured charge based on a flat rate charge irrespective of the amount of water used or the type of property of the consumer
- Unmeasured charge based on banding system wherein the company assesses the water charges, based on, for example, the size and type of the property or the number of occupants
- Measured charge (using a water meter) based on the amount of water, usually per cubic metre, used at a rate approved by the Director General of OFWAT

Bills are usually sent once or twice a year, depending on the company's practice. If the water charge is on an unmeasured basis, the bill will be for the forthcoming billing period. If the water charge is a measured charge the bill will be for the preceding billing period.[2]

Tariff Setting Mechanism

The Water Industry Act 1999 requires all the water and sewerage companies in UK to get their proposed water charges to be approved by OFWAT. All companies determine their individual charges and submit to OFWAT for their approval. The revenue requirement of each of the company should be such that the revenue collected should enable the company to finance its relevant expenditure. Revenue requirement should provide for:

- financing its operating expenditure
- financing its capital investment programme

[2] http://www.adviceguide.org.uk/index/your_world/consumer_affairs/water_supply.htm#Calculating_water_charges

- rewarding out performance in the previous five-year period
- financing previous capital investment through the return the company earns on its regulatory capital value (RCV)
- financing the taxes paid

The objective of setting the price limit is to support and encourage a sustainable water and sewerage sector by:

- providing a structure that places responsibility on all stakeholders to contribute to minimising the impact on bills to customers
- developing incentives for companies to improve efficiency and give consumers value for money
- taking account of long-term challenges such as climate change adaptation and mitigation
- financing the functions of efficient and well-managed companies
- promoting the development of a competitive market

The annual percentage difference between the revenue requirement and the base year revenue expected from customers is the price limit, i.e., the ceiling for the price hike.

Process of tariff setting mechanism

The economic regulator, OFWAT reviews the revenue requirement of the company and sets the limits on the prices that water and sewerage companies can charge their customers during the five-year period. The procedure followed for setting the price limit for water and sewerage charges is detailed below:

Phase 1: Framework and Issues

The objective of this phase is to finalise the approach of OFWAT for price review. The approach is finalised based on the consultation received from public and water companies on draft approach of OFWAT

Phase 2: Assessment of draft business plan and market research

Water companies submit their draft business plan including their proposed price limits which is then open for consultation.

Phase 3: Decisions and determinations

Water companies submit their final business plans. This is followed by the draft determination of the price limits proposed by OFWAT which is then finalised after consultation

Phase 4: Implementation

The final price limits is then put into effect.

Categorization of expenditure

Figure 3.1 indicates the categories of expenditure which are considered by OFWAT while setting the price limits.

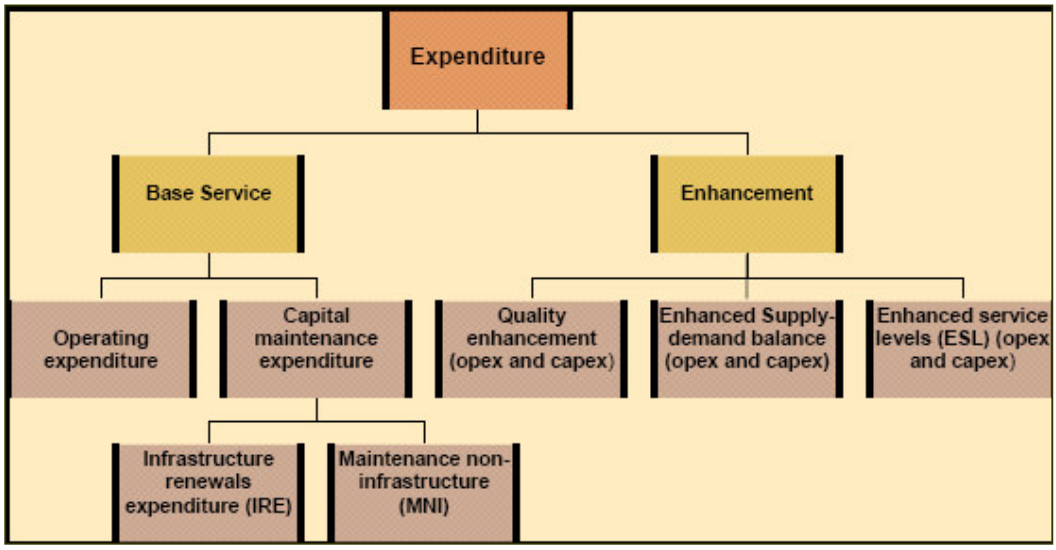

Figure 3.1 Expenditure included in setting water tariff by OFWAT

Methodology for review of expenditure

The OFWAT has finalized the following methodology for review of various components of revenue requirement for the upcoming review period of 2010-15.

Capital Expenditure

Capital expenditure and out performance incentives are set using capital incentive scheme (CIS). Under the CIS, each company recovers its actual expenditure plus or minus rewards or penalties that depend on the expenditure forecast it chooses and how actual expenditure compares to forecast. This involves:

- Deciding a 'baseline' level of expenditure for each company
- Comparing a company's forecast to the baseline and using this to calculate an expenditure allowance for setting prices for the first five years
- Providing an incentive for further out performance which declines as the ratio of a company's forecast to baseline increases
- Calculating ex-post rewards/penalties as the difference between the expenditure allowance and actual outturn expenditure multiplied by the incentive rate, plus an additional element structured to ensure that a company secures the greatest
- Benefit from submitting business plan forecasts that are realistic and aligned with the expected outturn level of costs
- Making ex-post reconciliation between the expenditure allowances used to set prices and actual expenditure plus or minus any rewards or penalties. This amount is then carried forward for price setting for the next five-year period.

Operating Expenditure
OFWAT determines the base service operating expenditure and conducts more specific assessment of expenditure for the enhancement of operating expenditure. It primarily comprises of energy prices (cost of electricity). The water industry is a large user of electricity and energy costs form a significant proportion of water companies' operating costs. Other expenditure considered as part of operating expenditure are the pension costs and energy costs.

Cost of Capital (return on investment)
Capital Asset Pricing Model (CAPM) framework is considered for assessing the cost of capital. A single cost of capital for the industry is set by OFWAT. The CAPM approach assesses a company's exposure to systematic risk that is those (economy-wide) risks that an investor cannot avoid by holding a diverse portfolio of shares. The cost of capital has to compensate for any incremental risk. Cost of debt and equity are set by OFWAT depending on the market conditions.

Taxation
Tax is calculated based on the company's actual level of gearing (net debt: RCV) and that assumed by OFWAT, depending on whichever is higher.

Incentive mechansim
OFWAT clearly defines the following rules for rewarding the out performance:

- Operating expenditure rolling incentive: The Company is allowed to retain the benefits of out performance for five years before they are returned to customers. An adjustment is made to the RCV to reflect past capital out performance, and hence transfer the future benefit of this to customers through lower price limits.
- Capital expenditure rolling incentive: The Company is allowed to make adjustment in capital expenditure of the next review period to reflect the actual expenditure considered in current review period.
- Overall performance assessment (OPA): A company that scores well in OPA can charge its customers slightly more and those with poorer performance must charge slightly less.

OFWAT penalize the water company for under performance as follows:

- Logging down: Where an output included is not delivered due to reasons outside a company's control, the associated capital expenditure is logged down.
- Shortfall: Where a output is not delivered for which the

company has no legitimate excuse, then the associated capital expenditure is shortfall i.e. a financial adjustment is made to remove all benefit from the associated price limit allowance

- Financial Penalties: along with the above two measures for under performance, OFWAT also consider the nature of the undelivered output when deciding on additional measures which could include a requirement to deliver at shareholder expense or a financial penalty under their existing powers.

Australia

Institutional framework

Australia's urban water industry comprises approximately 300 utilities where a majority i.e. 70% of population is serviced by 26 utilities.

There is large variation in institutional framework in water sector across different states of Australia. For instance, in Victoria both wholesale and retail water business[3] are government controlled whereas in New South Wales and Queensland, local authorities control the small retail water business and rest is controlled by government. The nature of ownership arrangements for urban water businesses has changed over time, with an increasing preference for corporatisation of government owned businesses which provides a more commercial focus for operations and operates at arms-length from government.

In some cases urban water authorities are vertically-integrated suppliers for an entire State or regions (eg SA Water) wherein the utility undertake wholesale and distribution/retail functions, while in some states such as Queensland urban water services are provided at local government level. The Central body for urban water supply authorities is the Water Services Association of Australia (WSAA).

In some states, significant restructuring of the water industry has been undertaken in recent times. For example, in Victoria, Melbourne Water has separated into a wholesale business and three retail businesses that supply different regions in greater Melbourne; and, in New South Wales, Sydney Water and the Sydney Catchment Authority have separated.

[3] In the urban water sector, wholesale water is water supplied by a bulk water service provider from its original source, to a retail water service provider who then distributes it to end-users and the retail water businesses caters to supply water direct to residential, commercial and industrial customers.

The size and number of urban water businesses also differs across states. For example, in Queensland and New South Wales there are a large number of small non-major urban water businesses providing water to regional areas (125 and 93 respectively); while in Victoria, the urban water sector is characterised by 18 large businesses supplying water to the entire state.

Legal and Regulatory Framework

There are different decision makers who determine the water charges in Australia. These may include governments, ministers, economic regulators and local governments. For instance, in Victoria independent regulators determine water charges, in New South Wales independent regulator and the local councils set water charges, in Northern Territory and Western Australia, prices are set by government and in Queensland local governments set their own prices.

There are various statutory instruments under which decision makers determine water charges. The transparency and accessibility of those powers vary from statutory law (as in Victoria), to guidelines (e.g. Tasmania), to by-laws (e.g. Western Australia), to individual water business decisions (e.g. Queensland).

Also, there are variations in applications of pricing principles set under statutory instruments. For example in some states such as Western Australia it is not mandatory to follow regulators advice on water charges whereas in states like Victoria and New south Wales it is a legal requirement to follow a set of pricing principles as set by an economic regulator.

Water Charge setting Mechanism

Figure 3.2 depicts the tariff setting mechanism

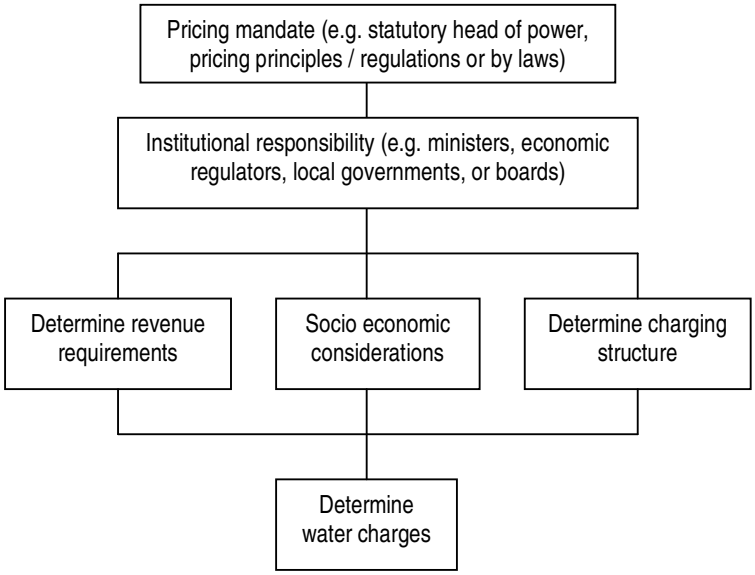

Figure 3.2 Tariff setting mechanism in Australia

Assessment of revenue requirement

The first step is the assessment of revenue requirement of the water utility. The Australian water companies use a building block approach for assessing their revenue requirement. This approach is used to calculate the efficient cost components that are to be recovered through prices during a regulatory period. The cost components to be included depend on the lower and upper bound pricing methods. Lower bound pricing is when prices are set to recover the minimum revenue (lower bound) required for maintaining a financially sustainable water storage and delivery business. Lower bound pricing is set to recover the following costs:

- recurrent expenditure requirements (operations, maintenance and administration)
- capital expenditure for replacement of existing assets and expanding the stock of assets to meet increases in demand, meet required service standards, and any increases in regulatory obligations
- The interest costs on any debt, dividends and tax or tax equivalent payments (if any)

Under upper bound pricing, prices are set to recover costs associated with:

- recurrent expenditure requirements (operations, maintenance and administration);
- a return on capital; and
- A return of capital (depreciation)

Figure 3.3 indicates the process for assessment of revenue requirement.

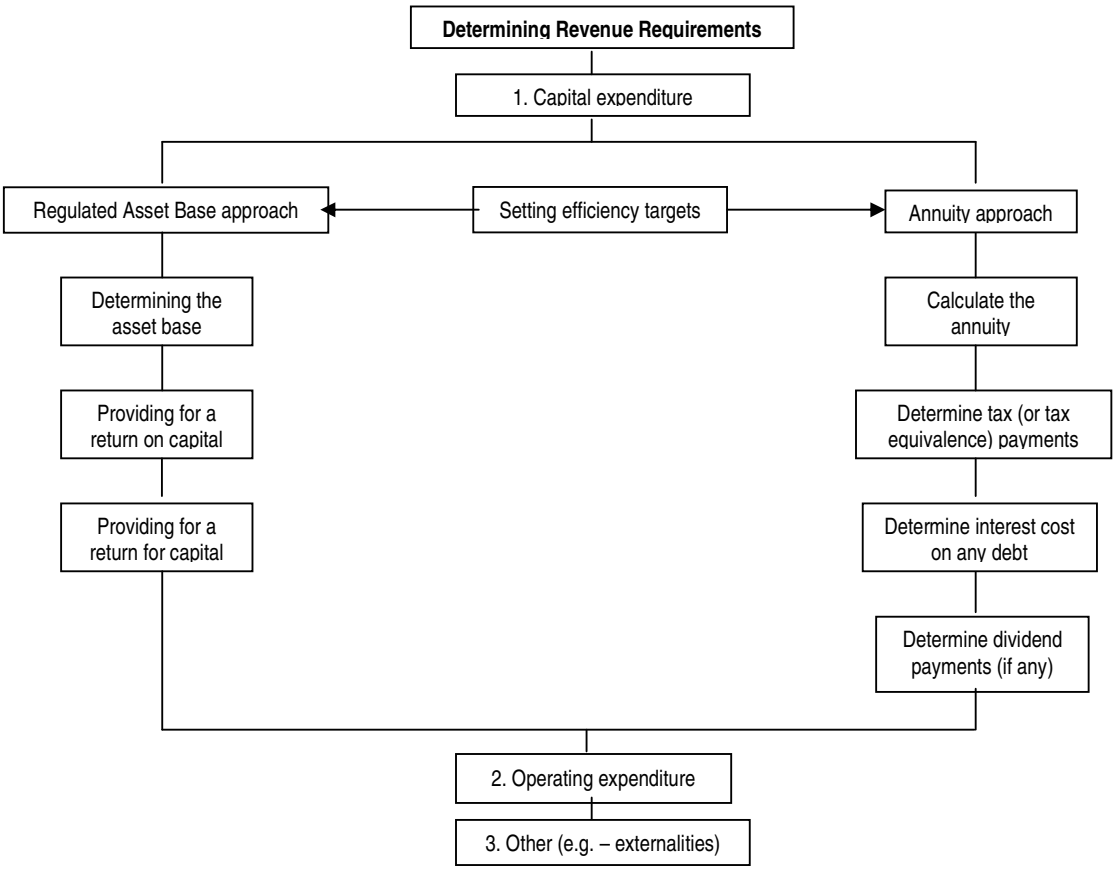

Figure 3.3 Assessment of revenue requirement of Australia

There are two different approaches for calculating the revenue requirement:

- Annuity approach
- RAB approach

Annuity Approach

The Annuity Approach forecasts asset replacement and growth costs over a fixed period and converts these to a future annualised charge (assumptions regarding rates of return on and of, capital are implied within this process). The annuity approach is applied to recover the costs of constructing and renewing non-financial assets over a medium to long time period. It does not directly seek to recover all of the forward capital expenditure associated with long-lived assets or a return on that capital. Depending on the choice of parameters, the annuity approach tends to be more aligned with lower bound pricing.

Regulatory Assets Base Approach

The RAB approach includes an allowance for a return of capital

(depreciation) and a return on capital. This approach is generally consistent with upper bound pricing.

Figure 3 depicts the key cost components which are to be included under each of the two approach. The following provides a brief explanation of the costs included under different approaches.

Capital related costs

In the urban water sector, water businesses generally use a RAB approach to recover capital expenditure.

Determining the initial asset base

The initial asset base may be valued in a number of ways, including:

- DORC methodology: A cost-based approach that involves determining a theoretical set of assets based on current technology, to provide the current level of service. The value of this asset set is then depreciated to reflect asset consumption since construction or acquisition(Eg Northern territory)
- Economic Valuation methodology: It is a value-based approach which establishes the value of the assets by estimating forward net cash flows of the business at current prices (Eg New South Wales)
- Optimised Deprival Value (ODV) approach: It is a hybrid approach (in that it can use either a cost-based or a value-based approach) wherein for each asset, or group of assets, the value becomes the greater of the market value/sale value or the Economic Value, where the asset is not to be replaced
- Depreciated Actual Cost method: where the actual financial cost incurred at the time the expenditure for the physical assets is made, is indexed and depreciated to its present value.

Determining the asset base going forward

Generally, at each water price review, capital expenditure undertaken since the last price review, plus that proposed to be undertaken over the price path, is added to the RAB, net of any asset disposals and contributed assets. The value of the asset base is indexed by the movement in the CPI each year, to reflect its real value. The value of the asset base is generally rolled forward using the following approach:

$RAB_t = (RAB_{t-1} + \text{Prudent Capital Expenditure}_t - \text{Depreciation}_t - \text{Disposal}_t \text{ (discarded assets)}) \times (1 + \text{Indexation (CPI)})$.

(Where t = the year under consideration).

Providing for a return of capital

In order to achieve objective of full cost recovery of water supply,

provision should be made for the cost of asset consumption, i.e. depreciation. Depreciation reflects the progressive consumption of the service potential embodied in an asset. A reinvestment decision at the end of the useful life of an asset will be made based on expected cash flows to be generated from a replacement asset. Most water businesses use a straight-line approach to calculate depreciation. Differences arise in the implied life of the asset over which depreciation is calculated.

Providing for a return on capital

All jurisdictions use the Weighted Average Cost of Capital (WACC) to calculate a rate of return on capital. Differences in the WACC that are applied across water businesses are largely due to differences in prevailing market conditions at the time they were calculated. For example, the current bond rate is used as the nominal risk free rate. Therefore, differences in bond rates (and other market factors) will lead to variations in the WACC being applied across jurisdictions. Generally, the Capital Asset Pricing Model (CAPM) is used to determine equity betas. The cost of debt component of the capital structure will vary with debt to equity ratio of benchmarked efficient supplier and the prevailing interest rates.

Dividend payments

Dividend payments are paid out of profits (or accumulated profits). Under the RAB approach, dividend payments are not a separate cost item or building block. The capacity to pay dividends may be considered as a factor in determining the initial asset base and in case of annuity approach dividends are a separate item, as part of the minimum revenue requirement.

Policies for dividend payments by government owned water businesses vary across jurisdictions. For example, in New South Wales, dividend payments are agreed annually with the Treasurer considering a notional upper-limit; in Victoria, Northern Territory and South Australia a fixed percentage of the after tax profit is paid as dividends; in Queensland, dividend payments are negotiated between the management board of the relevant government owned corporation and shareholders.

Taxes

Privately owned, urban water businesses pay taxes in accordance with standard taxation practices applicable to all businesses. Publicly owned water agencies (which include Water Boards, Local Councils and Government-owned wholesale and retail service providers) pay tax equivalents, under the National Tax Equivalence Regime (NTER).

Operating Expenditure

Allowance for operating costs is made to represent efficient

service delivery and is benchmarked against comparable organizations. Efficiency targets are also set up by the economic regulator. Operating costs include the costs of collecting, treating, testing and pumping water, direct costs of maintaining the system, overhead costs, and salaries.

Others

Under category of 'Others' expenditure includes allowances made for contributed assets and government funding, including government capital works grants and operating subsidies.

Structure of water Charges

Once the revenues requirement is defined, the next step is to asses how to recover the costs from the users. For this, a structure of tariff charged should be devised. All states in Australia use a combination of fixed and variable charges for passing on wholesale and retail water charges in urban areas. Fixed charge is determined as the residual component to be recovered after the revenue from water usage charges has been estimated and the inclining block tariffs are used for variable components. Number of blocks in inkling block tariff structure differs across states. There are 2 steps in inclining block tariffs of New South Wales and South Australia, 3 steps in Queensland and the Australian Capital Territory, 5 steps in Western Australia, 6 steps in AQWEST and 8 steps in Busselton Water.

Manila (Metropolitan Waterworks and Sewerage System Regulatory Office - MWSSRO)

The urban water supply and sewerage management in Metro Manila is regulated by the Metropolitan Waterworks and Sewerage System Regulatory Office (MWSSRO). The reform process began in 1997, which saw the acceptance of the Public-Private Partnership (PPP) mechanism by the government, in the form of a concessionaire model, resulting in improved service standards and efficiency, increased coverage (both area-wise and time-wise), reduction in government's debt burden, along with a more transparent water pricing mechanism.

Institutional Framework

Till 1995, water sector in Metro Manila was characterised by poor coverage of water supply and sewerage area (67% and 8% respectively), high tariff rates, low water availability (16 hours/day), high government debt burden ($100 Million p.a., 65% NRW - Non Revenue Water) and inefficient management. This realization prompted a change in policy to enact the National Water Crisis Act, 1995 which stated the need to adopt urgent and effective measures for tackling the water crisis and subsequently checking its adverse impact on health and well being of the

population, food production and industrialization process. This paved the way for private sector to join in for growth and development projects related to water supply and sewerage.
A PPP model was adopted which provided for concessionaire agreements (CAs) to be awarded by the MWSS for each of the two zones of Metro Manila – East Zone and West Zone, with two sets of private consortia individually, for managing the water supply and sewerage services. The 25 year CA was to be provided on the following basis:

- Bidding mechanism to be followed wherein the bidders have to bid for both areas. But no bidder can win both areas.
- Specific targets have to be achieved on coverage for water and sanitation, 24-hour supply, and quality.
- A consortium of local private operators must have an international operator as partner having at least 20% stake in the consortium.
- The awarding of CA was based on lowest tariff submitted.
- The winning bidders shall have to reimburse Government $6 million transaction cost
- The government's (MWSS) debt burden of $900 million was to be paid by concessionaire.

Subsequently, Manila Water Company, Inc. (MWCI) for East Zone, and Maynilad Water Services Inc. (MWSI) for West Zone were awarded the CAs in 1997 based on their submitted bids.

The CAs also provided for the creation of the MWSS Regulatory Office (MWSSRO) to regulate the water supply and sewerage system in the two zones.

Regulatory Framework

The MWSSRO functions under the close jurisdiction of the MWSS Board of Trustees. There are 4 prime areas of regulation, each headed by a regulator, and a Chief regulator acting as the Chairman of the 5-member Committee. The 4 areas of regulation are:

- Technical
- Customer Service
- Financial
- Administration and Legal Affairs

The Chief Regulator acts as the principal spokesperson of the office, and has the final approval over MWSSRO's staff selection and dismissal. A majority vote of three members is required for decision-making that affects any CA.

Forms of Tariff Charged

The tariff comprises of the following charges:

1. Basic Charge: It is the consumption (in m^3) multiplied to

the water rate as per customer classification (i.e., residential, semi-business).

2. Compounded Exchange Rate Adjustment (CERA): It is charged at P1.00 per m^3 of actual water consumed.
3. Foreign Currency Differential Adjustment (FCDA): It is computed as a percentage of basic charge (depending on the calculated factor for the quarter).
4. Environmental Charge (EC): It is charged to all water service connections to cover the cost of de-sludging and other environmental cleaning. It is computed as 10% of Basic Charge, CERA, and FCDA.
5. Sewerage Charge (SC): is charged only to those having sewer line connections. It is computed as 50% of Basic Charge, CERA, and FCDA.
6. Maintenance Service Charge (MSC): This is charged for maintenance of the meters, and is therefore, dependent on meter size.
7. Penalty Charge: This charge is currently levied by Maynilad (MWSI) at 3% per month, of the total bill.
8. Value Added Tax (VAT): It is charged at 10% of all the above items.

Tariff Setting Mechanism

As per the CA provision for water tariff adjustment,
Rate Adjustment Limit (RAL) = "C" ± "E" + "R"

Where,

C – Consumer Price Index (CPI): based on annual official figures by National Statistics Office (NSO), Philippines

E – Extraordinary Price Adjustment (EPA): based on specified grounds (as mentioned later). It can be an upward or downward adjustment.

R – Rate Rebasing: is to be done every 5 years, with the first rebasing being at the discretion of MWSSRO, while the subsequent rebasing exercises are mandatory.

Grounds for Extraordinary Price Adjustment (EPA)
As per article 9.3.1 of the CA, EPA can be undertaken if the following situation(s) arise(s):

- Amendment to service obligation
- Changes to the Concessionaires' legal obligations
- Breach of CA
- Treatment of grants or subsidized loan
- A material change has been made in the calculation of the Consumer Price Index (CPI)
- Outstanding penalties

- Material inaccuracies in bidding assumptions
- Cost overruns for the Umiray Angat Transbasin Project (UATP). It is defined in CA as the Raw Water Conveyance Component of the project, as described in schedule 9.
- Delays in the completion of the UATP Project
- Force majeure

Rate Rebasing Mechanism

The exercise of Rate Rebasing allows the Concessionaires in recovering its historical capital, operation, and investment expenditures that are incurred efficiently and prudently; while also reviewing the future capital, operation, and investment plans.

The first rebasing was done in 2002 (5 years after 1997). The conduct of the early rate rebasing was mutually approved by the MWSSRO, the MWCI, and the MWSI. After consulting the experts and general public, and the following parameters, MWSSRO determines the appropriate rates for water and sewerage services.

This involves a general rate revision or an appraisal of the concessionaires' performance in the past five years. The Concessionaires' original bids like the revenue, capital expenditure, interest payment and other projected expenses are re-examined and revalidated. This helps in determining if the tariff rates that are being charged can sufficiently earn a reasonable rate of return.

While conducting rate rebasing, the following elements are observed:

- Examination of concessionaire's cash position
- Determination of appropriate discount rate (date of commencement and rate rebasing)
- Evaluation of service obligation targets of both past and future
- Evaluation of future capital and operating expenditures

Key Findings from international experience

The key findings from the study of international experience is summarised below:

- International experience in water sector reveals different regulatory structure among countries. For instance, OFWAT in UK is a central level economic regulator which determines the water charges whereas in Australia, water prices are determined by different decision makers which include governments, ministers, economic regulators and local

governments. Similarly in Metro Manila, city-level water regulatory authority has been established. Both the models of regulatory structure have proved to be effective in improvement in services in respective countries. For instance in UK, OFWAT introduced specific policies to improve the quality of services and also Customer Service Committees (CSCs) were formed which work for protecting the interests of consumers. This has helped in improvement of standards of services regularly over the years.

- In case of pricing reforms, international experience suggests that there exists multiplicity of tariff structures within a country. Water companies in UK charges water tariff in different manner depending on whether the property is metered or un-metered. Similarly in India the water charged could be in form of single rate metered tariff, non volumetric flat rate tariff, non volumetric water tax or the block tariffs. Further price reforms in these countries has generally lead to higher prices along with consequential fall in water consumption which has eventually resulted in lower water bills for consumers. For instance in Australia, after price reforms were carried out, the average water bill in urban areas declined in real terms by 5.5% over the five-year period ending 2000-01. Thus price reforms have helped in improving financial sustainability of utilities as well as conserving of water. Further in almost all cases, consumption-based pricing rather than property value-based pricing, has given consumers the correct signal to control their water bills and hence help in conservation of water.
- It has been observed that the regulatory reforms have been effectively undertaken in international countries and cities. These provide a successful example of inclusion of privatization in water sector as in case of UK. With the introduction of privatization, there have been improvements in service standards and coverage area. Also there has been improvement in investment in the sector.
- Further in all cases studied, pricing reforms have aimed at recovery of full costs including operating costs, capital recovery costs as well as return on investments.

CHAPTER 4 Review of present practices in urban water pricing - National Experience

There are a variety of institutional arrangements in the provision of urban water in India. For e.g. some cities in India have set up city-level water boards for water services and sanitation like Bangalore, Chennai, and Hyderabad; while Delhi, Gujarat, Punjab, Tamil Nadu have set up state-level water supply and sewerage boards. Further no national-level independent regulatory body exists in water sector as brought in chapter 1 (overview of Indian urban water supply sector). This chapter reviews in detail the present pricing practices for urban water adopted by various Indian cities, namely Ahmedabad, Delhi, Chennai, Hyderabad, Bangalore and Raipur.

Ahmedabad

TERI team visited Ahmedabad in order to understand the roles of various institutions involved in distribution of water to end users in urban areas, pricing of water, collection and billing of water, etc. This section discusses the key findings of TERI.

Institutional framework

Ahmedabad Municipal Corporation (AMC) is responsible for supply of water to urban consumers in the city. Approx. 85% of city's water supply needs are serviced through AMC. AMC sources 90% of its water through Narmada Canal Development Scheme, while remaining 10% is met through ground water. Water treatment is carried out by state-owned treatment plants at Kotarpur and Jarpur. AMC owns 96 water distribution stations from where water is distributed to individual consumer households. AMC is also responsible for billing and collection and other operation and maintenance (O&M). Capital works are usually carried out by Government itself and are funded through central or state grants/subsidies.

Legal and Regulatory Framework

In Ahmedabad, AMC carries out the functions of operation and maintenance and revenue functions of water supply in the city. Capital works are carried out by the State government through the Public Health and Engineering Department (PHED). A separate water and sewerage board exists at state level in Gujarat, i.e. Gujarat Water Supply and Sewerage Board (GWSSB). GWSSB's is responsible for developing water supply and drainage projects in rural areas and assisting municipalities in small urban centres and plays no role in water supply in city of Ahmedabad.

Further, no independent regulatory authority exists either at city or at state level. Gujarat Water Resources Regulatory Authority (GWRRA) Bill has been drafted; however the lack of consensus among various government agencies is delaying the enactment of the Act.

Tariff setting mechanism and tariff rates

AMC charges for water at a flat rate. In 2008-09, AMC linked water and sewerage charges to property tax. According to this, annual water tariff would be 30% of the property tax payable by an individual consumer. For example, an individual paying Rs.1000 as property tax annually would in addition pay Rs.300 (30% of 1000) as annual water charges.

The tariff is fixed without consideration of costs involved in the provision of water supply and sewerage services as there is no concrete basis for levying '30%'. The major part of the cost incurred by the Corporation goes into operation and maintenance (O&M) costs. These include establishment expenditure (including employee costs), electricity costs, chemical costs, administrative and general (A&G) expenses, repair and maintenance (R&M) expenses and bulk water procurement charges. Electricity costs constitute approx. 60% of total O&M costs of AMC. While the Capital costs include expenditure on laying transmission pipes, buildings, pumps, etc, these costs are neither accounted while setting tariffs nor recovered through water tariffs. Further most of these costs are directly borne by State government through grants, subsidies, etc.

In the opinion of the Corporation, since collection of property tax is one of its key functions, linking water tariffs with it will also improve collection efficiency of water charges and make the task easier. Further in Ahmedabad, property tax is charged for all type of households i.e. upper income households to lower income households as well as slums. For example, AMC charges lower property tax and subsequently lower water tariff from poor households' as compared to upper income households depending on the size of their properties, income levels, etc. This automatically takes care of the issue of equity and fairness in design of tariff. The corporation is of the opinion that given the very low level of metering in the city, existing non-volumetric flat rate water charges are appropriate.

As regards cost recovery, AMC was able to recover 60-65% of its O&M expenditure on water in the year 2008-09 (where O&M expenses were approx. Rs.110 crores). AMC expects to recover greater proportion of its O&M costs in the future. With increase in property tax rates, revenue from water charges will automatically increase. In addition, AMC is also taking steps to

reduce its operating costs i.e. by undertaking regular energy audits and use of more energy efficient technology; hence better cost recovery in future is possible.

Problems in existing tariff system

AMC is of the opinion that existing water charges are adequate and it may be able to achieve full recovery of at least O&M costs in near future. However a review of AMC's pricing policy presents certain issues as briefly explained below:

1. At present, water charges are able to recover only part of O&M costs; while in future full recovery of O&M costs is envisaged by the corporation. However, the water charges do not recover the capital costs or cost of future expansion incurred by the corporation.
2. Actual cost of procuring and treating of bulk water and its distribution comes to Rs.4.20/kilolitre. The water tariff is not reflective of this cost.
3. The actual level of consumption by consumers is not known as metering is negligible. Even as per JNNURM, 100% metering is to be achieved; AMC is of the opinion that it may not serve the purpose as initial investment would be very huge and may not be possible to be recovered through tariffs. Thus AMC at present do not plan to undertake works for ensuring 100% metering.
4. The losses in water system (including theft) are approx 20% of bulk water received by AMC while collection ranges between 70-75% of water billed. In case of no metering, arriving at actual levels of losses is superfluous, while collection is still low to achieve 100% cost recovery in future.

Delhi

Institutional framework

The urban water supply and sanitation in the National Capital Territory (NCT) of Delhi is the sole responsibility of the Delhi Jal Board (DJB). DJB was established by the Delhi Water Board Act 1998 passed by the parliament, and the earlier fragmented divisions of Delhi Water Supply and Sewerage Disposal Undertaking were incorporated jointly to form DJB. The Board acts as the para-statal authority for all the capital works, operations & maintenance and revenue functions related to water supply within the NCT of Delhi.

DJB is responsible for retail distribution of water in the areas under the Municipal Corporation of Delhi (MCD), while it supplies only bulk water to areas under New Delhi Municipal Corporation (NDMC) and Delhi Cantonment Board. DJB serves,

90% of its demand through surface water from Yamuna River while remaining is sourced through ground water. It also carries out all the functions related to distribution of retail water in urban areas including capital works, O&M and revenue billing and collection. Table 4.1 summarises the various functions of DJB as per the different geographic areas of the NCT.

Table 4.1 Responsibilities of DJB with provision of water Services in Delhi

Geographical area	Water Supply functions		
	CW	**O&M**	**RF**
MCD	Yes	Yes	Yes
NDMC	Yes	Bulk Supply only	Bulk payment from NDMC
Delhi Cantonment Board	Yes	Bulk Supply only	Bulk Payment from Cantonment

Note: CW - Capital Works; O&M - Operations & Maintenance; RF - Revenue Function

SOURCE Delhi Water (Jal) Board Act, 1998

Though DJB carries out all the functions of urban water supply and sanitation in NCT of Delhi, any change or hike in tariffs has to be approved by the State Government. Thus to summarise the institutional arrangements, DJB is the sole body responsible for carrying out urban water supply functions including capital works, O&M and revenue functions. Further, while DJB is an autonomous body, most of its members are elected representative from Government itself and hence the state government is indirectly involved in the boards functioning.

Legal Framework

The DJB was formed as per the Delhi Water Board Act, 1998. As per the Act, DJB has the responsibility of performing all the functions of urban water supply in the NCT of Delhi. Further as per section 55 of the DJB Act, the board has the power of levying fees, charges, including development charges, rentals, etc and recovering them for the services rendered by it. However, the Board members of DJB comprise of elected representatives of government and therefore the state government has a major say in decisions related to tariff fixing and tariff revision.

Tariff setting mechanism and tariff structure

At present, water is charged based on two-part pricing model operating on a cost plus basis. The main points in tariff design are as follows:

1. Fixed connection charge is payable by all registered metered consumers to meet the cost of access to the network and operation and maintenance costs. It is dependent upon the type of dwelling and category of consumer.
2. Volumetric water charge is taken based on block tariff rate,

therefore, depending upon the actual consumption and category of consumer from metered users of the system. However, the basis for fixing of the blocks, i.e. fixing first block at less than 6 kl or last block at more than 30 kl is not clear.

3. 50% of the consumption charge is levied towards sewerage maintenance. Hence there is no clear distinction between revenue from water and sewerage.
4. An annual increment @ 10% on the fixed connection charge component of tariff is imposed at the beginning of each financial year.
5. Bulk water charge is levied upon NDMC and Delhi Cantonment Board covering the actual cost of water supplied.
6. A levy on extraction of ground water and water cess is also charged as one time charge.

The existing water tariff rates as per the Delhi Government are as follows:

Table 4.2 Service charges

Category	Nature of Premises	Charges per month (Rs)
C-I (domestic)	Premises with built up area upto 200 sq.m.	Rs.40/-
	Premises with built up area above 200 sq.m	Rs 120/-
C-II(Non-Domestic)	Commercial	Rs.250/-
C-III(Non-domestic)	Industrial	Rs 600/-

SOURCE Citizen Charter, Delhi Jal Board, Website of Government of NCT of Delhi; details available at: http://delhijalboard.nic.in/djbdocs/about_us/charter.htm

Table 4.3 Volumetric water charges (based on consumption)

Consumer category/ Consumption Slabs	Volumetric charges (Rs/kl)
Category I - Domestic	
Upto 6 kls	0.00
7-20 kls	2.00
21-30 kls	7.00
31 kls & above	10.00
Category II - Commercial	
Upto 25 kls	10.00
26-50 kls	20.00
51 kls & above	30.00
Category III – Industrial	
Upto 25 kls	15.00
26-50 kls	25.00
51-100 kls	35.00
101 kls & above	50.00

SOURCE Citizen Charter, Delhi Jal Board, Website of Government of NCT of Delhi; details available at: http://delhijalboard.nic.in/djbdocs/about_us/charter.htm

Note: 1. 50% of volumetric water consumption charges are recoverable in every category

towards sewerage maintenance charges in respect of colonies/area where sewer lines have been led and are functional.

2. Fixation of average consumption of water if DJB /private water meter is defective and till it is replaced:- a) Premises having built up =Average of 20 Kls per month per connection per area upto 200 sq.m. and b) Premises having built up =Average of 30 kls per month per connection per area above 200 sq.m.

3. However, if the actual consumption recorded by the meter during12 months immediately before the meter stopped working is less than 20 kls/30 kls,(as the case may be)then actual average consumption will be charged for the billing purpose .The above criteria is in force w.e.f. 28-09-2005

Costs and revenues

The main costs of the Board consist of Operation and maintenance charges including, employee costs, repairs, electricity, etc and financing costs including interest, debt servicing charges, etc. Capital costs are not considered while determining water charges. The revenue of the Board mainly consists of water charges, water cess, connection charges and bulk supply charges. Table 4.4 summarises briefly the costs and revenues of the departments and their percentage shares.

Table 4.4 Costs and revenue of DJB (1997-98)

Cost		Revenue	
Item	**% share in total**	**Item**	**% share in total**
Operation & maintenance (O&M)	*47*	Water charges	44
Salary, wages, etc	20	Water cess	1
Electricity charges	20	Connection charges	2
Consumables	2	Bulk Supply charges	53
Repair and maintenance	2		
Others	3		
Financing cost (Interest, Debt servicing charges)	*53*		
Total	**100**	**Total**	**100**

SOURCE NIUA.2005

In 1997-98, the actual O&M cost per kl of water sent out of the Board was estimated to be approx Rs.2.30/kl. If we also add financing costs, then total cost per kl to be recovered through water tariffs was Rs.4.90/kl (NIUA 2005). The revenue generated during 1997-98, given the existing tariff structure, was only Rs.0.80/kl. Thus cost recovery was only 34% of O&M costs and reduced to 16% if financing costs were also included leading to a revenue gap of Rs.1.5/kl (if only O&M costs are considered) and to Rs.4.1/kl (if O&M and financing costs both are considered).

The main reasons for such huge amount of losses ranging between 66-84% can be summarised below:

1. **The water tariffs do not reflect the actual costs**. The volumetric tariffs for domestic consumers for the first block i.e. upto 6kl cost is nil, while upto 20kl water charges are only Rs.2.00/kl. This charge is below the O&M cost per kl of the Board i.e. Rs.2.30/kl. Thus to say, DJB recovers only Rs.2.00 per kl for consumption upto 20kl from metered domestic consumers, when cost of servicing this water ranges between Rs.2.30-4.90/kl. Water tariffs charged increases for water consumption above 20kl and go upto Rs.10.00/kl for consumption above 30kl per month. However, consumers in the higher blocks are very less as compared to lower blocks where major consumption occurs, hence leading to low cost recovery. On the other hand, though non-domestic consumers are charged higher tariffs but they constitute only 17% of the total water consumption in comparison to 83% by domestic consumers (NIUA 2005). Given the above tariff structure and existing tariff being very low compared to costs, DJB has been suffering losses to the tune of Rs.8000 crores in the current year (Syed A. Ahmed. 2009).
2. **Huge amount of subsidies are being given out to consumers through tariffs.** As per the Chairman of the Board and the Chief Minister of NCT of Delhi, as much as 60% subsidies are being factored in the domestic tariffs (Syed A. Ahmed. 2009). These subsidies are meant for the poor, however, as poor are hardly connected to the system (due to high connection charges), these are enjoyed by middle-to-high income consumers. Further, poor have to incur additional coping costs to meet their water needs. Hence benefits from subsidies are not reaching the targeted audience.
3. **Metering is not adequate.** Though DJB has claimed to achieve approx 76% metering in case of domestic consumers and almost 96% in case of non-domestic consumers; there is no data to show whether the meters are actually functional (NIUA 2005).
4. **Low collection efficiency.** In addition, collection efficiency is also low of the Board. The revenue department of the Board is responsible for collection of revenue. Consumers can deposit their bills directly in the zonal offices or collection centres in form of banks, kiosks, etc. This model is good and in future, collection efficiency can be improved if further steps such as internet portals; etc can be used for collection of revenue.
5. **High water losses.** DJB has one of the highest losses in the country. As per latest estimates, the unaccounted for water, constituting both technical losses and loss due to theft, was

approximately 50% or more.

In order to revive DJB's finances, the Delhi Government took a step in the right direction on 1st December 2009, and has proposed to hike water charges from 1st January 2010. The new tariff structure would gradually do away with subsidies in present tariff structure and reflect true costs. However, the decision is still to be implemented.

Chennai

Water supply and sanitation services in the coastal city of Chennai are overseen by the Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB), constituted under the Chennai Metropolitan Water Supply and Sewerage Act 1978. A brief overview of the Chennai Urban water sector is given below.

Institutional Framework

The CMWSSB is a city-level agency for supplying water and providing sewage collection and disposition services. CMWSSB undertakes all the Capital works, Operations & Maintenance, and Revenue functions related to water supply, sewerage collection, treatment and disposal within the metropolitan city of Chennai. The Board charges higher tariffs compared to other cities, mostly reflective of actual costs, and has often reported financial surplus.

The Board serves around 89.3% of city's consumers. The main sources of water include Viranam Lake, Krishna River and Groundwater (11 tubewells). The private sector is involved in water production through service, management, and build-operate-transfer (BOT) contracts. The Board owns three water treatment plants and the whole transmission and distribution system.

Finally, though the Board is an independent agency looking after urban water supply, it does not have financial autonomy to set water tariffs as any proposal for revising water tariff needs to be approved by the State Government.

Private sector participation in water sector

In Chennai, many private entrepreneurs are involved in water sector projects through servicing contracts entered into with the Board. In 1992, CMWSSB contracted out the operation and maintenance of 14 pumping stations and following its success, an additional 61 contracts were signed for period ranging between 2-3 years. In addition, the operation and maintenance of 4 water boreholes has been contracted out to private players and same is to be extended to the new water treatment plant being operationalised by the board. The contracted outstations have

resulted in 45-65% cost savings as compared to the board; while the board has redeployed excess staff to vacancies resulting from retirement in other parts of the organization[4].

Legal Framework

The CMWSSB was constituted through the Chennai Metropolitan Water Supply and Sewerage Act, 1978. This resulted in Board taking over the water supply and sewerage functions from the Chennai Municipal Corporation. Further as per the Act, tariff was to be a statutory function of the Board and empowers board to levy charges for recovering expenses for water provision; however any tariff change has to be approved by state government.

Tariff-setting mechanism and tariff structure

The tariff charged are one of the highest for Indian metropolitan cities, and ensure that CMWSSB covers its O&M costs, part of its debt-servicing obligations and depreciation. This results in generating operating surplus for the Board. Tariff structure is a mix of volumetric tariff for metered consumers, flat-rate for un-metered users and monthly minimum charges for recovering the cost of reading meter, billing, collection and atleast part of the cost of water.

The tariff policy of the CMWSSB and the State Government has following main objectives:

1. Rationalization of tariff categories to remove ambiguity
2. Increasing metered users in domestic category, and hence gradually eliminating flat-rate users
3. Regular annual revision of tariffs by increasing them suitably to commensurate the increase in unexpected factors such as inflation, interest rates, etc
4. Gradual reduction in cross-subsidy, by increasing domestic tariffs and reducing industrial tariffs to reflect actual cost of supply
5. Well-targeted and transparent subsidies, by clearly defining the subsidized group and level of subsidies to be provided

The present water tariff structure is given in table 4.5 below.

Table 4.5 Existing tariff structure in Chennai

Consumer Category/ Consumption slab (m^3)	Unit	Existing tariff
Domestic		
A. Metered		
0-10	Rs/m^3	2.50

[4] 'Forms of private sector participation in water sector' in India; Infrastructure Development Action Plan for Chhattisgarh – Final Report by Price Waterhouse Coopers (PWC)

11-15	Rs/m^3	10.00
16-25	Rs/m^3	15.00
Above 25	Rs/m^3	25.00
B. Un-metered	Rs/month	50.00
Partly Commercial		
A. Metered		
0-10	Rs/m^3	5.00
11-15	Rs/m^3	15.00
16-25	Rs/m^3	25.00
Above 25	Rs/m^3	25.00
B. Un-metered	Rs/month	150.00
Commercial		
A. Metered		
Upto 500	Rs/m^3	35.00
Above 500	Rs/m^3	60.00
Pvt. Hospitals (above 500)	Rs/m^3	80.00
B. Un-metered	Rs/month	400.00 (Pvt. Hospitals 800.00)
Institutional		
A. Metered		
Govt Hospital	Rs/m^3	20.00
Private School	Rs/m^3	40.00
B. Un-metered		
Govt Hospital	Rs/month	200.00
Private School	Rs/month	400.00
Public Tube wells supply (un-metered)	Rs/month	40.00
W/sewerage charge (un-metered)	Rs/month	10.00

SOURCE Website of CMWSSB - http://www.chennaimetrowater.tn.nic.in

Note: In addition minimum monthly charges, including sewerage charges: domestic – Rs.50/dwelling or flat; commercial – Rs.400 (non-water intensive use), partly commercial – Rs.150, institutional – Rs.200 (govt hospital), Rs.400 (private hospital).

The existing tariff is fully able to recover the O&M costs of Board as well as the debt servicing costs and depreciation. The major positives in the existing system are (ADB 2007):

1. The board has a very low UFW at 17%, and continuous efforts are made to further reduce them.
2. Financial management is good, with the lowest operating ratio at 0.44 and accounts receivable equivalent to 1.1 months.
3. The average tariff for the Board works out to Rs.10.87/m^3 while the O&M costs are approx. around Rs.6.09/m^3. Thus it can be said that the Board has been generating revenue surplus.
4. Subsidies are well-targeted and are disbursed to the subsidized group through distribution of free water from tanks and public fountains.

5. Private sector involvement through service, management or BOT contracts is also a positive signal in making the Chennai water board self reliant in future.

The major drawback of the existing tariff system is that though 100% metering has been achieved at production stage, only 3.5% of total connections are metered at consumer level (ADB, 2007). This also makes the figure for Unaccounted for Water (UFW) only a best estimate and not actual number. Also the distorted tariff structure i.e. overcharging the commercial users while subsidizing domestic consumption may lead to loss of high revenue generating users.

Hyderabad

The metropolitan city of Hyderabad has a separate (independent) agency for urban water supply and sanitation, the Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB). Brief overview of the Hyderabad water sector is presented below.

Institutional Framework

As per the Hyderabad Metropolitan Water Supply and Sewerage Act 1989, the two existing public departments of Public Health Engineering Department (for water supply) and Municipal Corporation of Hyderabad (for sanitation services) were consolidated together to form the HMWSSB in 1989. HMWSSB is a para-statal authority for all the Capital works, Operations & Maintenance, and Revenue functions related to water supply (to all the domestic, industrial, and commercial users), sewerage collection, treatment and disposal within the metropolitan city of Hyderabad. Further, though the Act states that board may levy its own charges and fees for the services rendered by it, state government plays a major role in tariff fixation and its revision.

Legal Framework

The HMWSBB was constituted with the aim of establishing a body separate from the government which would have sufficient financial powers to implement its decisions. However, in working, the HMWSSB continues to be influenced by the government. This is evident in the formation of the Board of Directors, which is headed by the Chief Minister of Andhra Pradesh as chairman.

Tariff-setting mechanism and tariff structure

Water tariff is levied in such a way to at least provide enough revenue to cover the O&M charges, debt-servicing cost, depreciation, etc. The tariff structure is volumetric tariff based on actual consumption, and a monthly minimum charge in case of non-metering based on pipe size. Following are the main features

of tariff structure applicable in Hyderabad:

1. Two categories of consumers – Group housing and individual connections (including individual households, industries, municipalities, public institutions, government institutions, etc.).
2. Volumetric tariff is charged from metered connections according to actual consumption.
3. Monthly minimum charge is applicable for unmetered/non-working meters according to pipe size.
4. Bulk consumers to enter into separate agreements with the Board.
5. Rebate of up to 20% is provided for municipalities and public institutes.
6. Special per unit charge for industries where water is used as a raw material.
7. 35 % of the consumption charge is towards sewerage maintenance.
8. Charges for new connections have been provided depending upon the pipe size.
9. Sewage cess of 20% is also levied.

The existing tariff structure is summarised in tables 4.6 & 4.7 below.

Table 4.6 Water cess tariff levied by HMWSSB

Category	Description	Consumption KL/month	Rate Rs./KL
1	All water supply connections other than covered by category 2 below	0-15	6.00
		16-30	8.00
	(A) Where the monthly	31-50	15.00
	Consumption is 500 KL or less	51-100	20.00
	(B) Where the monthly	101-200	25.00
	Consumption exceeds 200 KL	Entire consumption	35.00
2	(a)Municipalities, Panchayats, Local Authorities, Cantonment and housing colonies (Other than Industrial housing colonies owner and maintained by institutions /Organizations / departments / Undertakings / industries) and Multi-storied residential apartment complexes (c).	Up to the agreed quantity Above the agreed quantity	Rs.6.00 Rs. 35.00

SOURCE Website of HMWSSB

Note: 1. In respect of Government-run hospitals, educational institutions, welfare hostels, falling under Category-I (B), a rebate of 20% is applicable;

2. In cases where the water is used as the raw material, for the manufacture of end products such as, mineral water, soft drink, alcoholic beverages etc., the rate applicable is Rs. 60/- per KL irrespective of consumption.

3. In cases of multi-storied residential apartment complexes, where specific agreements are not entered into, the agreed Quantity is deemed to be 15 KL multiplied by the number of residential apartments in the complex, as per MCH/ Municipality.

Table 4.7 Monthly Minimum Charges levied by HMWSSB

Category	Description	Monthly Minimum Charge
(a)	Where individual agreements are entered into with the customer for water supply	Minimum charges as agreed to in the agreement or the charges applicable to 60% of the agreed quantity.
(b)	Individual domestic houses	Rs 90/month
(c)	In the cases of customer under category-I where the complex consists of five or more residential apartments as indicated in the plan approved by the MCH/municipality And the approval is for a residential Complex or Commercial-cum-residential Complex.	Rs 90/month
(d)	In the case of multi storied residential Apartment complexes falling under Category-II, i.e., group housing as Defined in the notes to the boards proceeding no.114, dt.29-05-2002.	Rs 90/month
(e)	In all others cases, the minimum charges Rs./month the size of the pipe size connection	15 mm (1/2") – Rs 90/month 20 mm (3/4") – Rs 270/month 25 mm (1") - Rs 600/month 40 mm (1-1/2') – Rs. 1500/month 50 mm (2") & above – Rs 3200/month

SOURCE Website of HMWSSB

Note: 1. In all cases of bulk supplies, multi-storied buildings and non-domestic supplies, where the monthly demand / consumption exceeds 500 KL per month the consumers are required to enter into agreements with the board for supply of water.

2. In all cases, where the agreed quantity is 500 KL per month and above, the minimum monthly charges levy able shall be the consumption charges for 60% of the agreed quantity.

3. In all cases where the consumption exceeds the agreed quantity, connection charges shall be payable on the quantity exceeding as per the tariff in force. Besides, additional consumption deposit shall also payable as determined by the Board form time to time.

Furthermore, there is no incentive provided/penalties imposed for improving efficiency on any count and review of secondary literature does not provide any explanation for the rates set for various categories.

Bangalore

TERI team visited Bangalore to understand the existing practices for fixing water tariffs. Bangalore forms an important case-study as it has the highest level of domestic metering. It has a

volumetric tariff structure and also focusing on recovery of full costs. This section discusses the key findings of TERI.

Institutional framework

The Bangalore Water Supply & Sewerage Board was set up in 1964 under the Bangalore Water & Sewerage Sanitary Act 1964. All the water and sewerage related assets of the Bangalore city were transferred to the Board on its establishment. The Board is responsible for source management and distribution of water in the city. It is responsible for both O&M and Capital works. The sources of water supply are Cauvery, Arkavatty - T G Halli and Hessarghatta rivers. The board has approx. six lakh consumers.

Tariff setting mechanism and tariff rates

As per the Bangalore Water & Sewerage Sanitary Act of 1964, the Board is allowed full cost recovery (at no profit no loss basis). The city has very high level of metering (board claims 100% metering and collection efficiency of 99%) and the city charges volumetric tariffs. Consumption is metered at both the supply end and the consumer end. Losses are about 50%.

The main categories of cost are: power consumption, establishment, R&M, A&G and depreciation. No charges for bulk water as the source is owned (developed) by the board. Table 4.8 gives a break-up of costs involved in water provisioning of BWSSB.

Table 4.8 Break-up of costs of BWSSB

Cost components	% of Total
Establishment	20.1
Electricity	59.5
Chemicals	-
General Repairs	7.6
Raw Water	-
Interest payments	12.8
Others	-
Total	**100**

SOURCE K S Sridhar and O P Mathur. 2009

The per unit cost of water is Rs.12.98 per kl while the average cost recovery through tariffs is Rs.13.79 per kl. For any tariff review, a proposal is prepared by the board, submitted to the councillors for voting and then sent to the government for its approval. General revision of rates is undertaken every three years. Hike in electricity price is considered as pass through.

The latest tariff rates applicable from 2002 onwards for the major categories of consumers are summarized in table 4.9 below.

Table 4.9 Applicable water tariff by BWSSB

Category & Consumption	Revised Water Tarrif Per Kilo Litre
Domestic (Sec. 36(i))	Minimum Rs 90/-
1) 0-15000	6
2) 15001-25000	8
3) 25001-50000	12
4) 50001-75000	30
5) 75001 & above	36
Non-Domestic	Min Rs360/-
1) 0-10000	36
2)10001-20000	39
3) 20001-40000	44
4) 40001-60000	51
5) 60001-100000	57
6) Above 100000	60
Industries	60.00/KL
Bidadi Industrial Area	51.00/KL
Lorry loads(BMP/BDA)	250.00/Lorry
Swimming pools	60.00/KL
Public Fountains	3000.00 per annum
Raw Water to Industries & Defence	36.00/KL

SOURCE Website of BWSSB

Raipur

TERI team visited Raipur in order to understand the roles of various institutions involved in distribution of water to end users in urban areas, pricing of water, collection and billing of water, etc. This section discusses the key findings of TERI.

Institutional framework

Raipur Municipal Corporation (RMC) is responsible for supply of water to urban consumers in the city. The Public Health Engineering Department of Chhattisgarh under takes capital investments. RMC is also responsible for billing and collection and other operation and maintenance (O&M). The major source of water to Raipur is Gangarel Dam which is built on River Mahanadi. Kharun River is supplying water to Raipur during a lean period. About 65 – 68 % of the total area of the city is covered with piped distribution and about 20% is serviced with borewells. Uncovered area of about 11% is supplied through tankers. For the year 2009, demand for water was about 250 MLD as against supply of about 180 MLD.

Tariff setting mechanism and tariff rates

RMC charges for water at a flat rate based on the ferrule size as per the following tariff structure:

Domestic
Per day charges for ½" connection- Rs 2.00
Commercial
Per day charges for ½" connection - Rs 4.90
Per day charges for ¾" connection – Rs 15.00
Per day charges for 1" connection – Rs 25.00
Per day charges for 1½" connection – Rs 40.00
Per day charges for 1¾" connection – Rs 70.00
Per day charges for 2" connection – Rs 100.00
Per day charges for 2½" connection – Rs 130.00

One time annual water charges is collected from consumer every year. The tariff is fixed without consideration of costs involved in the provision of water supply and sewerage services. The major cost incurred by the Corporation includes operations & maintenance, water treatment cost, electricity charges, bulk water procurement charges and distribution costs. State is planning to set a Municipal Regulatory Authority. Such an Authority is expected to streamline the water tariff setting procedures. As regard the cost recovery, RMC is able to recover just about 34% of its cost from the water tariff.

Problems in existing tariff system

A review of RMC's pricing of water practice presents certain issues as briefly explained below:

- At present, water charges are able to recover only part of O&M costs; while in future full recovery of O&M costs is envisaged by the corporation. However, the water charges do not recover the capital costs or cost of future expansion incurred by the corporation.
- The actual per unit cost incurred in supplying water to domestic connection is about Rs 2.84 per litres. Out of this, about Rs 0.70 per litres is recovered from the consumers.
- The actual level of consumption by consumers is not known as there is no metering of water in the city. However, RMC plans to introduce metering in the phased manner in city in near future. In the first phase metering could be introduced in multi stored commercial sector, followed by metering in all commercial sector and thereafter extending the same to rest of the city.
- Large quantum of water, about 50%, is lost as non revenue water as there exist about 7000 public taps. However government plans to phase out the public taps through its scheme called 'Bhagirathi Nal Jal Yojna' for providing domestic water connection for poor. Under the scheme all poor houses in Municipal Corporations are given free water connections. However the water charges for usage of water are collected fro these houses. Such a scheme would help in phasing out of public taps and would also result in

conservation of water

- There is no separate accounting done by RMC for the cost and revenue from water supply

Table 4.10 gives a comparative summary table of key institutions, legal framework and pricing mechanisms in UWSS in some of the Indian cities reviewed.

Table 4.10 Comparative summary table of Indian cities studied

Particulars	Ahmedabad	Delhi	Chennai	Hyderabad	Bangalore	Raipur
Institutional and Regulatory Framework						
Agency type	Municipal Corporation	Para-statal	Independent Board	Independent Board	Independent Board	Municipal Corporation
Utility	Ahmedabad Municipal Corporation (AMC)	Delhi Jal Board (DJB)	Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)	Hyderabad Metropolitan Water Supply and Sewerage Board (HMWSSB)	Bangalore Water Supply and Sewerage Board (BWSSB)	Raipur Municipal Corporation (RMC)
Independent Regulator	Bill drafted, Act pending	Nil	Nil	Nil	Nil	Nil
Operational Framework						
Operation and maintenance	Yes	Yes	Yes	Yes	Yes	Yes
Capital works	No (State Government)	Yes	Yes	Yes	Yes	No
Revenue function	Yes	Yes	Yes	Yes	Yes	Yes
Tariff mechanism and structures						
Tariff fixation	State Government	DJB (with state intervention through subsidies)	CMWSSB (with state intervention through subsidies)	HMWSSB (with state intervention through subsidies)	BWSSB (with state intervention through subsidies)	RMC (With approval from state government)
Tariff structure	Single part; Non volumetric flat rate	Two part; IBT	Two part; IBT	Two part; IBT	Two part; IBT	Single part; ferrule based
Tariff subsidy	Yes	Yes	Yes	Yes	N/a	N/a
Water utility performance (in percentages)						
Coverage area	85	N/a	89.3	N/a	N/a	85
Full cost recovery	No	No	O&M cost fully recovered	No	O&M cost fully recovered	No
UFW	20	50	17	55	50	N/a
Metering	Nil	76	3.5	N/a	100	Nil
Collection efficiency	70-75	35	100	N/a	99	N/a

Key findings from national experience

The key findings from review of national case studies can be summarised as follows:

- **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 not available, on average, prices or recoveries from the sale of water and other charges relating to water provision are approximately 22-25 % lower than the O&M costs (KS Sridhar and OP Mathur.2009). 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 (Usha P Raghupati and Vivian Foster. 2002), raising serious concerns about the financial and economic viability and sustainability of urban water utilities (The World Bank. 1995). 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 enormous burden on water supplying entities.
- **Arbitrary pricing structures.** In the existing system, not only are the prices kept low, the method for charging is arbitrary and not clear. Usually no principle is followed for setting water prices, while strong political influence cannot be ruled out.
- **Under pricing 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[5]. Most households face limited hours of service, and water services is uniformly sub-standard. The cost of intermittent water supplies for households is said to be high; the average capital cost for installing pumps, water filters, tanks and other equipments is estimated at Rs.2,620 per household (PS Rana.2003). In Delhi, the annual cost of reducing water supply unreliability is placed at Rs.844 per household (Marie Helene Zerah. 2000). 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

[5] Source: www.worldbank.org

for service improvements".

- **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 the non-poor households. Subsidies on private taps are poorly targeted, as no more than 30 percent 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.
- **Under pricing has affected the finances of state governments adversely:** Governments 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% of their gross domestic product.
- **Inefficiencies in water pricing.** In addition to inadequate pricing, water sector in India is characterised with huge inefficiencies such as unaccounted for water, poor quality, low cost recovery, etc. This also impacts cost recovery and hence the poor financial standing of the water utility.

Given the above shortcomings of existing pricing practices in most urban cities in the country there is a need to develop a set of guidelines to be used as basis for charging for water by most urban local bodies.

CHAPTER 5 Review of pricing reforms and principles in electricity sector in India

For framing water tariff principles, it is important to study the experience in other infrastructure sectors with respect to tariff reforms. Electricity sector has undergone reforms and restructuring and now follows a defined tariff setting mechanism. Thus, this chapter summarizes the key findings from review of the tariff setting mechanism in electricity sector in India.

Overview of electricity reforms

Electricity sector reforms in India started in 1990s. Before setting up of State Electricity Regulatory Commissions (SERCs), the tariffs were fixed and realised by the State Electricity Boards (SEB) and Electricity Departments. However, the state governments were constantly involved in the process, so as to provide concessional tariffs to certain sectors-mainly agriculture and domestic consumers. These sectors are generally cross-subsidised by the commercial and industrial sectors and are also directly subsidised by the government. On the other hand, SEBs were not adequately compensated for this loss in revenue i.e. settlements were made in book of accounts of the government while cash payments were not released and thus they incurred heavy losses. The attempt to make up these losses by raising industrial tariffs led to increasing migration out of the grid through the captive generation route. As a result, the financial position of the SEBs deteriorated every year.

The Electricity Act 2003 (EA 2003) notified in June 2003, empowered the SERC's to specify the terms and conditions for the determination of tariff and ensures transparency in the tariff setting process. SERC's have to constitute proper measures to allocate revenue requirement in an economically efficient manner by reducing the extent of cross subsidies. The Act also provides guidelines and procedure to be adopted for the purpose of tariff determination and issuing of tariff order. Most SERCs have issued their regulations for tariff determination and tariff orders rationalizing tariffs including charges for meter connection and other services.

While the EA 2003 provides the legal framework for tariff determination, the policy framework has been provided by the National Tariff Policy (NTP) and the National Electricity Policy (NEP). The NTP recognizes that rational and economic pricing of electricity is one of the major tools for energy conservation and sustainable use of ground water resources. It also refers to

Section 61 (g) of the EA 2003, which states that the Appropriate Commission shall be guided by the objective that the tariff progressively reflects the efficient and prudent cost of supply of electricity.

Approaches to tariff determination

Traditionally, SERCs have been following the rate of return regulation or cost plus approach to tariff determination. The National Tariff Policy however suggests performance based cost of service regulation or Multi Year Tariff (MYT) approach to tariff determination and gradually most of the SERCs are moving towards this approach. This is because the MYT approach provides more incentives for regulated discoms to reduce costs, improve quality of service parameters, and encourage efficient investment. Following section describes the above two mentioned tariff determination approaches in detail.

Rate of Return Regulation or Cost-Plus Approach

This method enables a utility to collect all its prudently incurred expenses, in addition to a regulated return on prudent investment. The formula adopted for calculation of annual revenue requirement is as follows:

$$\mathbf{ARR = [RB \times RoR] + E_{PPC} + E_D + E_{O\&M} + T}$$

Where,
ARR = the total annual revenue requirement of the utility (after taking credit for any subvention from State Government)
RB = the rate base (required investment) of the utility i.e. the Capital base in case of a licensee and Fixed assets in case of the Board
RoR = the allowed rate of return on investment (debt and equity)
E_{PPC} = annual power purchase costs
E_D = annual depreciation expense
$E_{O\&M}$ = annual operation & maintenance (O&M) expense including repairs & Maintenance cost, Employee Cost and Administrative & General expenses
T = annual taxes paid by the utility

The above formula derives the annual revenue requirement of the utility. Following are the sources of revenue through which ARR of the utility is recovered:

- Income from sale of power within the state which is based on tariffs as determined by the SERCs
- Income from sale of power outside the state
- Contract agreements between states for exchange of power
- Non tariff income in forms of meter rentals, delayed payment surcharges and other charges and rebates

Performance based cost of service regulation or MYT Approach

This method introduces an element of incentives and disincentives for effecting improvements in certain key function areas based on performance above or below the "normal range". SERCs in India follow a Multi Year Tariff (MYT) Framework for incorporating performance based cost of service regulation.

Under MYT, SERCs fixes targets for certain factors which are controllable in nature, like O&M expenses, financing costs, T&D losses and other performance measures. In case utility exceeds its targets during control period, it would make profits and if it falls short, it would bear the losses. Further there are certain factors which cannot be controlled like escalation in fuel costs resulting in changes in power purchase costs, sales, taxes, inflation, etc. Under MYT, any gain/loss due to changes in uncontrollable factors is passed through in ARR of the utility, while any gain/loss due to changes in controllable factors is usually shared by utility and consumers as prescribed by the regulator. Under MYT, ARR is approved for the entire control period, the tariffs are revised annually.

Following is the description of treatment of certain key function areas as per the NTP:

- The framework feature a five-year control period. The initial control period may however be of 3 year duration for transmission and distribution if deemed necessary by the SERC on account of data uncertainties and other practical considerations
- Benchmarking is an integral part of MYT regulation. Suitable benchmarking studies need to be conducted to establish the “desired” performance standards. Different benchmarking techniques may be used based on the powers and discretion of the regulator, extent of information and data available from the utilities, structure and power of the regulator. Also separate studies may be required for each utility to assess the capital expenditure necessary to meet the minimum service standards.
- All power purchase costs need are considered legitimate unless it is established that the merit order principle has been violated or power has been purchased at unreasonable rates.
- Targets are set to reduce AT&C losses gradually. AT&C loss reduction is incentivised by linking returns in a MYT framework to an achievable trajectory.
- Working capital is allowed duly recognising the transition issues faced by the utilities such as progressive improvement in recovery of bills. Bad debts should be recognised as per policies developed and subject to the approval of the State Commission.

- Pass through of past losses or profits are allowed to the extent caused by uncontrollable factors. During the transition period controllable factors should be to the account of utilities and consumers in proportions determined under the MYT framework.
- Uncontrollable costs should be recovered speedily to ensure that future consumers are not burdened with past costs. Uncontrollable costs include (but not limited to) fuel costs, costs on account of inflation, taxes and cess, variations in power purchase unit costs including on account of hydro-thermal mix in case of adverse natural events.

Tariff setting process

A defined procedure is followed for setting tariffs in each state. SERCs are guided by NTP while determining tariff for their respective state. Utilities in each state file their proposed Annual Revenue Requirement (ARR) for the ensuing year to their respective SERCs. SERCs in exercise of the powers vested under sections 61 and 62 of the EA 2003 and other powers enabling it in this behalf and after conducting detailed scrutiny of the costs submitted by the utility and submissions made by the utility and other stakeholders during public consultation process issues the tariff order within 120 days of acceptance of ARR filed by the utility. The tariff determination process is consultative in nature and SERCs take full cognizance of the public views and only then approve the ARR for the utilities. The tariff determination process has been described in figure 5.1 below.

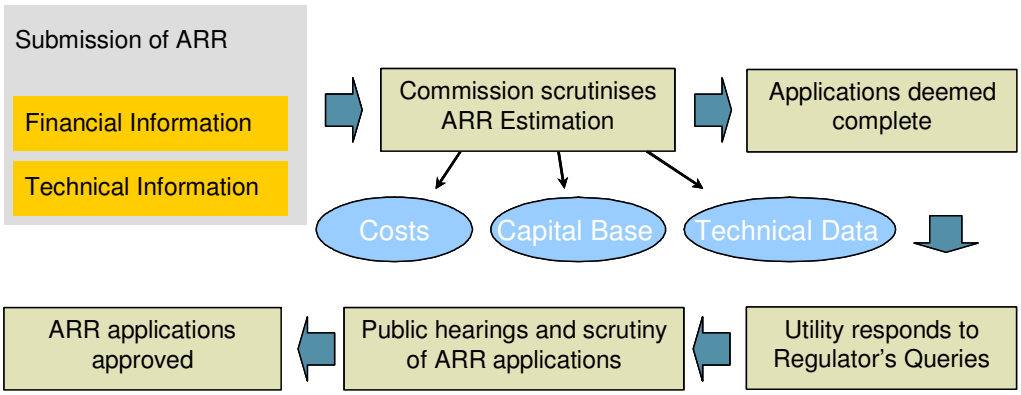

Figure 5.1 ARR Approval and determination process

The SERC while scrutinising the costs, takes the following steps:

1. Sales estimation – forecasts category-wise sales for ensuing year based on previous year's actual sales and historical growth trends.
2. Assessment of T&D loss – actual losses estimated on the basis

of load and metering studies undertaken by utilities. Targets for loss reduction are set at reasonable levels taking into account past trends. Further, most of SERCs link the loss reduction trajectory to incentive/penalty mechanism. In case of under-achievement all losses are borne by utility, while in case of over-achievement, profits are shared between utility and consumers as per ratio prescribed by SERCs.

3. Estimation of energy requirement – energy requirement is estimated after adding T&D losses to sales forecast for the ensuing year.
4. Own generation or power purchase – based on the energy requirement, the power available from own generation and power purchase needs of the utility are estimated. Though the power purchase costs are mostly allowed by SERCs on actual basis, prudence is employed to oversee that purchase is made based on merit-order dispatch and that cost of power is not very high.
5. Employees cost – justification of employee cost is based on trade-off between productivity of the employees and the rewards granted to employees. Also projections are based on actual figures and also measures undertaken for cost control.
6. Repair & Maintenance cost – in this case prudence check is carried out by a trade-off between the cost incurred and resultant improvement in quality of supply, productive use of additional expenditure and commitment of the licensee. Also most SERCs benchmark R&M expenses as a % of gross fixed assets. Depending on the conditions of the utility, suitable benchmarks are selected and incentive mechanisms put in place.
7. Administrative and General cost – in this case also prudence check is made between the cost incurred and resultant improvement.
8. Capital recovery costs – inclusive of interest costs, depreciation and Return on equity estimated on basis of actual expenditure in the past, future investment requirements and prevailing rate of interests. All expenses are allowed only after thorough scrutiny by the SERCs.

In addition to the scrutiny made by the SERC of each cost element given in the petition by the utility, the ARR petition is circulated in public domain and notices are published in local newspapers by the SERC inviting comments on the petition. Public hearings are conducted to solicit views/ objections/ comments from public on tariff rebalancing by utility. The ARR approved based on above procedure i.e. scrutiny of costs and public consultation is then send to the State Government for approval. The approved amount of subsidy to be received from state government and the appropriate tariff hike is then allowed by SERC and is reflected in the tariff order. SERCs also consider

following matters while determining the retail tariffs for electricity:

1. **Metering levels –** 100% metering level is essential for correct estimation of sales, losses and improved revenue collection. This also helps in setting realistic loss reduction targets. At central level, Government of India initiated the Accelerated Power Development Reforms Programme (APDRP) for electricity utilities under which various schemes are approved for upgrading their metering systems, aiming at achieving 100% metering and achieving substantial reduction in losses. Such utilities receive capital grants from central government. Keeping this in mind most utilities focus on achieving 100% metering for all consumer categories, except in agriculture wherein also sample metering is used to estimate correct demand.

2. **Subsidies and cross subsidies** – state governments review the tariff proposal sent by the SERC, after detailed scrutiny and public consultation, and decide on appropriate tariff hike while providing the remaining revenue gap through cash subsidies. This is essentially to subsidise agriculture and domestic consumers. In addition these users are cross-subsidised through charging of higher tariffs from industrial and commercial consumers. The SERCs are guided by the provisions of NTP in regards to subsidies and cross subsidies and directs the utilities to follow the same or gradually move in that direction. Following are the key points relating to subsidies and cross subsidies as per NTP:
    a. State governments can give subsidy to the extent they consider appropriate as per the provisions of section 65 of the Act.
    b. Direct subsidy is a better way to support the poorer categories of consumers than the mechanism of cross-subsidizing the tariff across the board. Subsidies should be targeted effectively and in transparent manner.
    c. The State Governments may give advance subsidy to the extent they consider appropriate in terms of section 65 of the Act in which case necessary budget provision would be required to be made in advance so that the utility does not suffer financial problems that may affect its operations.
    d. Efforts would be made to ensure that the subsidies reach the targeted beneficiaries in the most transparent and efficient way.
    e. As a substitute of cross-subsidies, the state government has the option of raising resources through mechanism of electricity duty and giving

direct subsidies to only needy consumers. It also recognizes that this is a better way of targeting subsidies effectively.

3. **Billing and collection efficiency** – SERCs also considers improvements in billing and collection efficiency of the utility as it in turn impacts the revenue estimated. Measures which help in achieving 100% collection efficiency are promoted and allowed by SERCs.

4. **Cost of supply** –The tariffs should reflect actual cost of supply for that category of consumers and SERC should take cognizance of this fact. However, as per the NEP it is important to eliminate cross subsidies gradually i.e. without giving tariff shock to consumers. The guiding principle for the SERCs while determination of the tariff has been that tariff progressively is within plus or minus 20% of the average cost of supply of electricity.

5. **Benchmarking** – In addition to above issues, another important consideration is to conduct benchmarking studies of set reasonable base lines. The focus is not only on charging consumers but to also improve performance of the utility. Any improvements over the benchmarks may be given incentives so as to promote efficiency in performance.

Tariff Design

Retail tariff structure for electricity in a state is based on following principles:

- Two part tariff differentiating the fixed and variable charge is being presently followed in electricity sector.
- NTP suggest movement towards time differentiated tariffs for large consumers on priority basis for flattening the peak load and as an energy conservation measure.
- Tariffs should be designed in the manner that it provides incentive to encourage metering and billing based on metered tariffs especially for consumer categories that are presently unmetered to large extent.
- As per NEP, consumers below poverty line who consume below a specified level, say 30 units per month, may receive a special support through cross subsidy. Tariffs for such designated group of consumers will be at least 50% of the average cost of supply.
- Tariff for agricultural use should be set up based on cost of supply and the need of using ground water resources in a sustainable manner. Tariff for agricultural use may be set at different levels for different parts of a state depending of the

condition of the ground water table to prevent excessive depletion of ground water.

- Sate government may determine the extent of subsidy for different categories of consumers. However, provision of free electricity is not desirable as it encourages wasteful consumption of electricity.

Lessons from electricity tariff reforms

- As in the electricity sector, the first step to reforms in water sector is to carry out institutional reforms. Setting up of an independent regulatory body would go a long way in this regards. In electricity sector, prior to enactment of Electricity Act 2003, the State Electricity Boards and/or Electricity Departments set the electricity tariffs. The process involved constant interference from state governments and lack of transparency. However after enactment of the Act, the SERC's were empowered to specify the terms and conditions for the determination of tariff. This ensures efficiency and transparency in the tariff setting process. Similar policy changes may be carried out in water sector and independent regulatory bodies may be set up at state level for specifying terms and conditions for tariff determination.
- The functions of a water regulatory authority would include a) setting tariff guidelines for charging for water supply; b) monitoring and ensuring adherence to guidelines by city-specific water utilities; c) providing link between government, water utilities and consumers; and d) advocating best practices in tariff setting in water sector to all stakeholders.
- Unlike electricity sector, water is a state subject and within every state, various city level agencies distribute water. Hence a state level water regulatory body may find it difficult to set or regulate tariffs for each city-specific agency. As such each city within a state may face unique challenges for water supply. Thus, an independent water sector regulatory body may set tariff guidelines for the state as a whole and city specific agency may adopt them according to local conditions.
- The tariff setting guidelines should be based on principle of cost plus approach or rate of return regulation. This would ensure that water supplying utilities will be able to achieve financial sustainability. However for improving the overall economic efficiency of water utilities, operating and performance benchmarks may be set and utility may be incentivised when these are met. However, the MYT framework for tariff setting may be adopted once the sector has shown signs of financial recovery and sufficient data on water costs is available in separate accounts.
- The following costs may be included while determining annual

revenue requirement by water utilities:

- Annual operation and maintenance costs (including employee, repair and maintenance and administrative and general costs),
- Annual depreciation cost,
- Cost of financing,
- Expected return on equity, &
- Taxes

However in the initial stages, only O&M costs may be recovered and gradually capital costs may be included.

- The sources of revenue to recover above costs by water utility will include following:
  - Income from sale of water
  - Non tariff income in forms of meter rentals, delayed payment surcharges and other charges and rebates
- Like electricity sector, two-part tariff should be determined for water sector also. Fixed charges would ensure sufficiency of revenue while variable charges would take into account consumption.
- Tariffs should be designed in the manner that it provides incentive to encourage metering and billing based on metered tariffs especially for consumer categories that are presently un-metered to large extent.
- State governments may continue to give subsidies, however they should be well targeted and transparent.
- Like in electricity sector, policy changes may also be adopted to promote pricing reforms in water. A state level water tariff policies may be notified detailing guiding tariff principles and approach adopted to achieve economic pricing in water sector.

CHAPTER 6 Economic model for pricing water

This chapter presents some of the principles and practices on tariff setting which should be considered while fixing guidelines for fixation of water tariff. The chapter learning's are based on experience in various Indian cities, international case studies and review of reforms in electricity sector. This chapter covers the following:

- Need for water tariffs
- Principles of tariff
- Alternative models for tariff setting
- Pricing strategy
- Tariff revision
- Approach for tariff determination
- Category-wise water tariffs

Need for appropriate pricing

As seen in previous chapter, most of the ULBs under price water as it is viewed more as a social good than as an economic good. This makes the ULBs financially unsustainable and also results in over use of water. This is because water (like any commodity) if undervalued or under priced is always overused or over exploited. Impact of under pricing of water vis-à-vis cost is indicated below:

1. Under pricing in relation to the cost affects the economic and financial viability and sustainability of urban water utilities.
2. Under pricing results in poor and unreliable water services.
3. Water subsidy is not a targeted subsidy. As water supply is provided to the rich and middle class and the poor are not provided with regular piped supply at residences, the subsidy benefits the rich. Un-served poor people in urban areas actually pay much higher price for the water (e.g. cost of water tankers, etc) as they have to procure water from private sources.
4. Under pricing affects investment in expansion of services.
5. Free water removes the "ownership" over the system from the public. As they do not pay for the water, they neither question nor feel they have a right to question ULB for low quality performance. If the citizen pays for water, this would enable them to exercise their rights and demand right quantity, right quality and consistency of water supply.

The gap due to under pricing of water has to be bridged, even in the short to medium term, through a government grant or a cross subsidy. This again puts a huge burden on government finances

or high consumption users. Thus, in effect, under pricing of water will lead to un-sustainable ULBs in the long run. In this scenario there is need to either reduce the cost of water or charge a higher tariff.

Given the negative impacts of under pricing water on financial sustainability of utility, quality of supply and efficient use of water, an appropriate pricing strategy needs to be formulated.

Principles of tariff fixation

Correct pricing of water, is however a difficult and complex issue. In case of water pricing, fine balance of several (seemingly) conflicting objectives and stakeholder' requirements have to be met. The policy objectives such as equity (among stakeholders), efficiency (in usage of resources, especially water), financial sustainability (to maintain and eventually replace the WS&S system in the long run) and full cost recovery (to operate and maintain even in the short run) have to be met by a water tariff.

The four main objectives to be kept in mind while setting water tariffs (Dale Whittington. 2002) are:

- **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 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.

- **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 (or fairness):** 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.

The above principles act as criteria for selection of an appropriate tariff. The other factors that need to be considered from a practical implementation point of view are:

- **Public acceptability:** The tariff should be acceptable to public in general and various political, social and financial groups.
- **Simplicity and transparency:** It should be simple to calculate for the municipalities (e.g. infrastructure, skill sets) and to verify for users. Tariffs for water services are based on a number of factors and assumptions such as cost recovery, sustainability, debt servicing and reinvestment. The determination of tariff for a particular segment of the customer profile may vary according to the policy and principles, objectives of the utility, political and social criteria. It is usually better if these criteria are transparent.
- **Ease of implementation:** The implementation of the revised tariff should not encounter significant barriers in terms of legal authority, administration competence, information requirements, or billing procedures.

Cost recovery and equity are the main criteria from the supplier point of view, whereas economic efficiency and affordability are the factors looked at by government's point of view in meeting its social obligations. Hence, in the light of these integrated objectives, pricing strategy for water supply requires a balanced approach.

In summary, the key elements of tariff philosophy should keep in mind following:

- ✓ **Cost recovery for financial sustainability**
- ✓ **Volumetric basis for equity**
- ✓ **Cross subsidization for the short run (affordability)**

Alternative tariff structures

Worldwide there are different models used for retail water pricing: especially single part tariff and two-part tariff. Alternative options possible are:

(a) Single part, variable tariffs: (volumetric consumption based)
   i. Uniform volumetric tariffs
   ii. Increasing block tariffs
   iii. Decreasing block tariff
(b) Single part, fixed tariff:
   i. Flat rate charge, ferrule based, ARV based, tap based charge
(c) Two part tariff

Single part, variable tariff structure

Here the tariff is based on volumetric consumption. However option exists for varying the tariff for different quantities of water consumed either on an increasing rate or decreasing or at a constant rate. Details of these tariff models are discussed in Table 6.1.

Table 6.1 Types of tariff models

S.No.	Type of tariff model	Definition	Objectives	Assumptions	Methodology
A.	Linear uniform volumetric tariff model	Under this model, users will pay in direct proportion to their consumption and the corresponding water charges vary entirely based on their consumption. But in most of the cases water is provided at subsidised tariff to the masses based on their affordability to pay.	✓ Ensuring cost recovery of relevant costs ✓ Incorporation of concept of water conservation ✓ Ensuring social equity ✓ Ensuring water availability for poor people irrespective of their paying capacity	✓ All elements of cost are recovered fully ✓ Average costs of water supplied is same for all	✓ Average cost per KL is computed based on total water supplied and total cost incurred at various levels. ✓ This average cost per KL is the base tariff charged to all customer groups. The subsidies to the various groups are provided on the base cost.
B.	Volumetric increasing block tariff (IBT) model	IBT provides more than one price for water used, where each price applies to a customer's use within a defined block. Prices rise with each successive block. The water slabs are determined based on consumption pattern of the	✓ Ensuring the cost recovery for O&M operation ✓ Ensuring the economic efficiency ✓ Incorporation of the concept of water conservation ✓ Market driven tariff	✓ All elements of cost are recovered fully ✓ Water consumption slabs are defined based on water norms for various types of households.	✓ Average cost per KL is computed based on total water supplied and total cost incurred at various levels ✓ Weights are derived based on water consumption norms.

		public. For the purpose of development of the model the slabs are adopted based on per capita water consumption norms defined for local bodies, which forms the base for the design. Hence this model is more tuned towards the determining of tariff for local bodies based on their type.			These weights define the corresponding level of per capita water consumption and depict the ratio for the tariff in these slabs.
C.	Tariff model based on cost incurred in servicing different type of consumers	This model is somewhere in between the ULB based pricing and uniform tariff	✓ Ensuring social equity ✓ Ensuring water availability for poor people irrespective of their paying capacity	✓ ULB are incurring different costs for supplying water to different groups of customers categorized as commercial, public stand post and households. As the cost of production is different for these groups of customers, hence the tariff should also be different for them.	✓ In this model, it is suggested that at the ULB level itself, cost will be segregated between the different categories of consumers based on data on water pumped. ✓ For all ULBs, cost should be aggregated consumer category wise and cost per KL will be calculated. ✓ The subsidies if any can be provided on it.

Of the various single part, variable tariff structures explained above, Increasing block tariffs (IBT) are popular tariff structure in many developing countries. As per a report of Asian Development Bank a majority of utilities in India (in their sample - 20 out of 32) used an IBT price structure. Many experts have shown their preference to IBT because it contributes to equity, recovery is easier and promotes conservation of water. In most of the IBT structures, the first block price is deliberately set below cost, in order to promote equity. In the design of IBT, much attention is given to the size and price of the first block.

However, an incorrect structure of the IBT leads to several shortcomings, such as difficulties to set the initial block, mismatch between prices and marginal costs, conflict between revenue sufficiency and economic efficiency, absence of simplicity, transparency and implementation etc.

The main advantages of IBT structure are:

1. IBT promotes equity because it forces wealthy households to cross-subsidize poor households.
2. The price associated with the highest block can be made very high to discourage "wasteful" water use.
3. With more water usage at economy level, the cost could increase. IBT can match with the increasing marginal cost.

Single part, fixed tariff structure

In ULBs which do not have metering for households, a flat tariff has to be used as the norm. This would be a period charge (say rupees per month), irrespective of the volume of water consumed.

Some variants that are used in different cities in India include: variation based on number of taps, number of bathrooms etc. Also the tariff could vary based on the size of connection (Ferrule). Further in some cases water is charged as a cess based on property tax or water tax and it represents a tax based on the value of the property (indicative of the value addition by a water connection to a property value).

Two component tariff structure

Single part tariff can be either fixed tariff (with predetermined lump sum amount) or variable tariff (charged on consumption of water basis): whereas the two-part tariff is a combination of both.

A water user's monthly bill may include two distinct components: a part based on the volume of water used, and another part based on factors other than water use. ULBs spend on fixed costs and variable costs to supply water. The fixed costs include establishment, load based power costs, depreciation, loan servicing costs etc. The fixed costs are actually fixed in the short run only. The variable costs could include pumping costs, water treatment costs, operation and maintenance costs etc. Hence a two part tariff based on the fixed costs incurred by the ULB and another based on the marginal cost is one option.

The economic theory associated with full cost recovery in capital intensive utilities, focuses (a) on efficient pricing to achieve full cost recovery (of water supplied) and (b) on optimal capacity given natural monopoly (of infrastructure). Hence a two-part tariff structure recovering both a fixed charge and a variable charge would be an ideal tariff structure. This would also match with the requirement of the consumer as he obtains a benefit from water connection (fixed) and a benefit from use of water (variable with quantity of water). The benefit from a water (or sewerage) connection could for example be increase in worth of his property due to water connection or time savings (vis-à-vis fetching a public stand post). The benefit from water could

include health benefits, consumption benefits etc.

Evaluation of tariff models to suitability for the objective set

A comparison of these tariff models is made to evaluate the feasibility to meet objectives summarized in previous section and results are presented in the table below.

Table 6.2 Evaluation of tariff models

Tariff structure	Cost recovery	Economic efficiency	Equity	Affordability
Fixed charge	*Adequate* Provides stable cash flow if set at appropriate level	*Poor* Does not send a message about the cost of additional water	*Poor* People who use large quantities of water pay the same as those who use little	*Adequate* If differentiated by having different tariffs depending on ability to pay
Uniform volumetric charge	*Good* If set at appropriate level. Moreover adjust automatically to changing consumption	*Good* If set at or near marginal cost of water	*Good* People pay according to how much they actually use	*Average* However it is possible to differentiate set of consumers by geographical/ social barriers
Increasing block tariff	*Good* Only if the size of the blocks are well designed	*Good* If water is sold at marginal cost or near to marginal cost	*Average* Normally people do not pay according to the costs their water use imposes on the utility	*Poor* Penalise poor families with large households and/or shared connections
Decreasing block tariff	*Good* But only if the sizes of the blocks are well designed	*Good* If water is sold at marginal cost or near to marginal cost (Applicable only when there is no water scarcity)	*Poor* People do not pay according to the costs their water use imposes on the utility	*Poor* This would only facilitate higher consumption categories with better affordability and goes against the category with less affordability

Thus from the above, it seems, uniform volumetric tariffs and IBT structures are more adequate in meeting the objectives of water pricing than other type of tariff structures.

In summary, it is recommended that following tariff structure be used in setting water prices:

- ✓ **A two part tariff is recommended for the short run**
- ✓ **The Increasing Block Approach could be used for variable water charges.**

Pricing strategy

A robust pricing strategy needs to be developed. It would include consideration of following factors while deciding the appropriate tariff structure:

- Uniform state level tariff: should a single tariff be applicable for the entire state or should each ULB be free to adopt a different tariff level or tariff approach. The current system is a state level tariff with variations by type of ULB or based on debt obligations of the ULBs
- Costs components
- Subsidy
- Other factors
    - Unaccounted for water
    - Connection costs
    - Metering
    - Tariff for public stand posts

Uniform tariff for state versus ULB based tariff

The most important issue which is analysed first and which also sets out the guidelines for arriving at the tariff structure is: What is the best possible option between ULB based pricing and state level tariff. In this case, uniform tariff means that the same tariff is applicable for all ULBs in a state but this may vary based on consumer category. The pros and cons of uniform tariff are presented in table below.

Table 6.3 Pros and Cons of uniform tariff pricing

Pros of uniform tariff pricing	Cons of uniform tariff pricing
❖ Easy to administer by government or any independent regulator	❖ Very often does not reflect the true cost of production and hence goes against the economic principles
❖ Ensures social equity and affordability for all class of customers	❖ May provide subsidy to high cost customer, hence violating principle of equity and affordability
❖ Avoids the risk of charging different rates to local bodies	❖ May not be acceptable to customers for whom cost of production is less than tariff
❖ Reduces the administrative costs	❖ May discourage customers from water conservation
❖ Ensures the viability of small schemes where cost of production is abnormally high because of lesser population covered under the scheme	
❖ Makes the process of tariff revision simple	
❖ Ensures uniform service to all customers	
❖ Encourages investments in water supply infrastructure in an open system market	

In a country like India, where most of the Indian states have high un-serviced and below poverty line (BPL) population and where production cost of water per KL is very high, a uniform tariff policy can be adopted which promotes social equity and affordability. Another important reason for using uniform tariff

could be to protect consumers from the inefficiencies of an ULB. ULBs especially the smaller ones benefit from the availability of a ready made tariff. At present also, most states follow uniform tariff policy but with specific variations in different ULBs as need to use an appropriate tariff to suit the local conditions is accepted.

In summary, it is recommended that in the short run, when the ULBs do not have a good costing or information system, uniform tariff can be adapted, more from an implementation point of view. Slowly over the future, the ULBs can be allowed to operate within a pre decided band. Flexibility in having ULB specific tariff can be permitted within the overall limits.

Cost components

The most important step in devising the water pricing strategy is to identify the costs associated with its provision. Accurate estimation of costs is important to remain efficient and recover the right price from consumers.

The various costs involved in provisioning of water by a ULB may be divided into direct (which are essentially incurred by the ULB in servicing water) or indirect costs (which are incurred for facilitating the main activity of the ULB). Within direct costs, costs may further be divided into fixed (those are incurred by ULB irrespective of generation) and variable (those that are directly proportionate to generation of water) costs. These costs can also be bifurcated on the basis of stages in water supply i.e. transmission, treatment and distribution costs.

Table 6.4 summarises the various costs involved in water provisioning based on nature of costs (direct and indirect) and stages of water supply (transmission, treatment and distribution).

Table 6.4 Type of costs in water provisioning

Type of costs	Transmission	Treatment	Distribution	Other
A. Direct costs				
i) Fixed	✓ Power cost (fixed charge) ✓ Manpower ✓ Repairs & maintenance	✓ Power cost (fixed charge) ✓ Manpower ✓ Repairs & maintenance treatment	✓ Power cost (fixed charge) ✓ Manpower ✓ Repairs & maintenance	✓ Interest on loan ✓ Interest on working capital ✓ Depreciation ✓ Return on assets ✓ Major maintenance costs ✓ Lifecycle capital costs

Type of costs	Transmission	Treatment	Distribution	Other
ii) Variable	✓ Power cost (usage charge) ✓ Bulk water rates ✓ Royalty	✓ Power cost (usage charge) ✓ Chemicals ✓ Fuel	✓ Power cost (usage charge)	
B. Indirect costs				✓ Establishment ✓ Administration charge

The various elements of costs, as mentioned above and subsequently their integration into a costing system are explained in detail below.

A. Operation and maintenance (O&M) cost components

1. Manpower costs

This is a direct cost incurred by the ULB at all stages of water supply. This cost is fixed in nature and is incurred irrespective of water supplied. It is estimated on the basis of number of employees of different grades at transmission, distribution and water treatment plant and the average salary paid to them.

2. Power costs

This is one of the major components of water costs. The quantum of the power costs vary across cities depending on location of water source. This is a direct cost and can be both fixed and variable in nature. Power is consumed at treatment sites and also at water pumping sites in case of transmission and distribution of water.

The fixed power costs are determined through the Horse Power (HP) of pumps installed at transmission, distribution and water treatment plant sites and the power tariffs applicable per HP. While the variable power costs are determined through the electrical units consumed at above sites and the rate of power per unit.

3. Bulk water rates

Most of ULBs acquire water from source i.e. state water bodies at bulk water rates. They are variable in nature and are similar to the power purchase costs in electricity sector. This cost is incurred at the transmission stage and is estimated as per the water supplied in bulk and the bulk water rate charged by the state water bodies' development authorities.

4. Chemical or treatment costs

These costs are variable in nature i.e. directly linked with the amount of water processed at the water treatment stage. These costs are directly incurred by the ULBs and are an important

component of water supply costs as many state governments have water quality standards which are monitored timely.

5. Repair and maintenance costs

These costs are one of the most important direct costs incurred by the ULB. They are incurred at each stage of water supply at periodic intervals. These costs are based on cost of major replacements (e.g. pumps), major maintenance charges and periodicity of major maintenance. Also material costs necessary for repairs and regular maintenance are estimated under this cost component.

B. Capital recovery cost components

1. Interest costs

This is one the important components of capital recovery. It is estimated based on balance amount of loan and the prevalent rate of interest.

In addition interest on working capital is also one of the cost components. This is estimated based on the working capital requirements of the ULB and the rate of interest.

2. Depreciation

As the assets depreciate in value over time, it is essential to provide for depreciation costs. It is estimated based on the asset cost of various assets at transmission, distribution and water treatment plant site and the applicable depreciation rates.

3. Reasonable return

The water utility must earn a reasonable return on investment to be financially sustainable. The return on investment (or equity) is estimated based on the asset cost not financed through loans and the required rate of return. In this cost plus regulation as used in electricity sector to set tariffs should be incorporated. In this case, the tariffs are fixed such that, other than recovering its costs, a fixed rate of return is also available to the utility.

4. Life cycle costs

Other than the above costs, in case of recovery of capital costs, recovery of life cycle costs should also be considered i.e. cost of creation of a sinking fund for additional investment in future should also be taken into consideration. Sinking Fund is estimated based on life cycle costs as estimated based on year wise consumers, inflation rates and replacement cost of the assets.

In summary, though cost components may be identified, the key constraints in their accurate estimation are:

- ✓ **Non availability of quality data is a restraint in identifying all associated costs.**
- ✓ **All costs may not be captured initially through tariffs. The focus may be to recover the O&M costs. Capital recovery costs like sinking fund provision can be provided for in the future only.**
- ✓ **Most costing systems are cash based in the country, hence actual costs accruing to a particular period may not be known.**

Subsidy

Following are the key issues which need to be considered while determining water subsidy:

- Method of subsidization
- Targeting the subsidy
- Time period of subsidy
- Quantum of subsidy

Method of subsidization

There are two methods for building of subsidy in tariff models: direct subsidy i.e. government grant or by cross subsidizing the different category of users based on their ability to pay. Direct subsidy is desirable as it avoids charging extra amount from certain category of customers and also it keeps control over the utility towards minimizing its cost and improving overall efficiency.

Targeting the subsidy

Subsidy should be targeted towards 'economically disadvantaged' class of consumers. One way to target these consumers and incorporate subsidy through tariff structure is to have a slab of water tariff for 'lifeline consumption quantity' and expect the poor to limit their consumption to that level. This has been practiced in electricity sector and is also applicable in water sector through IBT structures.

Another option would be to rely on other systems for identification of the poor, including using the BPL ration cards issued under Public Distribution System (PDS) for essential commodities. However this would require that volumetric consumption system is used.

Time period of subsidy

In the short run, ULBs would not be able to raise the tariffs as the cost is several times the tariff. Hence, there should be a subsidy from the state to the ULBs to cover some of the gap between tariff and costs. Currently this is provided as State Finance Commission

(SFC) grants. This kind of a subsidy flow is required in the short to medium term till the tariff rates are adequate to cover the costs. Also in order to increase tariffs, adequate investments in quality of supply and metering, billing and collection would have to be made. In addition and more importantly, the public would need to be prepared for a higher tariff. A sustained public awareness programme would be necessary from a social and a legal angle for a phased reduction of the subsidy.

Further, cross subsidization also should not to be encouraged in the long run beyond some extent, as it could drive out the high charge customers (either by forcing them to look for other cheaper sources of water or by making them uncompetitive) or it may not lead to meeting the objectives of tariffs (like water conservation) by the lower tariff class.

However this is not to say the poor should not be subsidized. The subsidy should continue upto a level and in a transparent and well targeted manner only. In the long run the level of subsidy should be kept low.

Quantum of subsidy

In the current system where costs are paid by different agencies and accounting for water related costs is not separate, the exact costs and hence quantum of subsidies is not clear. There is a need for transparency and dissemination of information to public on level of costs and subsidization.

The water tariff could cover O&M cost initially while the funds for capital recovery could be built in over the phased time period. Thus in the short run, while O&M cost can be recovered through tariffs, fund for capital recovery and maintenance should be proposed and funded at state government level through subsidies. Subsidy could initially be a significant portion of the cost. A marginal tariff to cover the cost of metering, billing and collection could be levied to inculcate the habit of tariff payments and to monitor water consumption (and wastage).

In summary, it is recommended that, given the issues related to subsidy are typically policy decisions; they must be addressed through state water tariff policy. This would ensure that subsidies are well targeted and transparent in nature. The long term objective of these policies, however, should be to establish an appropriate cost recovery mechanism through adequate tariff to ensure that revenues cover operations and maintenance costs, debt service plus a reasonable return on capital. In the medium term, however, subsidies will continue to be needed and will be focused in areas such as pockets and communities of extreme poverty.

Other factors

Unaccounted for water

One of the important parameter which needs to be considered while determining pricing strategy for water is to take care of inefficiencies in delivery of water specifically the unaccounted for water (UFW). The UFW can be on account of technical losses i.e. the pipeline leakages, metering inaccuracies, operating inefficiencies of utility, wrong billing, and illegal and unauthorised consumption. The key issue here is whether to allow these inefficiencies to pass on to consumers. Though the inefficiencies due to UFW should not be recovered from tariffs; but in short run due to lack of investments they may be passed on to consumers, but incentive system should be developed to reduce UFW gradually over time like in electricity sector.

It is also recommended that clear demarcation should be made between technical and commercial losses. Efforts should be taken to estimate losses correctly and to bifurcate them into technical and commercial loss. Steps such as mapping of distribution networks of all corporations, 100% metering and water audit by areas should be carried out. The Central government may give grants for this purpose under its several schemes such as JNNURM, etc.

Initially focus should be to reduce commercial losses. Steps such as computerization of billing systems, setting up of collection centres near consumers, ease of payment options, etc should be taken up to improve billing and collection efficiency.

Connection costs

It is generally indicated that household should contribute some amount toward the capital costs to involve them in the project and to obtain an ownership. The connection costs should be based on this assumption. The incremental cost of providing the individual house connection should also be borne by the households. The option of levying an External Development Contributions (level for developing new areas) can be considered for water supply to new colonies.

Metering

It has been seen that most consumers are un-metered and those which are metered have almost 30 to 60% either non-functioning or faulty meters. In many cases meters are not functioning due to poor quality, intermittent nature of supply or meters are tampered with. This is alarming considering the investment made in metering and dependence on metering for tariff collection. In the above scenario, the right tariff cannot be collected from a significant portion of the people. The issue of malfunctioning of

meters needs to be urgently addressed as this is a critical assumption for volumetric basis of tariff.

As per the JNNURM reform documents, metering is an essential element to avail funds for capital investments from central government. Even then, most ULBs are either unwilling or unable to achieve 100% metering. ULBs are unwilling to install meters as the revenue collected is a fraction of the costs incurred. Given the high cost of meters (say Rs. 750 to Rs. 1000) and the number of connections in the state (say 14 lakhs), the total cost of metering would be approx Rs. 140 crores. In addition, ULBs need to have technology for installing meters, systems for maintenance of meters, water management etc. Further in some cases meters are also not used in case of bulk supply or at source. Hence there is hence a need for a change in mindsets to accept metering and use water measurement, audit and monitoring techniques.

Given the necessity of metering a committed drive for achieving 100% metering along with awareness campaigns on its importance should be initiated. State water policies should mandate metering as an essential for charging tariffs. Capital grants under JNNURM should be advanced for this purpose. The metering drive should begin with installing meters for wholesale supply (source, transmission etc.), large consumers (industry, non commercial etc.) and high income domestic consumers first and gradually moving towards metering the remaining domestic users. The public standposts should also be metered (given the numbers), to understand their consumption pattern. Over a period and based on learning from the sample, this has to be extended to the entire state.

The installation of meters should be in tandem with a system for metering. This would involve record keeping, water audits, maintenance programme for meters, periodic recalibration etc. The problems of the earlier system should be avoided in the next drive in installing meters. If required the system of metering and meter maintenance can be outsourced to an agency (state or otherwise) to ensure its proper working.

Tariff for public stand posts (PSP)

There is a need for a good institutional system for ensuring collection from PSP. A local group of households or communities can be encouraged to form an association and take responsibility for management of the PSP. Metering of water and a tariff for collection would be required. A PSP policy is necessary setting forth plan for PSPs (e.g. locations of PSPs, number per PSP, tariff rate, quantity of water supplied etc.). Tariff for PSP may be set at low rates since fetching water from a public stand post would require more effort.

Tariff revision

A tariff revision system, similar to electricity sector, needs to be established in water sector also which independently decides matters related to tariff. It is recommended that the water utilities prepare tariff revision petition every financial year for the perusal of either the state government or an independent state water regulator. This would ensure estimation of annual expenses for ensuing year and water tariffs reflecting real costs. The water charges may be revised based on following approaches:

1. Water tariff may be directly linked with power tariff and hike in power tariff should be reflected in water charges, i.e. for every increase in power tariffs a proportionate hike may be provided in water charges.
2. Another mechanism for price revision is to provide increase based on inflation index such as Consumer Price Index or Wholesale Price Index. Such inflationary revisions would be necessary when there are significant changes in costs or service level. Acceptability of such increases in tariffs would be better as the reason for the increase is likely to be well known.

In addition to above, State Water Tariff Policy should be prepared and approved by state governments to outline the process and basis for fixing water tariffs in future. This can be a standard document, which will form the basis for all tariff revisions. This is in line with electricity sector, where National level water tariff policy has been notified. A similar approach but at state level may be adopted in water sector.

In summary, it is recommended that a periodic revision in tariff every year should be taken in the short run to cover deficit in revenue. Periodic revisions should be taken up once in three years. While revisions due to inflationary reasons, etc resulting in significant changes in costs should be pass-through in tariffs.

Approach to tariff determination

Approach for tariff determination can either be based on costs of water supplied known as *'cost of service approach'* or based on ability of users to pay for services known as '*willingness to pay approach*'. These two approaches are explained below:

Cost of service approach

Under this approach, water tariff is fixed solely on the basis of cost of providing water services. Ideally, tariffs should be fixed in a manner to recover full O&M and capital costs and a reasonable

return on investment. Such an approach is used to achieve financial stability of the utility. However in the short term, as water utilities are still undergoing reforms and appropriate data on costs is still being collected and level of metering is far from ideal, tariffs should incorporate only recovery of O&M costs. A reasonable return may also be allowed. The remaining costs should continue to be recovered through grants/subsidies from governments. In the long run, however, tariffs should be able to recover capital costs also.

Willingness to pay approach

Under this approach, water tariff is based on the ability of users to pay for services. Tariff is set at less than the cost of supply to a particular segment of user and the revenue loss is either met out of subsidy given by the government or by cross subsidizing the other customer segments. Such an approach is used mainly for achieving the social equity and income redistribution objectives.

It is recommended that a combination of above two approaches may be used. This would help in achieving both the objectives of financial sustainability and social equity to a certain extent. The remaining costs may be recovered through grants/subsidies from government and/or cross subsidies.

An important issue to consider while determining water tariff - is that most of the Indian utilities operate at low efficiency. Some of the inefficiencies include: poor coverage, unreliable water services, unmetered connections, water loss in leakages, inefficiency in water use at the user end, low water charge recovery. Ideally, this should not be recovered from the users and should be borne by the utility itself. However some of these inefficiencies are beyond the control of utility such as inefficiency in water use or require long term capital investments such as metering and bridging leakages; and hence should be allowed to be recovered through tariffs in the short run. A sustained effort should be made by utilities to reduce or remove these inefficiencies and such measures should be incentivised through tariff setting process like in the electricity sector.

In summary, it is recommended that:

- ✓ **A combination of both the cost of service and willingness to pay approach to tariff determination should be used.**
- ✓ **In the short run tariff should be based on full recovery of O&M costs and a reasonable return on investment; while charging lower rates to poor users. In the long run tariffs should move towards recovery of full costs and gradual reduction of subsidies and cross subsidies.**
- ✓ **Tariff should also allow recovery of inefficiency from consumer's atleast in the short run; while in the long run sustained effort to reduce them should be made and same should be incentivised.**

Category-wise water tariffs

Domestic users

As has been stated earlier, an Increasing Block Tariff (IBT) structure may be used for charging from domestic users. This would ensure that costs are recovered while a separate lifeline user charge is also being incorporated to meet social justice. However some issues related to setting IBT tariffs are:

- What should be the level of first block?
- How many levels should be considered?
- What should be the portion of cost recovered for each block?

Level of first block

The first block should be set such that to meet the life line supply. Based on an average of 5 members per household, 40 lpcd[6] and 30 days per month, a household would require about 6 KL of water per month. Further most of Indian utilities seem to keep consumption in the first block to be upto 10 KL. Thus it is recommended that the first slab should be between 5-10 KL per HH per month.

Number of levels

Higher number of slabs could mean more complex calculations for the billing staff. It is suggested that at most three levels can be considered. One for subsistence consumers with low tariffs and large subsidization, second for a typical household recovering normal costs and third for consumers with large consumption and cross subsidising poor users. The actual cost or even a disincentive rate could be charged to the third category.

Proportion of cost to be recovered

In the short run, the first slab may have only a marginal charge. The entire cost has to be subsidized (more or less). A marginal charge is recommended to inculcate the habit of payment of water, to encourage conservation of water and to make households take ownership in the system. However the tariff should be higher than the likely cost of billing and collection.

The second category it is assumed would have to bear the operations and maintenance costs. This it is assumed would include costs of repairs and water treatment. The other variable costs like power or fixed costs like apportionment of establishment charges, other overheads, depreciation, debt servicing etc., would not be charged initially, but would be applicable progressively. The third category can charge at a rate

[6] Recommended per capita water supply norms for designing water supply schemes for urban areas as per Central Public Health and Environmental Engineering Organization (CPHEEO)

above the rate of second category, in any case not lower than the variable costs.

Non-domestic users

Non-domestic (i.e. commercial and industrial) users may be charged at uniform volumetric fixed rate per KL of water consumed. Further different rates may be charged by consumers falling in different consumption slab for promoting economic efficiency. For example within industrial users, high water consuming industries may be charged higher tariffs as compared to low water consuming industries. Further more than O&M costs should be recovered from these users and should be charged at a rate corresponding to a multiple of the rate applicable to the highest slab of domestic users. This is because they are high paying and high consuming users and may be used to cross subsidising tariffs for domestic users. Similar practice is followed in electricity sector.

In summary, it is recommended that:

- ✓ **Domestic users should be charged through IBT tariffs:**
  - **Slab 1 – life line category (for consumption between 5-10 KL per hh/month): charged a marginal price only**
  - **Slab 2 – normal category (for consumption upto 25 KL): charged to ensure recovery of O&M costs**
  - **Slab 3 – high consumption category (for consumption above 25 KL): charged at O&M cost + 'X'%**
- ✓ **Non-domestic (institutional, commercial and industrial) users should be charged at volumetric fixed rate per KL of water consumed. Further different rates may be charged by consumers falling in different consumption slab for promoting economic efficiency:**
  - **Charged at a rate corresponding to a multiple of the rate applicable to the highest slab of domestic users**

CHAPTER 7 Recommendations on incorporating economic principles of pricing

Law and policy changes

Even though there are differences in the electricity and water sector, most important being electricity is a concurrent subject under the constitution and both central and state have powers to regulate it, while water is a state subject where major responsibility of planning, development and providing water services lies within the state's jurisdiction and centre focuses on policy development only; law and policy reforms, like in electricity sector, can also be applied in water sector for promoting pricing reforms.

A state level water tariff policy should be notified detailing guiding tariff principles and approaches to achieve economic pricing in water sector. The policy should provide guidelines only which can be applied by the city-specific ULBs as per the local conditions in their cities. This is because of another unique feature of water sector that is within each state, water is mainly governed by city-specific ULBs providing water services in their cities and hence they should have power to modify guidelines for setting prices as per their ground realties.

Independent Water Regulatory Authority

Setting up an independent regulatory body would ensure efficiency and transparency in the tariff setting process. In India, only MWRRA has been set up so far; while UP and AP have enacted legislation. A State level water regulatory authority should be set up with following functions:

- Setting tariff guidelines for charging for water supply;
- Monitoring and ensuring adherence to guidelines by city-specific water utilities;
- Providing link between government, water utilities and consumers;
- Advocating best practices in tariff setting in water sector to all stakeholders
- Monitoring quality of supply

JNNURM

As per the JNNURM reform documents, metering is already an essential element to provide funds for capital investments from central government. This makes policy makers and utilities conscious that recovery from water tariffs is essential for financial sustainability and only then capital grants can be taken up.

In addition to above, JNNURM may also provide funds for estimation of technical losses by each corporation and undertaking measures such as mapping of distribution networks of all corporations, 100% metering, water audit by areas, capacity building of ULBs in small cities for taking up metering, loss studies, etc.

Principles for water

- Given the negative impacts of under pricing of water on financial sustainability of utility, quality of supply and efficient use of water, it is recommended to formulate an appropriate pricing strategy.
- Tariff philosophy should be based on economic principles of pricing namely revenue sufficiency, economic efficiency, equity and fairness. The key elements of tariff philosophy should keep in mind:
    - Cost recovery for economic and financial sustainability,
    - Volumetric basis for efficiency, and
    - Life line tariffs for affordability
- Various alternative tariff models exists namely non-volumetric flat rates, volumetric charges or IBT structures. Of the available tariff models, IBT structure seems most appropriate for domestic users; while uniform volumetric charges can be determined for other categories.
- A two-part tariff structure consisting of a demand charge and variable charge, like in electricity sector, is recommended.
- In short run, pricing strategy should adopt uniform tariff across state from implementation point of view while in long run, flexibility in having ULB specific tariff can be permitted within an overall range.
- It is recommended to include following cost components while determining user charges:
    - O&M costs – including manpower costs, power costs, bulk water rates, chemical / treatment costs, repair and maintenance costs, etc
    - Capital recovery costs – including interest costs, depreciation and reasonable return

However it is recommended that in the short run, only O&M costs may be recovered through tariffs while capital recovery costs can come through subsidy.
Further there may be data constraints in accurately estimating of present O&M costs also, hence it is recommended that proper MIS system should be put in place with regular data updating. Also costing system reforms should be carried out such as shift from cash based accounting to accrual based accounting, advance book keeping, regular audits for checking

reliability of data, etc.

- In case of subsidy, it is recommended that, given the issues related to subsidy are typically policy decisions; they must be addressed through state water tariff policy. This would ensure that subsidies are well targeted and transparent in nature. Though, the long term objective of these policies should be to establish an appropriate cost recovery mechanism through adequate tariff to ensure that revenues cover operations and maintenance costs, debt service plus a reasonable return on capital. In the medium term, however, subsidies will continue to be needed and will be focused in areas such as pockets and communities of extreme poverty and investments with large scale externalities like waste water treatment.
- Though the inefficiencies due to UFW should not be recovered from tariffs; but in short run due to lack of investments, they may be passed on to consumers, but incentive system should be developed to reduce UFW gradually over time like in electricity sector. It is also recommended that clear demarcation should be made between technical and commercial losses and initially focus should be to reduce commercial losses. Steps such as computerization of billing systems, setting up of collection centres near consumers, ease of payment options, etc should be taken up to improve billing and collection efficiency.
- It is recommended to charge connection costs as they will contribute towards recovery of part of capital costs.
- It is recommended to begin a committed drive for achieving 100% metering along with awareness campaigns. State water policies should mandate metering as an essential for charging tariffs. Capital grants under JNNURM should be advanced for this purpose. Also it must be ensured that meters are functional and complaints are redressed immediately.
- A PSP policy is necessary setting forth plan for PSPs (e.g. locations of PSPs, number per PSP, tariff rate, quantity of water supplied etc.). Tariff for PSP may be set at low rates.
- Tariff revision should be taken up at regular intervals in transparent manner.
- Various approaches to tariff determination such as cost of service approach and willingness to pay approach should be used in a combined form while setting water tariffs to ensure both revenue sufficiency and social equity.
- It is recommended to rationalize the existing number of consumer categories in various cities and a uniform approach should be followed across states. Also initially focus should be to design a simple tariff structure.
- In case of domestic users, IBT tariff should be used wherein blocks may be determined as follows:
    - Slab 1 – life line category: charged a marginal price only

  - Slab 2 – normal category: charged to ensure recovery of O&M costs
  - Slab 3 – high consumption category: charged at O&M cost + 'X'%
- Non-domestic users should be charged at uniform volumetric fixed rate per KL of water consumed. Further different rates may be charged by consumers falling in different consumption slab for promoting economic efficiency. The non-domestic tariff rate may be multiple of the rate applicable to the highest slab of domestic users.

Linking water quality with prices

It is also recommended that improvements of quality of supply should be incorporated in tariff setting procedure through an incentive mechanism. Herein standards and benchmarks for quality of supply should be set and in case of achievement of such standards, incentives should be provided to water utilities.

ANNEXURE I List of Stakeholder's Interviewed

1. Mr. M Sankaranarayana, Deputy Advisor (PHE), Central Public Health & Environmental Engineering Organization (CPHEEO)
2. Ahmedabad Municipal Corporation (AMC)
3. Gujarat Water Supply and Sewerage Board (GWSSB)
4. Gujarat Infrastructure Development Board (GIDB)
5. Mr Shivanand Swamy, Centre for Environmental Planning and Technology (CEPT)
6. Bangalore Water Supply and Sewerage Board (BWSSB)
7. Mysore Municipal Corporation
8. Karnataka Urban Water Supply and Drainage Board
9. Raipur Municipal Corporation
10. Mr Rajpal, PRIA, Raipur
11. Mr Pravin Jain, City Technical Advisory Group (CTAG), Raipur

ANNEXURE II Abbreviations

A&G	Administrative and General
AIC	Average Incremental Cost
AMC	Ahmedabad Municipal Corporation
APDRP	Accelerated Power Development Reforms Programme
APWRMA	Arunachal Pradesh Water Resources Management Authority
ARR	Annual Revenue Requirement
AUWSP	Accelerated Urban WSS Program
BPL	Below Poverty Line
BWSSB	Bangalore Water Supply and Sewerage Board
CAPM	Capital Asset Pricing Model
CAs	Concessionaire Agreements
CEPT	Centre for Environmental Planning and Technology
CERA	Compounded Exchange Rate Adjustment
CERC	Central Electricity Regulatory Commission
CGWB	Central Ground water Board
CIS	Capital Incentive Scheme
CMWSSB	Chennai Metropolitan Water Supply and Sewerage Board
COE	Centre of Excellence
CPCB	Central Pollution Control Board
CPHEEO	Central Public Health Environmental and Engineering Organization
CPI	Consumer Price Index
CSCs	Customer Service Committees
CTAG	City Technical Advisory Group
CWC	Central water Commission
EC	Environmental Charge
EPA	Extraordinary Price Adjustment
FCDA	Foreign Currency Differential Adjustment
GIDB	Gujarat Infrastructure Development Board
GWSSB	Gujarat Water Supply and Sewerage Board
HMWSSB	Hyderabad Metropolitan Water Supply and Sewerage Board
HUDCO	Housing and Urban Development Corporation

IBT	Increasing Block Tariff
LIC	Life Insurance Corporation
MCD	Municipal Corporation of Delhi
MCs	Municipal Corporations
MoUD	Ministry of Urban Development
MoWR	Ministry of Water Resources
MSA	Metropolitan-level Specialist Agency
MSC	Maintenance Service Charge
MWCI	Manila Water Company, Inc.
MWRRA	Maharashtra Water Resources Regulatory Authority
MWSSRO	Metropolitan Waterworks and Sewerage System Regulatory Office
MYT	Multi Year Tariff
NDMC	New Delhi Municipal Corporation
NEP	National Electricity Policy
NICD	National Institute of Communicable Diseases
NRCD	National Rivers Conservation Directorate
NSO	National Statistics Office
NTP	National Tariff Policy
O&M	Operation and Maintenance
ODV	Optimised Deprival Value
OPA	Overall Performance Assessment
PHE	Public Health Engineering
PHED	Public Health Engineering Departments
PPP	Public-Private Partnership
PSP	Public Stand Posts
PWC	Price Waterhouse Coopers
R&M	Repair and Maintenance
RAL	Rate Adjustment Limit
RCV	Regulatory Capital Value
RMC	Raipur Municipal Corporation
RWAs	Regional Water and Sewerage Authorities
SC	Sewerage Charge
SEB	State Electricity Boards
SERCs	State Electricity Regulatory Commissions

SFC	State Finance Commission
SMU	Specialist Municipal Undertaking
UATP	Umiray Angat Transbasin Project
UFW	Unaccounted For Water
UIDSSMT	Urban Infrastructure Development Scheme for Small & Medium Towns
UPWMRC	Uttar Pradesh Water Management & Regulatory Commission
UWSS	Urban Water Supply and Sanitation
VAT	Value Added Tax
WACC	Weighted Average Cost of Capital
WOCs	Water Only Companies
WSAA	Water Services Association of Australia
WSS	Water Supply and Sewerage

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