CHAPTER 5

INSTITUTIONAL ANALYSIS

“The water crisis is largely our own making. It has resulted not from the natural limitations of water supply or lack of financing and appropriate technologies, even though these are important factors, but rather from profound failures in water governance. Consequently, resolving the challenges in this area must be a key priority if we are to achieve sustainable water resources development and management”.

… UNDP on Water Governance¹.

5.0 INTRODUCTION

The present chapter attempts to analyse institutions pertaining to drinking water supply in Chennai. Given the normative concerns about drinking water supply, there is ample scope for the agencies involved in water supply for ensuring equity in water supply and adequate quantity and quality of water supply. The question is to what extent the official agencies engaged in water supply in Chennai have deviated from such normative imperatives. Furthermore, it is important to examine the actions taken by water supply agencies during times of scarcity.

Before we proceed further, conceptualization of institutions as a part of the urban water framework is essential. Institutions are defined as a set of rules and regulations which are followed informally or formalized for adoption (Bromley 1989; North 1990; Ostrom 1986). North, in particular, indicates that the role of institutions is to reduce uncertainty by establishing orderliness in the society (but not necessarily efficient). This distinguishes institutions from organisations. If institutions are ‘the rules of the games in society’ (North 1990:3), then organisations may be thought of as the players, or ‘groups of individuals bound together by some

common purpose to achieve objectives’ (North 1990:5). The institutions are of two types: one, informal (evolved over a period of time through a trial and error method) and two, formal. While the basic objective of both institutions is the same, namely, to introduce some kind of orderliness in the basic functioning of a society, the latter is much more authenticated, particularly in the context of a democratically functioning society. The CMWSSB is one such official public utility which is vested with the sole responsibility of providing equitable distribution of water supply in Chennai. Constituted under the Chennai Metropolitan Water Supply and Sewerage Board Act 1978, the board is a city-level agency for supplying water and providing sewage collection and disposition services. An overview of the structure and organization of the board has been attempted to understand the institutional framework and thus the operational success in realizing its mission. This would include a discussion on the constitution and nature of the board, its roles and functions, its mandatory duties and quality of services delivered. This discussion provides an understanding of the above-mentioned objective of this chapter “as to what extent the normative concerns of water supply have been satisfied with respect to Chennai”. In other words, the management of water by the board forms the highlight of this chapter. The key question to be examined in this chapter is to whether the measures adopted by the board are adequate in fulfilling the increasing demand, and if not why. With this aim, an overview of the institutional structure and organisation pertaining to the urban water sector in Chennai has been carried out in the subsequent sections.

5.1 AN OVERVIEW OF THE CONSTITUTION, STRUCTURE AND ORGANIZATION OF CMWSSB

Chennai got an organized accountable system for the management of water resources after the establishment of the CMWSSB. The CMWSSB, an independent institution, was constituted in (G.O.) Ms.No.916, Rural Development and Local Administration Department, on 21.05.1975. The CMWSSB Act was notified and the provisions of the act were brought into force in G.O.Ms.No. 1176, Rural Development and Local Administration Department, on 22.07.1978.
The CMWSSB was established under The CMWSSB Act, 1978 (Act No. 28 of 1978) and commenced functioning from 01.08.1978. The board attends to the growing need for planned development and appropriate regulation of water supply and sewerage services in the Chennai Metropolitan Area. Attention is also paid to the protection of public health and all matters connected therewith or incidental thereto.

At present, the administration of the CMWSSB is governed by a board of directors headed by a chairman and managing director (CMD). The policies and directions of the board are carried out through the managing director.

The managing director, who is the chief executive authority of the board, is a Grade I officer and is in charge of the day-to-day administration of the board and exercises supervision and control over the employees of the board. The managing director is assisted by the following heads of departments.

1. Executive Director
2. Finance Director
3. Engineering Director
4. Chief Engineer (O&M)
5. Chief Engineer (Con. Wsy)
6. Chief Engineer (CCRCP)
7. Chief Engineer (Con Sew)
8. General Manager

The board mostly comprises of senior IAS officers. Apart from three whole-time directors — managing director, finance director and engineering director — the others include the finance secretary, municipal administration and water supply secretary, member-secretary of Chennai Metropolitan Development Authority, managing director of Tamil Nadu Water Supply and Drainage Board and Corporation of Chennai commissioner. The local administration minister is the ex-
officio chairperson of Metrowater. Figure (5.1) below depicts the diagrammatic representation of the structure and organisation of the board.

Figure 5.1: Structure and Organisation of the Board

![Diagram of Board Structure and Organisation]

Source: CMWSSB

5.2 EXTENT OF THE BOARD’S OPERATION

The extent of the board’s operation has increased by an additional 1.7 million people from the population coverage of 5 million in 2011. This increase could be attributed to the expansion of the corporation area in 2011 from 174 sq km to 426 km, increasing the number of wards of the corporation from 155 to 200 and the number of zones from 10 to 15. As a result, the number of area offices of Metro Water also changed to correspond with the corporation's zones. While the existing
155 depot offices of Metro Water reduced to 107, 93 new depot offices were added from merged areas. At present, each depot office serves a population of about 50,000. As two or three wards have been merged into one, the coverage of the depot office increased by 20,000 people. There are also proposals to construct sewage treatment plants in Mangadu and Villivakkam as part of the plans to build new infrastructure for the newly merged areas².

5.3 NATURE AND MANDATE OF THE BOARD

The water utility is by nature an autonomous agency evenly focused on different issues and aiming at managerial delegation, where institutional and organizational innovations are worth being exemplified (Joel Ruet et al, 2002). Moreover, the board operates with the mandate “to provide adequate supply of good quality water and safe disposal of sewage”. This would mean enhancement of the health and quality of life of the citizens of Chennai, by providing them with adequate supply of clean and good quality water and by safe disposal of sewage/waste water at a reasonable price as well as by improving the environment. However, how far the mission of the board has been realized depends on the extent to which the board is equipped functionally and financially to fulfill its mandate.

The board is said to enjoy both financial and functional autonomy well enough to exercise its mandatory duties efficiently.

5.4 CRITICAL ANALYSIS OF THE BOARD AND ITS FUNCTIONING

An important query that arises in the light of the discussion in the first four chapters is to what extent the board is equipped to fulfil its mandate. In order to achieve the objectives stated in its mission statement, the board has undertaken to perform the following functions and mandatory duties.

5.4.1 The Functions and Mandatory Duties of the Board

The CMWSSB undertakes all the capital works, operations and maintenance, and revenue functions related to water supply, sewerage collection, treatment and disposal within the metropolitan city of Chennai. Some of the functions of the board are:

1) Promoting and securing the planned development of water supply and sewerage services

2) Efficient operation maintenance and regulation of the water supply and sewerage systems in the Chennai Metropolitan Area.

3) Preparing the immediate and long-term measures to meet the future demands of water supply and sewerage services in the Chennai Metropolitan area.

The Public utility follows certain mandatory duties as well such as to provide water and sewerage services in the CMA\(^3\), erect public hydrants, fire hydrants or other convenience for public use\(^4\), provide water and sewerage connections to citizens if they reside within 30 meters of a water main or public sewer; the public utility is willing to bear the costs involved in connecting these premises to the water main and for its repair, alteration and maintenance within their premises\(^5\). Apart from this, the board shall, subject to the provisions of this Act, have the power to do anything which may be necessary or expedient for the purpose of carrying out its functions and duties under this Act.

Although the utility seems to be equipped with functions and duties good enough to carry out its firm mission statement, it remains as mere paper work. The nature of operation in recent years supports this fact and has been evident from certain institutional studies (Karen Coelho\(^6\)) which indicates that by the late 1990s,

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3 Chennai Metrowater Supply and Sewerage Act, 1978
4 Chapter VI, Section 43 (2), Chennai Metropolitan Water Supply and Sewerage Act of 1978
5 http://www.chennaimetrowater.tn.nic.in/index.htm
Chennai Metrowater Board gradually and unofficially withdrew free supply of water in the form of stand pipes in order to enable the low-income households shift to private water connections. In its move towards privatization, priority has been given to revenue generation from private connections at the expense of welfare of the poor. Thus the subsidized or common-access components of the service are progressively marginalized.

Similarly, in its move to satisfy the consumer’s demand for water, the utility has been compelled to violate an important mandate. The mandate here refers to protecting and ensuring the long-term sustainability of the water resources (Karen Coelho, 2006). The board has neither adhered to its mission of providing adequate supply of good quality water and safe disposal of sewage, nor has it ensured sustainability of water resources. One of the most important mandates of the board has been to supply both adequate and good quality water; both these mandates are still not fulfilled. The board has failed to adhere to satisfy the norm of good quality standards of water supply. A recent report by Times of India (Christin Mathew Philip, 2012) reveals that metro water received in most parts of the city is full of disease-causing germs, toxic sediments, human and animal faeces. The problem is more pronounced in several areas in North Chennai compared to South Chennai.

A survey of households across north and south Chennai as a part of the present study also reveals the same. In Vyasarpadi slum and apartments in North Chennai, metro water is found to be unfit for drinking. Although South Chennai neighbourhoods are said to have access to less polluted water, for the population in Adyar, especially those in slum tenements, the tap water is contaminated. The water tested by the Chennai Corporation officials in these localities since 2007 has also revealed that water was not potable. The water sample tests conducted by the corporation officials has found that the water contained bacteria (E. coli and Coliform), which are fatal.

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7 The metro water supplied to Vyasarpadi slums and apartments is filthy, often mixed with sewage.
Leaky water distribution pipes have been identified as the cause of bacterial contamination at the consumer-end level. The pipelines are around 100 years old and have been affected by rust at several places, leading to leakage. Moreover, lack of maintenance has led to mixing of sewage water with drinking water, thus contaminating the drinking water supply with Coliforms and faecal Coliforms.

Leading newspapers like the Hindu and The Times of India have reported that tap water in several places has been found to be unfit for consumption. In these places, bacterial contamination has been found in the drinking water samples collected by NEERI (The National Engineering Research Institute, Nagpur) in 2002. Also, local people from these regions have complained that water from the tap stinks and is unhealthy. Diseases like diarrhoea, urinary tract infection, cholecystitis, bacteremia and cholangitis are caused by drinking water contaminated with E. coli. Thus more than half of Chennai city is affected with bacterial contamination. This is despite the steps taken by the CMWSSB to improve water quality in the city: The first Chennai Project in 1991 and the second Chennai project in 2004. The reason for low quality of water could be attributed to: lack of cleaning of surface water sources, lack of maintenance of existing water pipeline and improper treatment of water by not allowing appropriate contact time of residual chlorine with the water which is essential for preventing the infection of water. Thus it could be derived from the above analysis that the problem of low quality of water is due to the fault in the institutional mechanism (governance problem) rather than due to lack of availability of water. In order to understand the nuance of the institutional mechanism, it is essential to study the financial wellbeing of the statutory board.

5.4.2 Financial Autonomy of the Board

As per the Chennai Metro Water Act, 1978, the board is entitled to autonomy with respect to its fund. The board shall have its own fund and all receipts of the

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10 The first Chennai project was initiated with the motive of increasing the water treatment capacity and meeting the needs of the city’s increasing population. With aid from the World Bank, the project is supposed to have implemented the work of renewing the old and choked pipelines. Similarly the second Chennai project included increase in piped water supply availability and improvement in service levels in the same areas (NEERI, 2002).

11 http://www.chennaimetrowater.tn.nic.in/departments/adminactdetail_06.htm
board shall be credited thereto and all payments by the board shall be made there from. The Chennai Metro Water Board is thus an autonomous board in terms of cash flow and control rights over the planning, building and supplying of water. It maintains a clear allocation of funds for the management of the board’s activity as well as orienting the internal organisation towards an integrated approach of this activity.

According to World Bank (2006), municipal bonds are used by the CMWSSB to raise investment capital. At the same time, the board manages its high cost through its revenue and central grants (The Hindu, 2012). While the operational expenditure of the board is met out of the net surplus made by the board each year, its capital expenditure is met by the state government (Joel Ruet and Marie Helene Zerah, 2002)\(^\text{12}\). For instance in 1999-2000, Rs. 1650 million were granted by the state government, while total loans from the government amounted to Rs. 6560 million, and loans from financial institutions only Rs. 1290 million (CMWSSB, 2000). During the times the State government stops giving them financial support, the board provides for itself with the loan guaranteed by the World Bank. The operation and maintenance costs, part of its debt-servicing obligations and depreciation of the board are ensured by the tariffs (TERI, 2010). This results in generating operating surplus for the board.

5.4.3 Tariff Structure

Tariffs/water charges form an important source of revenue for the board. The board is said to have considered an indexation of tariff (Joel Ruet et al (2002). According to this indexation, a flat rate will be charged in unmeasured areas, while for metered connections, the predominant charge is a constant rate per kilolitre (volumetric tariff) and monthly minimum charges for recovering the cost of reading meter, billing, collection and at least part of the cost of water (TERI,2010). However in actual practice, a flat rate of Rs.50 (US$1.06) is charged per month, regardless of the quantity of water consumed. The tariff system in Chennai is thus based on non-

\(^{12}\) According to Joel Ruet, V.S.Saravanan and Marie Helene Zerah (2002), the board’s total income in 1999-2000 was Rs. 2070 million - the total expenditure was Rs.1815 million, with a net surplus of Rs. 255 million.
volumetric tariff as against what is spelt by other studies. For instance, according to Asian development bank (ADB), 2007, 100% metering has been achieved at the production stage and 3.5% of the total connections are metered at the consumer level. Similarly, an increasing block tariff (IBT)\textsuperscript{13} structure is said to have been followed for metered customers in Chennai (David McKenzie and Isha Roy, forthcoming Paper in Water Policy, TERI, 2010, FSFC, 2011). As such, the benefits of IBT as spelt out in the CMWSSB books do not serve any purpose without metering, not to speak of subsidizing the poor households\textsuperscript{14}. \textbf{In reality, the IBTs remain on the books of the board and are not applied.} The problem of inequity exists even though a flat rate is charged for all. This would mean that poor families using lesser water than rich families are likely to pay the same non-volumetric rate.

\textbf{Billing vs Costs: Assuming the existence of metering and increased block tariff system in Chennai (WSP, 2002)}, consumption below 30m\textsuperscript{3} is subsidized, and the household pays more than the cost of production, with the difference between billing and cost progressively increasing. However, the absence of metering shows that a \textbf{majority of the customers are not billed under this structure}. Moreover, few domestic consumers would use more than 30m\textsuperscript{3} per month, so in practice cost recovery does not exist in CMWSSB (WSP, 2002).

On the whole, the Metro Water Board is highly inefficient not only in water supply but also in recovery of costs.

\textbf{5.4.3.1 Connection Charges}

The area of the plot on which the house stands is the criteria used for calculating water charges. However, the minimum official charge is Rs. 1688

\begin{itemize}
  \item Under an increasing block tariff, a low rate is charged for the first few units of water, and then higher amounts of use are charged at higher rates. Increasing rates on higher amounts forces wealthy households to subsidize poorer households, which is seen as desirable for equity and public health reasons (Boland and Whittington 2000).
  \item As per the tariff system chalked out by the CMWSSB, the initial block seems to be high (10 KL) with the majority of households consuming in the first couple of blocks. Although the average tariff for water is as high as Rs.10.87/m\textsuperscript{3} (25 US cents/KL) in Chennai compared to other metros in India, it is low relative to costs. \textbf{To benefit from the advantages of metering, the meters must be operational. There seems to be no evidence for metering in Chennai.} Moreover, the poorer households are less likely to have metered connections in the first place\textsuperscript{14}, as they do not benefit from the IBT structure.
\end{itemize}
(US$41), which would present a significant barrier for a poor household. CMWSSB introduced a flat rate of Rs.100/- for providing new house sewer connections for people below the poverty line and drinking water is supplied through stand posts and street tanks free of cost (20% of the population is living in slum areas).

Table 5.1: CMWSSB Connection charges for water supply (2001)

<table>
<thead>
<tr>
<th>Plot area in m²</th>
<th>Water connection charges in Rupees for a 20mm connection</th>
</tr>
</thead>
<tbody>
<tr>
<td>Independent house - up to 200 m²</td>
<td>Rs.1,937 ($41.06)</td>
</tr>
<tr>
<td>If it exceeds 200 m²</td>
<td>Rs.2,538 ($53.80)</td>
</tr>
</tbody>
</table>

Source: CMWSSB, also see WSP (2002)

The board is thus still close to functioning of an administrative body. This is because a major portion of the operational revenue (27%) comes from tax collected by the board, which is an administrative prerogative (Joel Ruet et al, 2002). Moreover, 64% of the increase in operational revenue is due to the increase in tax value. In return of these taxes, "there is no necessity to provide service" and that "they are advances to implement schemes".

The board also depends on grants and subsidies from the government, other miscellaneous revenue such as service charges, testing fees etc. (table 5.2 below). The table says that the revenue income takes care of revenue expenditure excluding debt servicing, and if water charges are revised, the resultant surplus could go for debt servicing. The board has also been purchasing water from desalination plants from the year 2010-2011, which would be about 35% to 70% of the existing expenses. Hence the board needs to meet its increasing expenditure for which the revision of water tariff is essentially required. The board’s income, however, has gone up only incrementally over the years, although the expenditure is on the steep rise (Table 5.2).
<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sale of water</td>
<td>2053.4</td>
<td>2002.9</td>
<td>2040.5</td>
<td>2310.4</td>
<td>2308.6</td>
</tr>
<tr>
<td>Water and Sewerage tax</td>
<td>666.6</td>
<td>658.9</td>
<td>830.7</td>
<td>864.6</td>
<td>886.3</td>
</tr>
<tr>
<td>Grants&amp; Subsidy from Government</td>
<td>123.1</td>
<td>247.6</td>
<td>91.1</td>
<td>32.1</td>
<td>24.1</td>
</tr>
<tr>
<td>Water Charges</td>
<td>4.9</td>
<td>8.5</td>
<td>12.8</td>
<td>11.5</td>
<td>3.7</td>
</tr>
<tr>
<td>Other Income</td>
<td>284.0</td>
<td>323.3</td>
<td>1574.1</td>
<td>625.0</td>
<td>703.4</td>
</tr>
<tr>
<td><strong>Total Income</strong></td>
<td><strong>313.20</strong></td>
<td><strong>3241.2</strong></td>
<td><strong>4549.2</strong></td>
<td><strong>3843.6</strong></td>
<td><strong>3926.1</strong></td>
</tr>
<tr>
<td>Salaries and wages</td>
<td>609.4</td>
<td>704.9</td>
<td>806.2</td>
<td>977.9</td>
<td>1279.1</td>
</tr>
<tr>
<td>Repairs and Maintenance</td>
<td>778.2</td>
<td>892.1</td>
<td>1017.5</td>
<td>1102.3</td>
<td>1172.1</td>
</tr>
<tr>
<td>Debt Servicing Interest</td>
<td>858.9</td>
<td>896.2</td>
<td>958.7</td>
<td>937.2</td>
<td>951.7</td>
</tr>
<tr>
<td>Depreciation</td>
<td>673.8</td>
<td>842.4</td>
<td>1815.0</td>
<td>1324.8</td>
<td>1168.0</td>
</tr>
<tr>
<td>Other Expenditure</td>
<td>337.1</td>
<td>285.3</td>
<td>288.6</td>
<td>256.4</td>
<td>350.2</td>
</tr>
<tr>
<td><strong>Total Revenue Expenditure</strong></td>
<td><strong>3257.4</strong></td>
<td><strong>3600.9</strong></td>
<td><strong>4886.0</strong></td>
<td><strong>4598.6</strong></td>
<td><strong>4921.1</strong></td>
</tr>
<tr>
<td><strong>Excess of Income over Expenditure</strong></td>
<td>-125.4</td>
<td>-359.7</td>
<td>-336.8</td>
<td>-755.0</td>
<td>-995.0</td>
</tr>
<tr>
<td>Contributions</td>
<td>8691.4</td>
<td>10346.9</td>
<td>10723.1</td>
<td>11017.2</td>
<td>12071.3</td>
</tr>
<tr>
<td>Grants from Government</td>
<td>4669.0</td>
<td>4915.2</td>
<td>5525.4</td>
<td>6648.1</td>
<td>8521.8</td>
</tr>
<tr>
<td>Long term Borrowings</td>
<td>13512.1</td>
<td>13446.5</td>
<td>13323.3</td>
<td>13403.9</td>
<td>13043.0</td>
</tr>
<tr>
<td>Fixed Assets</td>
<td>31719.0</td>
<td>32811.4</td>
<td>32981.2</td>
<td>33421.7</td>
<td>35644.2</td>
</tr>
<tr>
<td>Net Current Assets</td>
<td>-3326.3</td>
<td>-2862.2</td>
<td>-2505.8</td>
<td>-2203.8</td>
<td>-2854.3</td>
</tr>
<tr>
<td><strong>Accumulated Surplus</strong></td>
<td><strong>1600.2</strong></td>
<td><strong>1240.5</strong></td>
<td><strong>903.6</strong></td>
<td><strong>148.7</strong></td>
<td><strong>-846.2</strong></td>
</tr>
</tbody>
</table>

Source: Chennai Metro water Annual Report (2009-2010)
Also see Fourth State Finance Commission Report (2011)

A close analysis of the above financial statement shows that the Metrowater board is in crisis. It has recorded a net deficit for five consecutive years; it generated a loss of Rs. 995 million in 2009-2010.
The water agency has been under loss since 2005-2006 (The Hindu, 2011). The last time the agency's income exceeded expenditure was in 2004-2005. It had then showed a surplus of Rs. 51.8 million. During the financial year (2009-2010), the water agency also wiped out accumulated surplus and slipped into the deficit zone in this respect too.

Although the increase in salaries and wages has been cited as one of the reasons for the sharp increase in expenditure (Hindu, 2011), non-revision in the tariff structure seems to be a major reason for the growing revenue gap of the board. For domestic consumers, the tariff was last revised in October 1998 and for commercial establishments in January 2003.

As far as water supply is concerned, the board gets more than half of its water operational income from 40 big consumers only (Joel Ruet et al, 2002). It can retain them only on the basis of the Ground Water Conservation Act, i.e., as a depositary of the public authority. For other consumers, it has shown an administrative behaviour. For instance, despite the realization of operational profits from 1996 and real profits from 1998, the board does not supply piped water to all its users, nor does it provide a large sanitation, despite collecting “taxes”. In other words, the mandate of the board is hardly fulfilled as far as the poorest sections of Chennai are concerned.

The poorly designed tariff structures in Chennai have resulted in ineffective targeting, resulting in subsidies intended for the poor sections flowing to the wealthier sections and even resulting in the poor paying more for water than their richer neighbours (WSP, 2002). When water tax is levied (in Chennai as a separate water tax), the amount of tax is linked to the physical characteristics of property, usually through a calculation of the annual rental value of the property. The metro water and sewerage taxes directly amount to 7% of assessed rental value. The tariff structure in Chennai is designed to operate a cross subsidy between high-volume consuming households and low-volume consuming households.

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15 In 2005-2006, when Metrowater had 4,578 employees, the water agency had spent Rs. 609.4 million towards salaries and wages. Five years later, even with 4,333 employees, the expenditure on this count went up to Rs. 1279.1 million. This was, in turn, attributed to the upward revision of salaries of employees.
It is beyond doubt that tariffs are used to deliver consumption subsidies. The tariff policy of the board is to ensure that everyone gets a subsidy, regardless of the need\textsuperscript{16}. Accordingly, the production cost of water is much higher than the amount billed to most consumers, so that almost everyone gets a subsidy, regardless of the need. As the subsidies increase with consumption, the households who consume more water benefit more than those consuming less. Households which use small volumes of water also pay the same non-volumetric or flat monthly rates, thus resulting in inequity. The poor who are not connected to the network are barred from benefiting from these consumption subsidies (WSP, 2002).

Thus in the sphere of urban water supply, the board does not have financial autonomy to set water tariffs, as any proposal for revising water tariff needs to be approved by the state government. The State Finance Commission (SFC) has advised the government to increase the water charges in 2007-2008 and thereafter once in three years\textsuperscript{17}. Despite the recommendation of the SFC and the government’s acceptance (2009), the board has still not revised the tariff. The board has continued to levy Rs.50/month (flat rate) in Chennai Corporation since 1998\textsuperscript{18}. This is especially so because the fixation and revision of water charges are linked to a strong political decision (Moench and Janakarajan, 2002). Any proposal by the board to increase the tariff has to be approved by the elected councilors.

The procedure takes years for tariff increase to be approved due to populism and strong vote bank politics. As a result of a politically determined tariff policy on

\textsuperscript{16} In Chennai only consumption below 30m$^3$ is subsidized, and thereafter the household pays more than cost of production, with the difference between billing and cost progressively increasing (it should be noted that less than 5% of domestic connections in Chennai are metered, so most customers in that city are not billed under this structure. In addition, few domestic customers would use more than 30m$^3$ per month, so in practice cost recovery would seldom occur.), WSP(2001).

\textsuperscript{17} www.thehindu.com, May 18, 2012, “CAG advises Metrowater to revise tariff

\textsuperscript{18} The tariff structure which is being followed now by the Chennai Metrowater Board was revised lately in 1998. As per the Act, the Water tax and Sewerage tax shall not be more than 20% and 10% respectively of the annual value of properties. Subsequent amendment made in June 1998 (Act No. 30 of 1998) facilitates the levy of water tax and sewerage tax at the rate of not more than 35% and 15% of the property tax respectively. However, this amendment is reported to be not enforced for want of notification on the date of giving effect to this revision. As of now, CMWSSB is getting the assessment details from the Chennai corporation and is levying 7% (1.5% for water and 5.5% for sewerage services) of the annual value of properties fixed by the Chennai Corporation (Report and Recommendations of the Fourth State Finance Commission, 2011)
which a certain number of actors agree, the public water supply charges are kept at an artificially low flat rate. Thus, as regards water tariffs, there are political compulsions. The expectations of the population of the state are more due to the longstanding populist attitude of local politicians.\textsuperscript{19} A proper tariff structure is thus necessary for the sustenance of an autonomous board like the Metrowater Board (Joet Ruet and Marie Helene Zerah, 2002), which is not noticed in the financial structure of the board.

As a result of a distorted tariff structure, providing water supply and sanitation has been limited only to a part of the population (Joel Ruet et al, 2002). Thus, despite relying on government support and tax property collection for its schemes, the CMWSSB is still mostly structured around procedures (technical and administrative) and not yet around services. In this respect, the mandate or its mission statement is not duly taken care of.

The water supply and sanitation in Chennai thus shows the full attempt at the administrative appropriation of the sector by the State-cum-Municipalities (Joel Ruet et al, 2002). Despite the purely administrative and non-cost based decision making\textsuperscript{20}(Joel Ruet, 2002), the operation of CMWSSB shows the extent to which managerial delegation can reach within the administration frame of India. The water utility, according to Joel Ruet, shows both good governance and a technical-cum-managerial solidity of the system that allows capacity-building through delegation and contracting out.

The operations and services of the CMWSSB were initially carried out by departmental staff except for major construction activities (CMWSSB, 2008). Frequent absenteeism and long leaves of the employees (staff at sewage pumping stations, water distribution stations, security personnel, water tanker drivers etc.) affected the quality of service delivery and increased the cost of operation. Hence, the board took an initiative of outsourcing various operations in stages.

\textsuperscript{19} The arrival of a new Chief Minister in the state of Tamil Nadu is associated with inflated electoral promises, for instance provision of free water and electricity by charging the rich sections of the society.

\textsuperscript{20} The decision-making of the CMWSSB is neither based on economic cost nor long term costs which are essential for the sustainability of policies for the poor (Joel Ruet, 2002).
5.4.4 Private Sector Participation in the Water Sector

Contracting out (new public management\textsuperscript{21}) has been the mode of privatisation seen in Chennai. As revealed in World Bank reports and project proposals, the board has shifted towards corporatization and later on towards commercialization and privatisation of water service (Karen Coelho, 2006).

In 1992, CMWSSB contracted out the operation and maintenance of pumping stations, and following its success, an additional 61 contracts were signed for a period ranging between 2 to 3 years. In addition, the operation and maintenance of 4 water boreholes has been contracted out to private players. Private players have also been involved in 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 organisations (forms of private sector participation in India, Infrastructure Development Action plan for Chattisgarh - Final Report by Price Waterhouse Coopers [PWC] Legal Framework).

Following the invitation of tenders for contracting out of sewage pumping stations in 1992, the O&M of 14 sewage pumping stations were contracted out in 1993. Another 22 more pumping plants (out of the total of 103) were privately managed in 1994. By 1996, there were some problems emerging with the execution of the sewage pumping contracts, although substantial savings were still being achieved. The reason for this is that unlike the ideal contracts\textsuperscript{22}, the pumping stations contracts tended to be ‘input based\textsuperscript{23}'. It is not always easy to specify output standards for a large number of pumping stations, particularly where electric supplies are unreliable (like in Chennai). However, it was felt that it was easier to develop ‘output based’ contracts, water treatment plants (WTPs) and sewage treatment plants (STPs). Since 1995, a number of such contracts were let for STPs, WTPs and water production wells by CMWSSB. Some details of these contracts are given in the table below:

\textsuperscript{21} Narasimha Raghavan, 2004
\textsuperscript{22} Ideal contracts are ‘output based’, i.e. contract payments, penalty and incentive clauses are dependent on the contractor achieving service improvements as well as cost savings.
\textsuperscript{23} In input based contracts, payments are based on the number of shifts worked and penalties for attendance. Moreover, monitoring of such contracts is time-consuming.
Contracting out is both a commercial and customer-oriented approach of the water board in the last few years (Kevin Sansom et al, 2003). This is particularly so in terms of cost savings. However, the scope for service improvement and innovations by the contractors is limited, where the contracts are more input based or ‘labour only’ contracts as the case of sewage pumping stations and STP contracts tend to be (table 5.3 below)

Table 5.3: Chennai service and management contracts

<table>
<thead>
<tr>
<th>Contract scope</th>
<th>Contract period</th>
<th>Value of contract (per annum)</th>
<th>Procurement details and comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. O&amp;M of sewage pumping stations (36 no.) through 14 contracts</td>
<td>3 years from 1995</td>
<td>Rs.23.9 million Savings of 30% less than CMWSSB’s cost estimates.</td>
<td>A single bid document with qualifications specified for supervisory staff.</td>
</tr>
<tr>
<td>2. O&amp;M of sewage pumping stations (30 in number) through 10 contracts.</td>
<td>3 years from 1997</td>
<td>Rs.11.55 million Savings of 26 to 66% less than CMWSSB’s cost estimates.</td>
<td>No pre-qualification but tender open to registered contractors. Daily log sheets for contract staff introduced.</td>
</tr>
<tr>
<td>3. O&amp;M of 15 water production wells</td>
<td>2 years duration starting in 1995</td>
<td>Rs.5.25 million Saving of 48% less than CMWSSB’s cost estimates.</td>
<td>No pre-qualification but tender open to registered contractors. Contractor responsible for minor electrical and mechanical repairs up to Rs. 5000 per month.</td>
</tr>
<tr>
<td>4. O&amp;M of 300 million liters per day (MLD) water treatment plant at Redhills</td>
<td>3 years from 1997</td>
<td>Rs.5.25 million</td>
<td>A single bid document with eligibility criteria indicated. Separate prices were requested for each of the following: O&amp;M, supply of chemicals, minor and major repairs.</td>
</tr>
<tr>
<td>5. O&amp;M of Villivakkam sewage treatment plant (STP, 10 MLD).</td>
<td>3 years from 1995/96</td>
<td>Rs0.27 million Savings of 16 to 67% less than CMWSSB’s cost estimates.</td>
<td>Single bid document. Cost of power and consumables borne by the CMWSSB.</td>
</tr>
<tr>
<td>6. O&amp;M of STP at Kodunagaiyur (80 MLD)</td>
<td>3 years from 1996/97</td>
<td>Rs.1.29 million Savings of 16 to 67%</td>
<td>Bids quoted in terms of rates for specific manpower and not a fee for O&amp;M. This implies that it is a ‘labour Only’ contract.</td>
</tr>
<tr>
<td>7. O&amp;M of STP at Nessapakkam (23 MLD)</td>
<td>3 years from 1997/98</td>
<td>Rs. 2.45 million</td>
<td>Bids quoted in terms of rates for specific manpower and not a fee for O&amp;M. This implies that it is a ‘labour only’ contract.</td>
</tr>
</tbody>
</table>

Source: adopted from Table A1.3 in A Review of PPPs, Metha, DFID, 1999, Also see: Kevin Sansom et al, 2003

The above table indicates that a well-designed incentive-based management contract for water distribution and billing with good management information and
regulation could effectively contribute to better service. After identifying the role of contracts in improving service and cost recovery, water utility management has been contracted out in recent years by the board.

For instance, the board had outsourced the operation of water tankers (on an annual rate contract, based on the number of trips and distance covered fully controlled by the board), security arrangements at water and waste water treatment plants, O&M and minor repairs of sewage pumping stations, and O&M and minor repairs of water and waste water treatment plants - for O&M of sewage pumping stations, WTPs, water distribution stations and well field operations. For instance, the maintenance of the new water supply project (Veeranam Project), including major and minor repairs, the O&M of new sewage treatment plant and new water treatment plant of 530 MLD (Chembarambakkam) was outsourced. On an experimental basis, the O&M of water and sewerage system, including collection of water charges and maintenance of installations, in Manali New Town, with a population of 12,850, has been privatized (CMWSSB, 2008).

As far as water supply is concerned, the board has resorted to contracting out, especially due to the benefits of contracting accruing to the utility (Narasimha Raghavan, 2004). Its 2002-2003 annual report mentions contracting out and its advantages. The CMWSSB also envisages private sector participation as a part of its market-oriented financial systems package and also as alternative systems of management towards securing increased efficiency and cost-effectiveness. An outcome of such an initiative has been contracting out the water sector projects to private entrepreneurs.

The Chennai Metropolitan Water Supply and Sewerage Act,1978 (Tamil Nadu Act 28 of 1978) guides and legally weapons the CMWSSB to involve in contracts with private agencies given in Chapter IV: Establishment, Transfer and vesting of Water Supply and Sewerage Services, under sections 25(a) and 30 (a). It could be noticed that there are three areas earmarked for private participation at the Chennai Metro Water (Figure 5.3 below).
Figure 5.3: The Gamut of Contracting Work

Water Supply: Certain parts of Chennai are provided water with the help of certain companies like Vivendi (French Conglomerate) and Kirloskar Brothers Ltd. The CMWSSB undertakes to provide water to the other areas of the city with the help of water tankers.

Infrastructure: Around 4 to 5 years back, the CMWSSB started giving annual maintenance and operations contract to private parties, which also include multi-crore-worth MNCs. The infrastructure contracting work includes laying of pipes across the city, building water, cleaning plants, etc.

Consultancy: The CMWSSB has undertaken to provide consultancy work along with an MNC M/s Comapagnie Generales des Eeaux (GDE), a French company, under a twinning agreement. The agreement aims to give CMWSSB towards providing a commercially minded, customer-oriented service that will operate in an efficient and cost-effective manner”. The solid aims of this consultancy twinning arrangement are to maintain public health and to provide a pollution-free environment. Presently, the private sector has been involved in the water sector through service, management and built-operate-transfer contracts.

Bulk Supply-cum-Operation and Maintenance (O&M) Contract, Chennai

The bulk supply and O&M contract is a Public private partnership (PPP) agreement that has been implemented for the development of a 100 (MLD) of sea water in a desalination plant in Chennai. The PPP structure has been categorized as a
design-build-own-operate-transfer model. The project has been awarded to Chennai Water Desalination, a special purpose vehicle floated by IVRCL Infrastructures and Projects. The contract was awarded to the CMWSSB for a period of 25 years. As stipulated by the contract, the private developer is required to design, engineer, finance and procure the entire infrastructure for offtake of water and the transmission, treatment, and supply of treated water to the storage reservoir. In addition, the private developer is required to operate and manage the facility for the concession period. The private developer is, therefore, required to supply treated bulk water to the CMWSSB. The private developer is paid a water charge by the CMWSSB for the treated water produced. The unique feature of this contract is that the private entity is assured of a minimum fixed payment by the utility for all the activities it is required to undertake. This arrangement is also referred to as a "take or pay" system. The key bidding criterion was the per unit charge for treated water, which the private developer would collect from the CMWSSB (Anouj Mehta, 2011).

A major drawback of this model seems to be the environmental implications of the desalination plant project at Chennai. It is supposed to cause damages to the ecology and environment in a number of ways. The most hazardous implication is the uncontrolled discharge of concentrated brine that can contaminate water aquifers and damage aquatic ecosystems (Gregar Meerganz Von Medeazza, 2006). However, the CMWSSB failed to take into account the environmental hazard associated with this desalination plant before giving environmental clearance.

A recent fact-finding committee, which acted on complaints by villagers near Nemmel desalination plant, has observed that the desalination plant had eroded the coastline, turned groundwater saline, has been polluting and endangering safety at sea. The most significant factor is the discharge of brine openly onto the beach, which ought to be legally discharged at a distance of 600 metre into the sea. As a result, the groundwater in the streets closest to the plant has become unpotable (Deccan Chronicle, 2014). Neither the private operator nor the state seems to be bothered about the ecological and environmental implications of the desalination plant. Instead of reducing the environmental pressure on peri-urban areas, it seems to worsen it. As Gregar Meerganz Von Medeazza (2006) has pointed out, the
desalination plant is still very much a supply-oriented strategy, which will only stimulate more demand. Current environmentally damaging water exploitation practices are not likely to be changed, which ultimately adds to the environmental costs\(^{24}\) and negative environmental impacts, thereby damaging the ecosystem. Thus the above PPP model seems to be a costly proposition, the main concern being one of water supply augmentation.

### 5.4.4.1 The Fundamental Contracting Links

It is generally believed by the CMWSSB that it is not absolved of its duty once contracting out is done. The presence of a transparent tender system for private participation available on the board’s website\(^ {25}\) reveals the board’s aim to provide the needed service to the consumers. In accordance with the policies of the CMWSSB, the system is carried out in two ways:

- Contracting Out
- Overall Surveillance and Monitoring of Services

The utility would be partially fulfilling its duty to the public, even if it misses things on one of these points. The relationships in the contracting out strategy of the utility could be better explained with an aid of an adapted framework (Blundell, Brian and Murdock, Alex, 1997. Managing in the Public Sector Oxford: Butterworth-Heinemann), given in the Figure 5.4 below.

\(^{24}\) The energy-intensive technology applied by the desalination plant is responsible for the greenhouse gas emissions, resulting in environmental costs which are uncovered (Gregar Meerganz von Medeazza, 2006).

\(^{25}\) www.chennaimetrowater.com)
The aim of all the above mentioned three links (the CMWSSB, contractors and consumer public) in the contracting out programme would be to achieve economy, effectiveness, efficiency, equity, quality and performance. This is one socially viable and financially feasible way for providing the needed service to the public (Narasimha Raghavan, 2004). Although the above framework of the board is clearly spelt out in its mission statement, it is hardly realised in practice through its policy of privatisation. The benefits of privatisation hardly reach the consumer. An analysis of the water management practice in Chennai clearly reveals the fact that the board is not efficient in realizing its norm. Privatisation or contracting out has not helped it in realizing its mission statement. Thus the aim of servicing the consumers at large is what is lacking as far as privatisation or contracting out is concerned. Another drawback of the contracting model of the CMWSSB is the negligence of the environmental concern, which is a significant factor, while accruing the other benefits of contracting out programmes.
5.4.4.2 Benefits to the CMWSSB

Actually, the benefits of contracting out have been more accruing to the CMWSSB than to its consumers. The benefits included the safety of the consumers; the bottom-line of the board is also taken care of. Although it may seem only to be an exercise in financial resource allocation\textsuperscript{26}, entailing efficiency and effectiveness in its use, what has been missed out is the time and effort saved by the CMWSS Board. Contracting out has resulted in the benefits in term of cost savings compared to the direct recruitment of staff. Moreover, initial investment and maintenance cost on vehicles have been minimized (CMWSSB, 2008). It is also imperative that work gets completed on time, as it is people who must bear the brunt of unwarranted delays.

Above all, the state agency now operates like a profit-making business with little regard for the public, a major factor against the privatisation effort in recent years. Thus the basic dictum behind privatisation has not been realized in the case of the board (water being a merit good\textsuperscript{27}). The main reason behind privatisation, however, is not economy or efficiency. It shall be noted that in the distribution aspects, the outsourcing concerns the operation side and not the supply activity (Joel Ruet et al, 2002). Like weak tariff structure, the hurdles in privatisation have lead to the issue of unaccounted water and leakages in the institutional framework of water in Chennai. Reducing the non-revenue water in Chennai is one of the greatest institutional challenges of the water sector in recent years (NUWA, 2008).

5.4.5 Unaccounted Water and Leakages

Because of the increase in water demand, there is a great strain on the limited sources in Chennai. One of the disastrous outcomes has been unaccounted water and the associated problem of leakages. According to

\textsuperscript{26} The total monetary savings is around Rs 299.55 lakhs, which is around 1.19% of the total income of the board (Rs 25018.49 lakhs) for the period 2002-2003. In terms of expenditure, the total savings stood at 1.23% for the same period. The CMWSS reaped an excess income of about Rs 758.48 lakhs during the year ended 31.3.2003. The total savings from privatisation activities form about 40% (39.49%) of the excess income, thus indicating an efficient and cost-effective involvement of the private sector in public works.

\textsuperscript{27} Merit goods are those goods that are given 100% subsidy by the government, as they are basic to living and are of use to the poor people, who cannot afford it, in the case of subsidy not given.
NUWA (2008), the leakages for a minimum pressure of 10 m in the distribution system of CMWSSB during 1989-90 were very high, ranging between 45-50%. The board intended to curtail these leakages so that the existing water resources are utilised to the fullest potential.

The board has implemented a phased (5 phases) programme of unaccounted water with World Bank assistance, to bring down leakages and unaccounted water. As the city's water supply is intermittent, a new innovative technology of pressuring the sub-district to 10 m head using mobile water tankers was adopted to measure the leakage level under Phase I. The study revealed that 77% of the leakages detected were at the point of house service connection (due to non-existence of ferrules), with leakage rates being 265 l/c/hr in CI mains and 391 l/c/hr in PVC mains at 10 m pressure. Under phase II, a rectification programme was conducted, and ferrule replacement and other leak repairs were done, which resulted in reducing the leakage levels to 76 l/c/hr in CI mains and 391 l/c/hr in PVC mains at 10 m pressure.

As it was difficult and time consuming to identify micro-leaks at house service connections, the board conducted a water mains survey under phases III, IV and V, and replaced the corroded mains by taking a sample of the mains of 1 m length at each street or 150 m intervals. All house service lines from the ferrule point to the meter chamber in Chennai were renewed using medium density polyethylene (MDPE) pipes provided with poly propylene stop-taps. Subsequently, a sub-district was isolated for a minimum period of 1 hour and leakage level was measured at 10 m pressure. Leaks identified using electronic equipments such as leak noise correlator and sounding rods were rectified, and the average leakage achieved was 2.47 l/c/hr (litres per capita per hour).

Based on the encouraging results, the board proposed to continue to renew the left out 30,000 house service connections with MDPE pipes. To measure bulk flows to and from major distribution stations, the board installed 48 bulk meters. The board had also opted to implement customer metering and entrusted M/s GdE, a company from the United Kingdom, to recommend a way forward for complete domestic metering. As part of this, a study conducted in the pilot area reveals that if
all customer connections in CMWSSB are metered, the revenue of the board would go up by 564%. The study also recommended the implementation of a phased metering programme.

However, the model developed by the board by shortening of the district and pressuring the system externally (by mobile/static tankers) worked effectively for detecting leaks in the intermittent supply (NUWA,2008).

5.4.6 Water supply Through Tankers

The CMWSSB started its tanker supply as early as the 1980s (Jency, 2009). For meeting the needs of the city dwellers (particularly slum population), the board has been purchasing water from private agricultural wells. Around 500 water tankers were hired to supply water bought from private agricultural wells in the suburban villages.

The CMWSSB also sells treated water through tankers at a price of Rs. 450 per 9,000 litres tanker. According to WSP (1999), the tanker water met the occasional demand of the consumers. The demand for this type of water supply varies between 62 and 100 total tanker trips per day. Approximately 950 water tanker trips, with the capacity of 9,000 liters per tanker, supply daily to poor households. These tankers transfer water to storage tanks made of concrete, steel or plastic, which have been installed by CMWSSSB in these areas.

In 2002-2003, when the bore wells fell short of meeting the demands of the households, water (25 MLD) was delivered by CMWSSB through tankers on non-supply days\(^{28}\). When supplied by tankers, each house was allocated 125 litres of water. During 2004, 1300 tankers made an average of 11 trips a day from the distribution station to the residential localities, while 1,700 lorries hired by the government ferried water from the agricultural wells in the suburban areas to the distribution stations.

In 2004, Metrowater supplied water to the city through the tankers for about 6 months at a cost of Rs.1 crore (10 million) per day.

\(^{28}\) CMWSSSB supplied 175 mld on alternate days, whereas the actual requirement was double.
Table 5.4: Metro Water’s Daily Water Sheet (2003-2004)

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of water ferried over long distances by tankers (MLD)</td>
<td>38</td>
<td>74</td>
<td>140</td>
<td>203</td>
</tr>
<tr>
<td>Number of tankers hired</td>
<td>595</td>
<td>726</td>
<td>1,100</td>
<td>1,300</td>
</tr>
<tr>
<td>Number of daily trips</td>
<td>6,733</td>
<td>7,555</td>
<td>9,500</td>
<td>12,000</td>
</tr>
<tr>
<td>Number of fixed plastic tanks installed</td>
<td>10,030</td>
<td>10,430</td>
<td>11,315</td>
<td>13,500</td>
</tr>
<tr>
<td>Number of new borewells sunk</td>
<td>5,500</td>
<td>6,500</td>
<td>7,000</td>
<td>7,500</td>
</tr>
<tr>
<td>Daily expenditure (in Rs lakh)</td>
<td>55</td>
<td>70</td>
<td>85</td>
<td>100</td>
</tr>
</tbody>
</table>

Source: Metro Water

The board provides water through tankers for areas where piped water is not reachable, especially slums. A charge of Rs.4 per 1000 litres of water and Rs. 200 per month has been levied for the maintenance of its water tankers. It is feasible for CMWSSB to provide tanker supply, as they have to pay only Rs.50 for a load of 1,200 litres. The survey of slum households in Vyasarpadi reveals that whenever there is no supply of metrowater via public handpumps in their slums, water is supplied by the board through tankers, for which the households pay Rs 4 per pot to the tankers (15 litres) towards water supplied through tankers. Similarly the apartment dwellers in Adyar and Vyasarpadi purchased water from tankers in times of water scarcity. Very recently, they had paid Rs.1000 for a water purchase of 12000 litres. However, water purchased from tankers has almost stopped after 2005, say the respondents. This may be attributed to the availability of metrowater and good ground water recharge of their borewells or may be partly due to the commissioning of the two mega seawater desalination plants with a capacity of 100 ml each.

http://www.chennaimetrowater.tn.nic.in/departments/finance/tariff.htm
Historically, the Chennai Metro Water Board has been excessively concentrating only on water supply augmentation measures through various interventions that involve huge capital expenditure. However, in our view, these interventions are myopic in nature in the sense that these capital intensive measures do not consider issues such as the ever increasing demand for domestic and industrial uses, the city’s vast expansion plans, the rapid development of peri-urban areas, sewage management, water quality concerns, loss due to leakages, inequity in water supply, bad cost recovery plans, absolute lack of plans for groundwater protection, lack of plans for arresting seawater intrusion and so on. Eventually, despite a huge expenditure incurred over a period of time, the water demand of the city is still not met and there exists a big shortfall between demand and supply. A brief analysis of the water augmentation measures of the board (and subsequently the capital expenditure undertaken) in the past years would make this more clear. Such an analysis would help in understanding whether the proportionate expenditure gone into the urban water sector has been useful in solving the problems of mismanagement of the water sector, especially one of reducing the gap between demand and supply.

5.4.7 Water Augmentation Measures of the Board

The main measure adopted by the water utility has been one of supply augmentation, although no concrete measures have been taken so far to get to match the demand for and supply of water in Chennai. Following are some of the major water projects of CMWSSB for augmenting the city’s water supply.

5.4.7.1 First Chennai Water Supply and Sanitation Project

The first Chennai Water Supply and Sanitation project was taken up in 1988 and completed in 1996 at a cost of Rs.1508.0 million, aided by the World Bank. Under this project, the city water supply was augmented by a quantity of 50 MLD per day by digging 30 bore wells in 3 new fields, including 19 more bore wells. A 300 MLD capacity water treatment plant was set up to treat the first phase flow of Krishna water. About 330 km of water mains have been rehabilitated and extended
in the city and about 10 km of existing trunk mains were strengthened (Annual Report, 1995-96, CMWSSB, P.9, also see A. Munian, 2010).

5.4.7.2 The Second Chennai Water Supply Project (started in 1995 and completed by 2002)

The revised cost of the project was Rs.7780 million and carried out with the World Bank loan to the tune of US$ 86.50 million. The funding pattern for the project includes 17.25% from the Government of Tamil Nadu as grant, and the World Bank funds constitute the rest of the funding. The objective of the project is improvements in the source of supply, distribution, conservation of water and expansion and rehabilitation of sewer collection, conveyance, and treatment and disposal system. The expenditure on all the components of the project till the year 2003 was Rs. 6393.5 million (Annual Report 2002-2003, CMWSSB, PP.9-10).

The nature of work executed in this project includes construction of clear water pump house (300 MLD capacities) at Red hills, installing Archemedian screw pumps at Koyambedu raw sewage treatment works and improvements in 16 sewage pumping stations. One of the main benefits of implementing the above project is the increase in piped water supply availability due to which the number of defective streets have reduced, with improved service level and pressure in the mains. Secondly, reduction in the radius of the water distribution station has resulted in increased piped water supply availability with reduced quantity of supply. Lastly, the level of unaccounted water has been reduced resulting in additional water availability to the Chennai citizens.

5.4.7.3 Veeranam Water Supply Project

Veeranam is a huge irrigation tank fed by the river Cauvery, located (Figure 5.5) about 220 km south of Chennai. Originally, in the late 1960s, during the DMK rule, it was planned to bring water from this tank through big pipes to augment the city’s water supply position. But the project ground to a halt in the mid 1970s when the pipes developed leaks. Subsequently, the project was abandoned due to charges of corruption, political controversy and change in government.
5.4.7.4 Krishna – Telugu Ganga Project

The Telugu Ganga Project was commissioned in 1996 as an outcome of the agreement signed on 18th April, 1983 between the states of Andhra Pradesh and Tamil Nadu. As per the agreement, the project was envisaged to bring 12 TMCft (15 TMCft of water minus the evaporation losses of 3 TMCft), about 930 MLD of Krishna water to the city from the Kandaleru reservoir, over a distance of 152 km over a period of 8 months. The utilisation of Krishna water for the city was proposed...
to be done in two stages, viz., 400 MLD (or 5 TMCft) under stage-1 and 530 mld (or 7 TMCft) under stage-2. The total estimated cost of the whole project was around Rs.12000 million. The Government of Tamil Nadu has already spent and executed this project. However, it has never, since 1996, delivered more than about 1 or 2 TMCft a year. Contrary to expectations, what has been the actual realization from this source is the following:

1996 (Sep-Oct): 0.076 TMC
1997 (July-Nov): 2.29 TMC
1998 (July – Nov): 2.81 TMC
1999 (July-Nov): 1.83 TMC
2000 (May-June): 0.101 TMC

This is largely because it passes through the perennially drought-prone Rayalaseema district, whose farmers were never consulted; these farmers continue to tap into its canals for their irrigation needs. Despite its failure to materialize, Krishna water formed the basis for more massive investments. Between 1996 and 2002, Metrowater spent close to Rs 10,000 million, under the World Bank-assisted Second Chennai Project, to expand and improve the city’s pipe network to carry the additional 930 MLD of Krishna water expected. However, the supplies from Telugu Ganga were much below the contracted volumes because of extensive drought in the Krishna basin during 2002-2003.

### 5.4.7.5 Chennai Water Supply Augmentation Project-I - New Veeranam Project

When the city was facing a severe water crisis, the Veeranam Project was revived in 1990 under the new name, New Veeranam Project. The project was commissioned in the year 2004 as an additional source of water to Chennai. The Tamil Nadu Government had proposed to execute this project at an estimated cost of Rs.7200 million. The proposal was to draw 190 MLD of raw water from the Veeranam tank in Cuddalore District, situated about 230 km south of Chennai; after the treatment of the water, the plan was to distribute 180 MLD to Chennai. Now,
fearing that the Veeranam Lake may dry out during deficit rainfall years, the
government sanctioned a further Rs 3000 million for the New Veeranam Extension
Project, to extract groundwater from the Kolli dam river basin and convey it to the
city through the New Veeranam infrastructure. The capacity of the lake is 1465
Mcf. The lake water is treated at the Vadakuthu Water Treatment Plant by pumping
raw water at a distance of 20 km, from Sethiathope to Vadakuthu through a 1775-
mm diameter mild steel pipe. The treated water is then pumped at a distance of 8 km
to Break Pressure Tank at Kadampuliyyur through a 1750-mm diameter mild steel
pipe. From there, the water is conveyed to a distance of about 200 km through a
mild steel pipe of 1875 millimeters (mm) and 1500 mm diameter by gravity to the
Porur Water Distribution Station near Chennai. From this distribution station, water
is pumped to a distance of 1.2 km and distributed to Chennai through trunk mains
and water distribution stations.

In January 2005, villagers from the catchment areas staged a fast in protest
against the proposed depletion of their water resources and the threat to their
livelihoods. This practice, of sucking resources out of rural hinterlands to cater to the
ever-expanding urban appetite, is now a globally recommended policy breakthrough,
facilitated by the institution of “modern water rights”, which create markets in
groundwater and permit individuals to profit from selling water commercially. However, the World Bank funded project was unable to provide the lake water to
Chennai when it was needed the most\textsuperscript{30}. The project was ultimately abandoned.

5.4.7.6 Third Chennai Project

Proposals for a third Chennai project have been submitted at an estimated
cost of Rs. 6000 million to the World Bank. The main aim of the project is to draw
ground water from Araniyar and Koratalliyar basin aquifer, and augmenting water
supply by constructing a check dam at Thirukundalam across Koratalliyar,
refurbishing Vallur anicut and desilting Rettai Eri at Madhavaram. It is also planned
to extend the supply of water to the adjacent urban areas of Chennai (Annual Report, 2001-2002, CMWSSB, and PP.9-10).

**5.4.7.7 Chennai City River Conservation Project**

The board has conceived a comprehensive project for "Interception, Diversion and Treatment of sewage" under the umbrella "Chennai City River Conservation Project". Besides the board, the project would be executed by the State PWD, State Slum Clearance Board, Chennai Municipal Corporation and the Chennai Metropolitan Development Authority. The total project cost is Rs.17000 million. The estimated cost of the component of the work to be executed by the board is Rs. 7201.5 million. The Government of India has sanctioned a grant of Rs.4915.2 million and the balance 2286.3 million would be funded by the board.

**5.4.7.8 530 MLD Water Treatment Plant at Chembarambakkam (started in 1996 and completed on 19.7.2007)**

The estimated cost of the project was Rs. 2960 million. Currently, about 135 MLD of treated water is said to be supplied to Chennai from this plant (CMWSSB Policy Note 2008-2009). The total water treatment capacity of the board is believed to have gone up from 750 MLD to 1280 MLD. The plant was constructed in anticipation of full realization of Krishna Water to the city, which would augment the existing supply levels.

The following table shows the increase in treatment capacity of the board after the initiation of the Chembarambakkam water treatment plant.

<table>
<thead>
<tr>
<th>Plant</th>
<th>Capacity (MLD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilpauk Water Treatment Plant</td>
<td>270</td>
</tr>
<tr>
<td>Puzhal Water Treatment Plant</td>
<td>300</td>
</tr>
<tr>
<td>Vadakuthu Water Treatment Plant</td>
<td>180</td>
</tr>
<tr>
<td>Chembarambakkam Water Treatment Plant</td>
<td>530</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1280 MLD</strong></td>
</tr>
</tbody>
</table>
However, the present water treatment capacity for Chennai city is as follows (table 5.5 as per 2010 data):

**Table 5.5: Capacity of the Water Treatment Plants in Chennai city**

<table>
<thead>
<tr>
<th>Water Treatment Plant</th>
<th>Capacity (In MLD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilpauk (1914 / 2005)</td>
<td>270</td>
</tr>
<tr>
<td>Puzhal (1996)</td>
<td>300</td>
</tr>
<tr>
<td>Vadakuthu (Veeranam Lake Source) (2004)</td>
<td>180</td>
</tr>
<tr>
<td>Chemabarambakkam(2007)</td>
<td>530</td>
</tr>
<tr>
<td>K.K.Nagar(1972)</td>
<td>4</td>
</tr>
<tr>
<td>Surapet(2009)</td>
<td>14</td>
</tr>
<tr>
<td>Minjur Desalination Plant</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,398</strong></td>
</tr>
</tbody>
</table>

Source: www.chennaimetrowater.tn.nic.in/departments/operation/developwss.htm

5.4.7.9 Sea Water Desalination Plants

a) **Plant at Kattupalli , Minjur**

Taking into consideration the long-term drinking water requirement of the growing population of Chennai and to address the water problem during the drought period, a desalination plant is being set up at Kattupalli village in Minjur Panchayat Union, north of Chennai city, to produce 100 MLD of water per day. The estimated cost of the project was 520 crores. However, the cost went up to 600 crores due to the delay in the commissioning of the project (expected to begin in 2008 earlier).

The plant was inaugurated on July 31, 2010. Chennai Metrowater will be supplied water from the 100-million-litres-a-day desalination plant at Kattupalli near Minjur at the rate of Rs. 48.74 per 1,000 litres. The plant, established on 60 acres of land, has to deliver 75 MLD; CWDL has already begun supplying water to Chennai Metrowater. As per an agreement reached in 2005, the company would maintain and operate the plant for 25 years after which the facility would be transferred to the water agency.

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31 The Hindu, Chennai, July 31st, 2010
The facility has been implemented on a design, build, own, operate and transfer basis by CWDL, which is a special purpose vehicle of IVRCL Infrastructures and Project Limited and Befesa Aqua, Spain.

b) Plant at Nemmeli on East Coast Road

In order to further address the growing drinking water requirements of Chennai, which is expanding rapidly, another 100 MLD desalination plant is proposed to be set up at Nemmeli on East Coast Road. The desalination plant, along with the associated infrastructure such as pipe lines for conveyance of the product water, is estimated to cost Rs.9938.3 million. The detailed project report was presented to the Ministry of Urban Development, Government of India on 15.02.2008, seeking sanction to the project under full grant from the Government of India. The Union Government, in its budget, has allocated Rs. 3000 million as its support for this project to start with; the work on this plant has been taken up in the coming financial year (CMWSSB Policy Note 2008-2009). The 100 MLD Nemmeli plant was inaugurated on 22.02.2013, with plans for another plant in Pattipulam that will generate 200 MLD (Mariappan 2011).

5.4.7.10 Projects under Jawaharlal Nehru National Urban Renewal Mission (JNNURM)

During 2008-2009, the board obtained approval for 5 projects for carrying out improvement works for water supply and sewerage system in Chennai as well as for creating additional infrastructure at an estimated cost of Rs.4921.6 million. These works have commenced and are in progress.

5.4.7.11 Upcoming Projects (Fifth Reservoir)

Recently, the Chief Minister of Tamil Nadu inaugurated the project to link Kannankottai and Thervoy Kandigai tank (Tiruvallur district) for storing one thousand million cubic feet (TMCft), which is equal to one month’s water supply to Chennai. The estimated cost of the project is Rs. 3300 million (Figure 5.6 below)

and is expected to be completed by March 2015. Tender for the main component of forming the reservoir at a cost of Rs. 1360 million is being finalized with a water spread area of 1,100 acres.

Map 5.6: Project to Link Kannankottai and Thervoy Kandigai tank

It can be inferred from the above discussion that the measures adopted by the board are for water augmentation or water development rather than water management. Huge capital expenditure has gone into various water supply schemes.

5.4.8 An Analysis of the Capital Expenditure on Water Augmentation Projects

Following is an analysis of the board’s capital expenditure that has gone into water development in Chennai. Table 5.6 shows the investment that has gone into various water augmentation projects in recent years. A close view of the table reveals that huge expenditure has gone into the water sector by way of increasing the
supply. Recent proposals also reveal plans for investment in water augmentation schemes with the total cost of projects/works proposed at Rs.8,9098.5 million.\(^{33}\)

**Table 5.6: Capital Expenditure on Various Water Augmentation Projects by CMWSSB**

<table>
<thead>
<tr>
<th>Water Supply Schemes</th>
<th>Year of completion</th>
<th>Cost of the project (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>World Bank (I Chennai Project)</td>
<td>1996</td>
<td>1508</td>
</tr>
<tr>
<td>II Chennai Wsy Project(A)WBI Water</td>
<td>2002</td>
<td>7787.9</td>
</tr>
<tr>
<td>Krishna Telugu Ganga Project</td>
<td>1996</td>
<td>12000</td>
</tr>
<tr>
<td>CWSAP-I</td>
<td>2004</td>
<td>7200</td>
</tr>
<tr>
<td>530 MLD</td>
<td>2007</td>
<td>2960</td>
</tr>
<tr>
<td>CWSAP-II</td>
<td>2007</td>
<td>1240</td>
</tr>
<tr>
<td>CCRCP</td>
<td>2005</td>
<td>7201.5</td>
</tr>
<tr>
<td>Desalination Plant at Minjur</td>
<td>2010</td>
<td>6000</td>
</tr>
<tr>
<td>Desalination Plant at Nemmeli</td>
<td>2013</td>
<td>9938.3</td>
</tr>
</tbody>
</table>

Source: CMWSSB Reports

Tables 5.6 and fig 5.7 below depicts the disproportionate capital expenditure that has been incurred by the public utility in various water supply augmentations over the decades. The rising capital expenditure curve (figure 5.7) clearly indicates an increase in the capital expenditure over the years, especially during the drought years of 2003-2004, which is not matched by the increase in supply.

\(^{33}\) G.O(2D) No.100 dated 15.10.2011 of Metropolitan Authority and Water Supply department (http://www.chennaimetrowater.tn.nic.in/departments/consultancy/pdwing.htm)
Table 5.7: Capital Expenditure on Water Projects (in millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>Capital Expenditure in millions</th>
<th>Capital Expenditure at Constant Prices&lt;sup&gt;34&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>1990-91</td>
<td>197.1</td>
<td>2.7</td>
</tr>
<tr>
<td>1991-92</td>
<td>180.3</td>
<td>2.17</td>
</tr>
<tr>
<td>1992-93</td>
<td>97.5</td>
<td>1.07</td>
</tr>
<tr>
<td>1993-94</td>
<td>203.2</td>
<td>2.03</td>
</tr>
<tr>
<td>1994-95</td>
<td>329.9</td>
<td>2.93</td>
</tr>
<tr>
<td>1995-96</td>
<td>804.6</td>
<td>6.62</td>
</tr>
<tr>
<td>1996-97</td>
<td>547.4</td>
<td>4.3</td>
</tr>
<tr>
<td>1997-98</td>
<td>1042.5</td>
<td>7.85</td>
</tr>
<tr>
<td>1999-00</td>
<td>1883.2</td>
<td>12.96</td>
</tr>
<tr>
<td>2000-01</td>
<td>1578.3</td>
<td>10.14</td>
</tr>
<tr>
<td>2001-02</td>
<td>581</td>
<td>3.6</td>
</tr>
<tr>
<td>2002-03</td>
<td>673.2</td>
<td>4.04</td>
</tr>
<tr>
<td>2003-04</td>
<td>5818.9</td>
<td>33.08</td>
</tr>
<tr>
<td>2004-05</td>
<td>2364.7</td>
<td>12.63</td>
</tr>
<tr>
<td>2005-06</td>
<td>714.9</td>
<td>3.66</td>
</tr>
<tr>
<td>2006-07</td>
<td>926.1</td>
<td>4.49</td>
</tr>
<tr>
<td>2007-08</td>
<td>1307</td>
<td>6.05</td>
</tr>
<tr>
<td>2008-09</td>
<td>1489.9</td>
<td>6.4</td>
</tr>
</tbody>
</table>

Source: CMWSSB, 2008

<sup>34</sup> Capital expenditure is calculated at constant prices by using Wholesale price index numbers furnished by RBI Bulletin, by applying the formula used for deflating: \( \frac{Y_1}{Y_0} \times 100 \); Where \( Y_1 \) stands for capital expenditure at current prices (CMWSSB, 2008) and \( Y_0 \) for capital expenditure at constant prices (calculated values), given the values of WPI(RBI Bulletin).
The above table and graph shows the amount of investment incurred in various water augmentation projects by the board in millions. In the case of Chennai, the Chennai Water Supply and Sanitation Board meets 16% of the total demand\textsuperscript{35}. The gap in demand persists despite the supply augmentation measures adopted by the board. Despite the measures adopted by the board, Chennai is still thirsty. There exists a huge gap between the demand for and supply of water as viewed in the last chapter. What is the reason for this? Is it caused by a lack of availability of water or due to lack of efficacy in water governance?

To-date there has been no sustainable long-term solution to overcome the water crisis in Chennai. The mega projects, which involved inter-basin transfers and desalination plants, have been expensive.

Table 5.8: Cost of production of Water from Various Sources

<table>
<thead>
<tr>
<th>Source</th>
<th>Volume (MLD)</th>
<th>Cost (Rs per kilolitre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface water</td>
<td>1,294</td>
<td>7.06(^a) ($0.15744)</td>
</tr>
<tr>
<td>Brackish water</td>
<td>15</td>
<td>28.72 ($0.64046)</td>
</tr>
<tr>
<td>Seawater desalination (Minjur)</td>
<td>100</td>
<td>48.66 ($1.08512)</td>
</tr>
<tr>
<td>Seawater desalination (Nemmeli-planned)</td>
<td>100</td>
<td>20.64(^b) ($0.46027)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,509</strong></td>
<td><strong>10.93 ($0.24374)</strong></td>
</tr>
</tbody>
</table>

(a) This cost represents the weighted average cost of water from all sources of surface water

(b) Another source mentions the projected operating cost as Rs 44.34/kl at 2008-2009 prices (Meena, 2008)

Source: CMWSSB, 2011

Note: The difference in the cost of production between Nemmeli and Minjur plant, as noted in the above table, is due to the state-of-the-art technology used in Nemmeli desalination plant built on 100% Government of India grant. The Nemmeli desalination plant is relatively cost effective, as it requires only Rs. 21 to produce 1 kiloliter of product water from sea water as compared to Minjur plant which is around Rs 48.66 per kiloliter ((http://newindianexpress.com) 23rd February 2013)

Before going in for such costly projects (table 5.8), it is necessary to explore the locally available sources once. Desalination plants, for instance, are considered as an anomaly in a region with plentiful rainfall (Meergamz von Medeazza [2006]). This is more so taking into consideration the quantum of the city’s rainfall, which is over 1200 mm (S. Janakarajan, Marie Llorente, Marie-Helene Zerah, 2006). Chennai, for instance, receives an average annual precipitation of 1,404 mm (KEA Weather Station, 2012; also see Vedachalam, 2012). The weather estimates indicate an average annual precipitation of 1,458.5 mm for the years 2000-2011 (Table 5.7). Moreover, except for cyclical fluctuations over the past 100 years, a declining trend in rainfall is hardly noted (Figure 5.8 and table 5.9).

However, a lack of perennial river source leads to two problems. Firstly, the city has to find sizeable storage reservoirs where it can capture the enormous rainfall that occurs on the 63 days it gets rain. Secondly, the captured water has to be sufficient enough to last through the rest of the five months of the year, when it only rains 122 mm over five days on average (Vedachalam, 2012).
Figure 5.8: Average Annual Rainfall at Poondi, Red Hills and Cholavaram, 1965-2012

![Rainfall graph]

Source: CMWSSB

Table 5.9 Precipitation in Chennai (2000-2011)

<table>
<thead>
<tr>
<th>Year</th>
<th>January-February</th>
<th>March-May</th>
<th>June-September</th>
<th>October-December</th>
<th>Annual</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>213.0</td>
<td>42.0</td>
<td>442.0</td>
<td>375.0</td>
<td>1,072.0</td>
</tr>
<tr>
<td>2001</td>
<td>1.0</td>
<td>103.0</td>
<td>483.8</td>
<td>1,079.0</td>
<td>1,667.0</td>
</tr>
<tr>
<td>2002</td>
<td>45.0</td>
<td>17.0</td>
<td>355.0</td>
<td>985.0</td>
<td>1,402.0</td>
</tr>
<tr>
<td>2003</td>
<td>0</td>
<td>6.7</td>
<td>420.0</td>
<td>311.0</td>
<td>737.7</td>
</tr>
<tr>
<td>2004</td>
<td>51.0</td>
<td>213.6</td>
<td>360.0</td>
<td>572.0</td>
<td>1,197.0</td>
</tr>
<tr>
<td>2005</td>
<td>7.0</td>
<td>114.0</td>
<td>337.0</td>
<td>2,108.0</td>
<td>2,566.0</td>
</tr>
<tr>
<td>2006</td>
<td>3.0</td>
<td>34.4</td>
<td>393.0</td>
<td>892.6</td>
<td>1,323.0</td>
</tr>
<tr>
<td>2007</td>
<td>6.6</td>
<td>0.6</td>
<td>677.0</td>
<td>625.6</td>
<td>1,309.8</td>
</tr>
<tr>
<td>2008</td>
<td>60.2</td>
<td>166.6</td>
<td>422.6</td>
<td>947.6</td>
<td>1,597.0</td>
</tr>
<tr>
<td>2009</td>
<td>21.2</td>
<td>16.6</td>
<td>233.2</td>
<td>909.8</td>
<td>1,180.0</td>
</tr>
<tr>
<td>2010</td>
<td>5.4</td>
<td>204.0</td>
<td>647.6</td>
<td>757.4</td>
<td>1,614.4</td>
</tr>
<tr>
<td>2011</td>
<td>99.6</td>
<td>31.2</td>
<td>852.4</td>
<td>852.4</td>
<td>1,835.6</td>
</tr>
<tr>
<td>2012</td>
<td>42.75</td>
<td>79.14</td>
<td>468.63</td>
<td>867.95</td>
<td>1,458.46</td>
</tr>
</tbody>
</table>

Source: KEA Weather Station (2012)
The solution to the Chennai water crisis is thus not in increasing investment or seeking solutions through high-cost capital intensive technology; one has to think beyond the mere supply augmentation measures\textsuperscript{36}. Better options like rainwater harvesting\textsuperscript{37} are not accorded the importance as are huge investments on mega projects like desalination plants. Neither the government nor the civic action has been instrumental in promoting and protecting the groundwater reserves in Chennai city, except for the actions taken by a few environmental NGOs like Akash Ganga (Veena et al 2010). Collective action is lacking as far as urban water management is concerned except for the actions taken by certain NGOs. While the government has made rainwater harvesting mandatory, enforcement is not strong in Chennai. Currently, only an estimated 9\% of rainwater in Chennai makes it to the aquifer; the rest runs off into the ocean. NGOs argue that Chennai’s aquifer could be used to harvest and store rainwater and thus increase the quantity available to consumers.

Another serious lacuna noticed with respect to the institutions involved in the water governance in Chennai is that they are highly fragmented\textsuperscript{38}. Due to the involvement of multiple agencies in various stages of water extraction, treatment, storage and provision, institutional fragmentation tends to be severe in the metropolitan context (Tacoli [2003], Allen [2005b]). Metropolitan areas like Chennai are comprised of different administrative units lacking communication between them. That is to say that the state agencies given the responsibility of water augmentation, operation and maintenance are different in CMA. However, lack of co-ordination in their actions makes them highly fragmented and inefficient; resulting in lack of proactive measures to provide a concrete solution to reduce the demand-supply gap as far as the water sector is concerned. As far as the government agencies are concerned, their role is one of increasing the supply rather than

\textsuperscript{36} Suresh.V and Vibhu Nayar (2006)
\textsuperscript{37} The “Rainwater Harvesting” solution involves increasing the amount of groundwater recharge by installing rooftop rainwater harvesting structures and rejuvenating urban ponds. Currently, only an estimated 9\% of rainwater in Chennai makes it to the aquifer; the rest runs off into the ocean. NGOs argue that Chennai’s aquifer could be used to harvest and store rainwater and thus increase the quantity available to consumers.
\textsuperscript{38} No co-ordination between the agencies vested with the responsibilities of drinking water management like CMWSSB, TWAD Board, CGWB, CMDA, and PWD, Municipal corporations, CMWSSB Depots in different wards, private water suppliers, the mineral water agencies and suppliers. The result is that the people act as the takers of the service delivery by these agencies.
managing the demand. The institutional solutions given in the water governance literature have their limitations in their applications in metropolitan cities like Chennai. For instance, Elinor Ostrom’s theory of institutions explains how the collective action of the consumers resolves the problem of management of common property resources. They laid emphasis on the institutional factors that determine when local management of resources becomes sustainable and highlight the importance of adapting strategies suitable for the local circumstances (Baland & Platteau 1996; Ostrom 1990; Wade 1988). Ostrom’s theory of institutions has dealt with the role of traditional societies in governing and protecting natural resources. Her theory has limitations and cannot be applied in a modern setting, where a democratic governance structure has emerged. Furthermore, Ostrom’s theory does not ensure equity but discusses more sustainability of resources. Nor can communities be enabled to construct and maintain drinking water systems as in the case of Nepal’s rural drinking water and sanitation sector (Achyut Lutel and Shyam K.C., 2000). That is because Nepal’s case is that of traditional village society which cannot be replicated in a mega city like Chennai. The need of the hour is thus to chalk out water management that is most suited to Chennai. One such idea is that of waste water treatment, recycling and reuse, which should form part of the water management program for cities like Chennai.

5.4.9 Waste Water Treatment and Recycling

The city authorities did not consider the option of getting used water out of the residences and release safely back to the environment. Like many older cities around the world, the city lacks comprehensive wastewater treatment facilities. The first wastewater treatment plant in Chennai was constructed in 1974; 60 years after the city got its first fresh water treatment plant. Except for the period 1990-1995, when the two treatment capacities nearly matched each other, wastewater treatment capacity in the city has been significantly lagging behind the total drinking water supply. As of 2012, the city had an installed capacity of 1,509 MLD for drinking water treatment (including the 100 MLD at the Nemmeli plant), but only 536 MLD for wastewater treatment. Although the excess capacity on the drinking
water front is encouraging from a long-term perspective, the lack of wastewater treatment capacity is equally disheartening.

Waste water treatment, for instance, is never considered an integral part of the concept of water management. The sewerage is supposed to be treated in treatment plants before being released into water courses. However, with the increasing population and unauthorized residential localities, the sewerage system has been expanding over several decades, making the operation and maintenance of the sewerage system a difficult task. This has resulted in untreated sewerage reaching the waterways over several decades, polluting the waterways and making them open sewers. Sandbars have been formed on the mouths of the waterways (Cooum and Adyar rivers) due to strong littoral drift on the coast, creating a lagoon-type condition in the last few kilometers of the waterways with sewage stagnation. These unsanitary conditions have continuously deteriorated the environment of the city (UNFCCC, Clean Development Mechanism, 2006). Although the sewage treatment needs to be attempted fully, only tertiary treatment is carried out at the moment. Its ecological and environmental implication for the city and peri-urban areas is colossal.

As the city’s residents rely on a number of borewells and private water tankers, it highlights the grave mismatch between the infrastructures devoted to treatment of waste water vis-à-vis drinking water. It also implies that much of the waste water is left untreated and contaminates groundwater aquifers, possibly getting into residential wells before joining the sea. Any discussion on water security has to include adequate infrastructure for wastewater treatment, not only because it is essential to manage available water resources, but also because treated wastewater can be a potential source of addition to water supply. Already, 41 MLD of raw/secondary treated wastewater is supplied to industrial plants such as Madras Refineries, Madras Fertilisers and GMR Vasavi Power for reclamation and reuse. Although waste water reclamation and reuse is not cheap, in certain cases, it can be much less expensive than desalination and provides a reliable source of potable water (Sridhar Vedachalam, 2012).
Treating waste water and returning it to the environment in its natural state will not only protect the ecosystem but can also serve as an additional source of water. It is said that in the German city of Frankfurt, every drop of water is recycled eight times. The water so recycled can be used in industries (Rajeev Semwal, Undated, a Concept Note on Water Governance).

The state agency has thus restricted its water management options to mega projects involving huge investments while not taking into account the locally undeveloped sources like rejuvenation of tanks. At the same time, the utility has over-emphasized more costly and less feasible options like the construction of large inter-basin transfer projects while neglecting cheaper and feasible local available solutions or local water supply options. Studies have revealed that inter-basin transfers are unreliable (Veena 2010) and unhealthy options. Thus the Solutions to Water Problems include:

1) Restoration of temple tanks and ponds in different parts of the city and re-capturing the flow of rain/flood water during monsoon months, especially by linking the city’s storm water drains with these tanks.

2) Recycling and reuse of waste water.

3) Rainwater harvesting in 3600 tanks located in the adjoining districts of Chennai, namely, Tiruvallur and Kancheepuram tanks located in the Tiruvallur and Kancheepuram districts.

4) Construction of check dams in Araniar and Kosathaliar basins to save more rain water.

5) Decentralisation of water treatment and supply to cover both city and peri-urban areas to increase efficiency and to reduce cost and loss due to leakages.

39 Cited by water economist Dr. Janakarajan, MIDS. According to his study, there are 3,600 tanks located in and around Chennai and the adjacent districts of Thiruvalluvar and Kancheepuram. These tanks form an important source of ground water recharge. Rejuvenating these tanks by desilting them and linking them is suggested as the best way to meet the water demands of Chennai city.

40 S. Janakarajan, Marie Llorente, Marie-Helene Zerah, 2006
5.5 SUMMARY OBSERVATION

Given the gap between demand and supply of water in Chennai, the responses of the institutions dealing with drinking water form the major crux of this chapter. The board is understandably a parastatal agency which has emerged with a clean mission statement of supplying good quality water and safe disposal of sewage. However, it is disheartening to find that the mandate of the board remains as mere paper work. This is evident from the fact that the board has confined its service provision to part of the population. Moreover the quality of water supplied is not potable.

A major reason for the poor service provision is because of its financial policies. Although the board has framed indexation of tariff, it is not followed in practice. The distorted tariff structure, charging a flat rate for all the consumers, irrespective of the water consumed has failed to subsidise the poor. Moreover the populist policies of the board have prevented it from revising the tariff which forms a major source of finance for its schemes.

Another institutional lacunae lies in the faulty investment options chosen by the board. A glance at the expenditure and revenue account for the past years shows that huge investment has gone into the different water augmentation projects. These projects are costly but don’t serve much purpose. In other words, the proportionate expenditure that has gone into the large projects has not been instrumental in wiping out the mismatch between demand and supply of water. On the other hand, the board has been found to be incurring losses continuously for five consecutive years. Even the accumulated surplus, due to the grants-in-aid and contributions from the state and central government, has been eaten away by the costly water augmentation schemes and the subsequent debt servicing requirement. Thus the board has failed to be a going concern in recent years due to its myopic policies.

Because of the above-mentioned costly projects, the board has failed to consider other options in realizing its mandate. Many of the locally available solutions like rainwater harvesting or wastewater treatment and reuse, which is
feasible, has been neglected. Instead projects which are expensive, but with negative environmental implications, are accorded high priority.

The sustenance of the water sector is very much under doubt even after the implementation of its costly desalination projects. In that respect, how far the upcoming desalination plant and other water augmentation projects will wipe out the demand-supply mismatch for water is highly questionable. This is especially so in light of the recent expansion of the city and the corresponding increase in the water demand for the future.

Given the failure of the parastatal agency to reduce the demand-supply gap of water, the role of markets in the water sector is noted across cities like Chennai. How far the markets have responded to cater to the increasing demand for water in Chennai has been dealt in the succeeding chapter.